European Journal of Political Economy xxx (xxxx) xxx

Contents lists available at ScienceDirect

European Journal of Political Economy

journal homepage: www.elsevier.com/locate/ejpe

Does clarity make central banks more engaging? Lessons from ECB communications ☆

Federico Maria Ferrara [a,*], Siria Angino [b]

[a] London School of Economics and Political Science – European Institute, Houghton Street, WC2A 2AE London, United Kingdom
[b] European Central Bank, Sonnemannstraße 20, 60314 Frankfurt am Main, Germany

ARTICLE INFO

Keywords:
Central bank communication
Clarity
ECB
Engagement
Media
Readability metrics

ABSTRACT

Despite increasing communication efforts, it may be difficult for central banks to engage the public, as their language is often too difficult to understand for most citizens. Focusing on the case of the European Central Bank (ECB), we hypothesise that greater communication clarity is conducive to stronger engagement. We rely on readability metrics to measure the clarity of ECB communications. We show that communication clarity is a significant and robust predictor of the media engagement generated by the ECB with its speeches, press conferences and tweets. Our findings are validated by a placebo test and have significant policy implications for central bank communication.

1. Introduction

Central bank communication has changed radically over the last decade. Since the Global Financial Crisis, the communication activities of central banks have grown exponentially in volume and have become more targeted at the general public (Haldane 2017). Nonetheless, despite increasing communication efforts, there remains a widespread perception that central banks communicate in a way that most households cannot understand. As Bank of England Chief economist Andrew Haldane put it on several occasions, "around 95% of all the words central banks utter are inaccessible to around 95% of the population" (Haldane 2018). This lack of clarity in the public communications of central banks is regarded as a major form of hindrance for these institutions to successfully engage the public and close the "twin deficit" of public understanding and trust in economics (Haldane et al. 2020).

Economic research has provided evidence for a range of positive implications of the clarity of central bank communication on the behaviour and expectations of financial market actors (e.g., Jansen 2011a; Montes et al. 2016; Smales and Apergis 2017; Montes and Nicolay 2017). Moreover, economists have increasingly studied the determinants and consequences of public attention and perceptions related to monetary policy by analysing media coverage on central banks (e.g., Berger et al. 2011; Binder 2017; Bennani 2018; Istrefi 2019a; Bennani 2020). Yet, we still know very little about the effects of central bank communication clarity on public attention and engagement. Focusing on the case of the ECB, this paper fills the gap by asking the following research question: does communication clarity make central banks more engaging?

☆ **Acknowledgements:** This paper was presented at the online workshop on "Central Banking in the 21st Century - A Crisis of Accountability?" on 11–12 March 2021. We thank Nicole Baerg, James Cross and the other seminar participants for helpful comments. The views expressed in the article are those of the authors. They do not necessarily reflect those of the European Central Bank and should not be reported as such. Federico Maria Ferrara acknowledges support by the European Research Council under ERC_SYG_2018 Grant no. 810356, in the scope of the project SOLID – Policy Crisis and Crisis Politics. Sovereignty, Solidarity and Identity in the EU post 2008.

* Corresponding author.
E-mail addresses: f.m.ferrara@lse.ac.uk (F.M. Ferrara), siria.angino@ecb.europa.eu (S. Angino).

https://doi.org/10.1016/j.ejpoleco.2021.102146
Received 6 April 2021; Received in revised form 9 August 2021; Accepted 7 November 2021
Available online 18 November 2021

The article addresses this question by analysing a comprehensive dataset of ECB speeches, press conferences and tweets using readability metrics (Flesch 1948; Gunning 1952; Kincaid et al. 1975). We follow previous studies that have used language complexity as a proxy of (lack of) communication clarity, and assess its impact on media engagement, focusing on both traditional and social media. We show that greater complexity (i.e., lower clarity) of ECB speeches and press conferences is significantly and robustly correlated with lower levels of media coverage on the ECB at the time in which these communication events take place. Also, we provide evidence that the clarity of ECB digital communications is a strong predictor of the social media engagement generated by the central bank on Twitter.

In carrying out these analyses, we control for several potential confounders, such as the topics of discussion and number of speeches on a given day, the presence of conventional and unconventional policy changes during a press conference, and the topics and media content of ECB tweets. Following a burgeoning literature employing text mining techniques to analyse the content of central bank communications (e.g., Baerg and Lowe 2020; Cross and Greene 2020; Ferrara 2020), we use supervised and unsupervised machine learning models to extract topics from the textual content of ECB speeches and tweets.

Moreover, we perform a placebo test for speeches and press conferences to ensure that our results are not driven by a phenomenon of reverse causality in which the level of the treatment (i.e., communication clarity) is affected by the pre-treatment level of the outcome variable (i.e., media engagement). Finally, we test the robustness of our results to different model specifications and operationalisations of communication clarity. Taken together, these findings contribute to a lively debate on the appropriate balance between different features of central bank communication (e.g., Bholat et al. 2019; Istrefi 2019b) and have significant implications, especially in light of the ongoing review of the ECB's policy strategy.

The next section reviews major contributions on communication clarity and develops the argument we test in our empirical analysis. The third section discusses the data and methods employed in the paper. The fourth section presents the results of our analysis. The fifth section performs the placebo test and provides robustness checks. The final section highlights the policy implications of our findings and points to future avenues for research.

2. The effects of communication clarity

A common observation in the academic and public debate is that, in many ways, the styles of discourse are changing radically in contemporary public communications. While the challenges of policy-making have grown in complexity over the past decades, the sophistication of public speech has declined. For example, scholars across disciplines have applied measures of textual complexity developed in the field of education to find that the sophistication of the speeches given by American presidents has steadily decreased over the past 200 years (e.g., Sigelman 1996; Teten 2003; Lim 2008). Political scientists and social psychologists have advanced significantly in the study of the determinants and effects of linguistic complexity in political communication (e.g., Spirling 2016; Lin and Osnabrügge 2018; Bischof and Senninger 2018; Schoonvelde et al. 2019; Benoit et al. 2019; Rauh et al. 2020).

Scholarly interest in communication clarity has not remained limited to the domain of political communication. This topic is particularly relevant for central banks. A long-standing debate in economics has focused on what constitutes an optimal communication strategy for central banks (for a review, see Blinder et al. 2008). Within this body of research, several studies have argued that communication clarity constitutes a key element of central bank transparency (e.g., Winkler 2000; Fracasso et al. 2003; Jansen 2011b). The clarity of the communication activities of central banks has been increasingly measured by applying the same metrics of textual complexity developed in education studies (e.g., Flesch 1948; Gunning 1952; Kincaid et al. 1975) and used by political science and psychology scholars to evaluate the complexity of political speeches. Most of the literature studying the consequences of the clarity of central bank communication employs these measures and points to significant effects of clarity in steering financial market expectations and reducing volatility (e.g., Jansen 2011a; Smales and Apergis 2017; Montes et al. 2016; Montes and Nicolay 2017).[1]

Economists have paid less attention to the effects of the clarity of central bank communication beyond the realm of financial markets. As argued by Haldane and McMahon (2018), one reason why central banks may want to communicate more directly with the general public is to address the "twin deficits" of public understanding and trust in economics. To achieve higher levels of trust and understanding, it may not be sufficient to simply increase the quantity of communications with the public. Haldane et al. (2020) contend that, for central bank communication to have an impact, it is important that households and businesses engage with it. Despite the increasing volumes of central bank communication with the public, the technical language used by central bankers may constitute an obstacle to effectively engage the public. As Haldane (2017), Coenen et al. (2017) and Haldane and McMahon (2018) show, the main publications of central banks in many advanced economies present a level of complexity that makes them too difficult to understand for about 90% of the general public.

In spite of the evidence highlighting that central bank communication is often too difficult to understand for the average citizen, whether central bank communication clarity has an effect on engagement remains a blind spot in economic research. There are good reasons to hypothesise this is the case. For instance, recent evidence from experimental research supports the idea that low levels of clarity constitute a key obstacle for central bank communication to have a direct impact on public attitudes, expectations and behaviour. Haldane and McMahon (2018) employ survey experiments to provide evidence that clearer and simpler

[1] Notwithstanding the potentially positive effects of clear communication on financial markets, it is interesting to observe that clarity of communications by several central banks decreased during the financial crisis, as documented by Bulir et al. (2012). However, a clear answer to the question of what drives the clarity of central bank communication has yet to be found (Bulir et al. 2013).

communications about inflation increase individuals' understanding of the communicated messages, improve attitudes towards the communicating central bank, and generate greater alignment between individuals' inflation expectations and central bank forecasts. Furthermore, Bholat et al. (2019) make use of online experiments to show that public comprehension of, and trust in, central banks can be improved if communications are made more relatable to people's daily lives.

As Haldane et al. (2020) put it, for households and businesses to engage with the communication of central banks, "they need to read or see it and they need to take the message on board". That points to the role of the media as the main vehicle of the messages of central banks to the public. For these reasons, the analysis of this paper focuses on media engagement as a proxy for public engagement. In doing so, we follow previous research, most notably Lamla and Sturm (2013), and see media as a fundamental transmitter of news to the public. Media engagement can be regarded as a necessary condition for central bank communication to exert an effect on public perceptions and decisions: if journalists and social media users do not pick up on the messages of central banks, it is reasonable to expect the communications of monetary institutions to have little leeway to reach the general public and influence its expectations and behaviour. In particular, while economists have traditionally focused on the effects of central bank communication on financial markets (e.g., Jansen and de Haan 2007; Rosa and Verga 2007; Rozkrut et al. 2007; Neuenkirch 2012; Büchel 2013; Anderes et al. 2021), household inflation expectations have increasingly become one of the main targets of central bank communication, as well as the object of a burgeoning strand of research in the field of central banking (e.g., Lyziak and Paloviita 2017; de Haan and Sturm 2019; Coibion et al. 2019; Coibion et al. 2019; Baerg et al. 2021).

We consider two dimensions of media engagement, which provide us with two different measures of public attention and action. First, we consider traditional media coverage, namely the amount of articles written by journalists. This provides us with a measure of *how much the public is exposed to the messages of the central bank*. Second, we analyse user behaviour on social media, which offers an indication of *how much the public reacts to the messages of the central bank*. We see the disintermediated context of social media as an appropriate setting to evaluate the degree of public response to central bank communications in a more direct fashion.

Media coverage on central banks has increasingly captured the attention of economic researchers, and our research endeavour builds on several studies in the economic literature. As pointed out by Bennani (2020), ECB media coverage can affect the economic perceptions of a wide range of actors, thereby shaping their expectations and behaviour. This is especially true for the general public, as the media is a cost-effective source to update the information sets under the tight informational constraints to which ordinary citizens are subject (Sims 2003). Previous research has shown that media coverage has a significant impact on interest rate expectations (Lamla and Sturm 2013), inflation expectations (Lamla and Lein 2014; Lamla and Lein 2015), and public support for the ECB (Hayo and Neuenkirch 2014). Moreover, Bennani (2018) shows that the ECB acts more dovishly in response to higher uncertainty expressed in ECB media coverage. Focusing on the US context, Istrefi (2019a) quantifies public perceptions of the policy preferences of Federal Open Market Committee members based on newspapers and business reports of Fed watchers, while Bennani (2020) provides evidence that investor sentiment is responsive to media portrayals of the Fed chair as confident and optimistic. Finally, Berger et al. (2011) and Binder (2017) have provided detailed assessment of how traditional media coverage responds to the communication activities of, respectively, the ECB and the Federal Reserve.

Despite the increasing scholarly interest in media coverage on central banks, previous studies have so far presented very little evidence that the attention of journalists and social media users to the communications of central banks is conditioned by the clarity of central bank communication. One exception is given by Haldane et al. (2020, 36-38), who compare the online media reach of the November 2017 Bank of England Inflation Report, which introduced simplified, layered content, with two counterfactual reports that presented no simplified content. Their analysis offers descriptive evidence suggesting that simpler communications may foster the engagement generated by central banks.

Drawing from this strand of economic research and from studies in the field of consumer psychology showing that readability shapes social media engagement (e.g., Leonhardt and Makienko 2017; Pancer et al. 2019), this paper offers the first systematic assessment of a link between clarity and engagement in the realm of central bank communication. It does so by focusing on the communication activities of the ECB. The next section presents the data and methods we employ to shed light on the effects of the ECB's clarity of communication with the public.

3. Data and methods

3.1. Measuring clarity of communications

Does the clarity of ECB communication activities shape public attention and engagement? To answer this question, we first have to illustrate how clarity is operationalised. We measure communication clarity using two readability metrics: the Flesch–Kincaid Grade Level and the Gunning-Fog Index. Both metrics attempt to measure how easy it is to read a piece of text and are based on word length and sentence length. The Flesch–Kincaid (F–K) Grade Level derives from the Flesch Reading Ease (FRE) Test (Flesch 1948) and provides a score that can be interpreted as the number of years of education generally required to understand a text. The higher the score, the greater the complexity (i.e., the lower is the clarity) of the language used. The measure is calculated using the following formula (Kincaid et al. 1975):

$$\text{F–K Grade Level} = 0.39\left(\frac{\text{Total Words}}{\text{Total Sentences}}\right) + 11.8\left(\frac{\text{Total Syllables}}{\text{Total Words}}\right) - 15.59$$

Different from the F–K Grade Level, the Gunning-Fog (FOG) Index takes into account the number of *complex words*, rather than total syllables. Complex words are defined as those words with three or more syllables[2] and that are not proper nouns, familiar words, or compound nouns. Thus, the FOG Index differs from the F–K Grade Level inasmuch as it relies on vocabulary-based features, namely word categories (e.g., familiar words, proper nouns, etc.) as operationalised by pre-specified lists. The metric is calculated based on the following formula (Gunning 1952):

$$\text{FOG Index} = 0.4 \text{ x} \left[\left(\frac{\text{Total Words}}{\text{Total Sentences}} \right) + 100 \left(\frac{\text{Complex Words}}{\text{Total Words}} \right) \right]$$

Initially developed in the field of education research, these measures have been applied in a wide array of other fields, ranging from medicine (e.g., Paasche-Orlow et al. 2003) to journalism (e.g., Wasike 2018), and including many studies in economics (e.g., Jansen 2011a; Bulir et al. 2014; Montes et al. 2016; Smales and Apergis 2017) and political science (e.g., Spirling 2016; Lin and Osnabrügge 2018; Schoonvelde et al. 2019; Rauh et al. 2020).

To be sure, the application of readability metrics has not remained uncontested. Recently, there have been different cross-disciplinary attempts to produce more sophisticated measures of comprehension difficulty of text. For instance, Benoit et al. (2019) have introduced a new domain-specific approach to measuring sophistication through complexity in political texts. Their approach relies on crowdsourcing for the evaluation of textual difficulty and considers a wider set of features, such as word rarity, measured with dynamic term frequencies derived from the Google Books dataset.

Despite these recent advancements and challenges to standard measures of textual complexity, the FRE Test, the F–K Grade Level and the FOG Index remain widely used in the social science literature for good reasons. For example, as Schoonvelde et al. (2019) point out, Benoit et al. (2019) find the FRE Test to be a crucial predictor of sophistication in political texts: with that measure alone, it is possible to correctly predict 72% of the human coders' judgements of difficult text snippets in their study. The introduction of various additional text features only marginally improves the prediction capacity of the FRE Test alone.

Thus, we follow the approach adopted by most social science studies analysing language complexity, namely we employ the F–K Grade Level, which is based on the same features of the FRE Test.[3] We then validate our results with the FOG Index in the robustness checks. Making use of these two metrics, we analyse the communication of the ECB across three different activities. First, we consider the speeches given by the members of the ECB Executive Board and Supervisory Board.[4] Second, we take into account the monetary policy press conferences held by the ECB President following the meetings of the ECB Governing Council. Third, we study the digital communications of the ECB on Twitter.[5]

3.2. ECB communications and traditional media engagement

3.2.1. ECB speeches

For ECB speeches, we use a dataset containing all the monetary policy and banking supervision speeches given by ECB Executive Board and Supervisory Board members from January 1999 to October 2019 (i.e., from the beginning of the Presidency of Wim Duisenberg to the end of the Presidency of Mario Draghi), for a total of 2175 measurable speeches which occurred on 1655 days. For days in which more than one speech was given, we consider the average score of all the speeches given on that day.

Table A1 in Online Appendix A provides the summary statistics of all the variables used in the speech analysis, including the daily communication clarity of ECB speeches based on the measures of textual complexity discussed above. The mean F–K Grade Level of ECB speeches is 14.4, which falls inside the range of complexity identified by Haldane and McMahon (2018), who claim that typical central bank publications have a F–K Grade Levels of 14–18 (roughly equivalent to college-level education). Given the levels of literacy across the population, this makes the average speech of the ECB inaccessible to at least 90% of the general public.

The summary statistics of Table A1, however, conceal some interesting degree of variation in communication clarity. Fig. 1 shows the evolution of the F–K Grade Level in the corpus of ECB speeches from 1999 to 2019. Higher values on the *y*-axis correspond to higher levels of complexity (i.e., lower levels of clarity). Data points for speeches given by Executive Board members are indicated by the light blue colour, while those of Supervisory Board members are coloured in red. Also shown in the graph is the Board-specific conditional mean of the readability score.

The graph displays a significant degree of variation in the communication clarity of the ECB over time, with two patterns worth highlighting. First, speeches of ECB Executive Board members have become clearer after the onset of the euro crisis in 2010. Before

[2] Common suffixes are not counted as syllables; e.g., *-ed*, *-ing*, etc.

[3] The only difference between the FRE Test and F–K Grade Level is that the latter produces a Grade Level rather than a score between 0 and 100.

[4] The Executive Board is the decision-making body that is responsible to implement monetary policy for the euro area, while the Supervisory Board plans and carries out the tasks of the ECB in the field of banking supervision. Both decision-making bodies have six ECB representatives (a President/Chair, a Vice-President/Vice-Chair and four other members). Similar to the Governing Council, which consists of the six members of the Executive Board plus the governors of the national central banks of the 19 euro area countries, the Supervisory Board has six ECB representatives plus representatives of national supervisory authorities. Our analysis focuses on the speeches given by ECB representatives.

[5] Other studies, such as Bennani et al. (2020), have also considered the content of press interviews in their analysis of central bank communication with the public. In our paper, we decide to focus on speeches, press conferences and tweets for reasons of data availability, composition and comprehensiveness. Indeed, not all interviews given by the ECB President and Board members are published on the ECB's website. At the time of the writing, the press interviews on the website of the ECB are available only from 2004, with the amount of communication activities being extremely low in the pre-crisis period (e.g., only six interviews in 2004 and 2006). We leave the extension of our analysis to assess the impact of communication clarity in ECB interviews for future work.

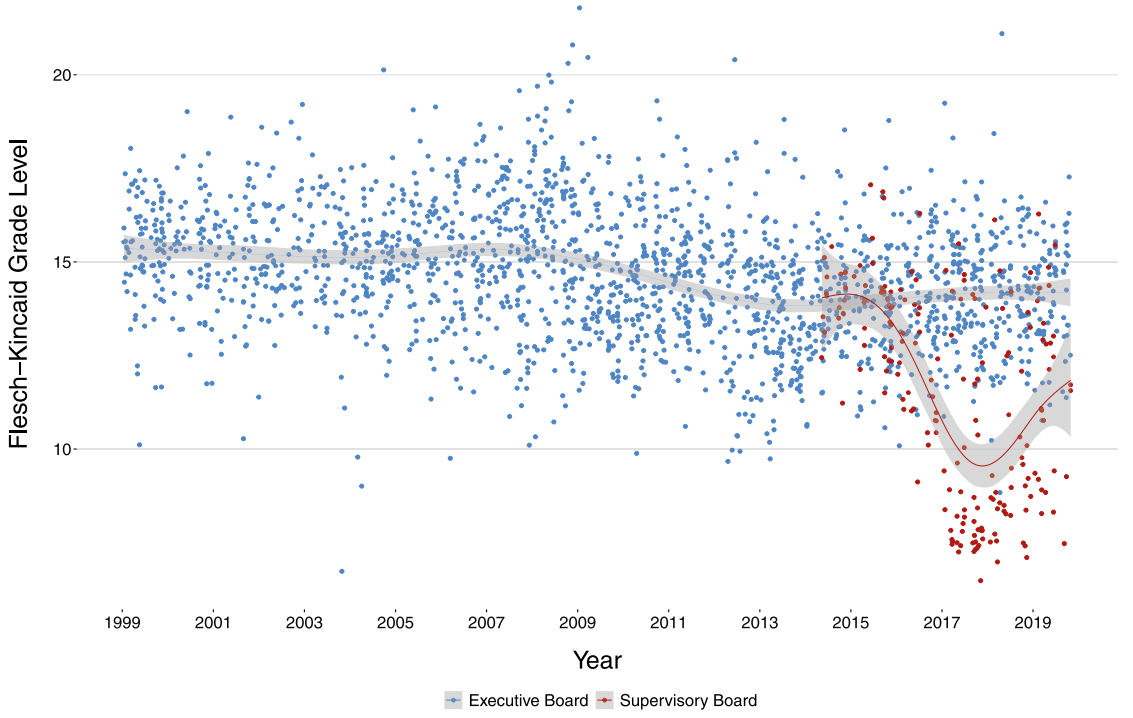

Fig. 1. Complexity in ECB speeches, 1999–2019 (F–K Grade Level). NOTES: This figure displays the F–K Grade Level value of all the speeches given by the members of the Executive Board and the Supervisory Board of the ECB from 1999 to 2019, together with Board-specific conditional means. Higher (lower) values indicate a greater degree of communication complexity (clarity). Conditional means show 95% confidence intervals.

that moment, the F–K Grade Level remained, on average, above 15, a degree of clarity that is accessible only to individuals who have graduate-level college education. After 2010, the level of complexity remains very high, but falls below 15. Second, the average F–K Grade Level of Supervisory Board members has been much lower than that of Executive Board members.[6] A significant portion of Supervisory Board members' speeches score below 10, thereby being more easily accessible also to non-college educated individuals.

In the estimation of the relationship between communication clarity and media engagement presented in Section 4, we control for potential confounding factors in the analysis. Clearly, one of the most important confounders is given by the topics addressed by each speech. It might be that speeches focused on certain technical issues about monetary policy and banking supervision are inherently more complex than speeches related to general interest topics, such as euro coins and banknotes. To account for these differences in the topics of discussion, in line with recent studies using topic modelling to analyse speeches related to monetary policy (see also Ferrara et al. 2021), we make use of a Structural Topic Model (STM) to obtain estimates of the distribution of topics in each speech, which we include as a control variable in our analysis. The procedure to extract topics from speeches and the output of STM is described in detail in Online Appendix B.

3.2.2. ECB press conferences

Regarding press conferences, our dataset includes the text from the introductory statement and the Q&A session with journalists for each press conference given by the ECB President from January 1999 to October 2019. This yields a text corpus of 225 press conferences. Table A3 in Online Appendix A presents the summary statistics for this dataset. The table also provides separate figures for the clarity of the introductory statement (IS) portion of the text, which usually follows a regular technical structure, and the transcript of the Q&A session, which is typically less structured and technical in its content.[7] The average level of complexity in

[6] Sabine Lautenschläger was both member of the ECB Executive Board and Vice-Chair of the ECB Supervisory Board from 2014 to 2019. Since her speeches focused mostly on banking supervision and were produced by the speechwriting unit of the Single Supervisory Mechanism, her speeches are classified as belonging to the Supervisory Board in Fig. 1.

[7] The textual data of the Q&A session includes both the questions posed by the journalists and the answers given by the President. Our decision not to remove the content of journalists' questions is driven by both technical and substantive reasons. Technically, due to the over time variation in the structure of the HTML documents of ECB press conferences, the removal of the journalist questions is difficult to automatise and would require a lengthy (and potentially prone-to-error) manual process to separate questions and answers. Substantively, it is important to note that the complexity of the ECB's answers may be partly endogenous to the clarity of journalists' questions. Thus, we prefer to minimise the amount of pre-processing operations and keep the full content of the Q&A session in our analysis.

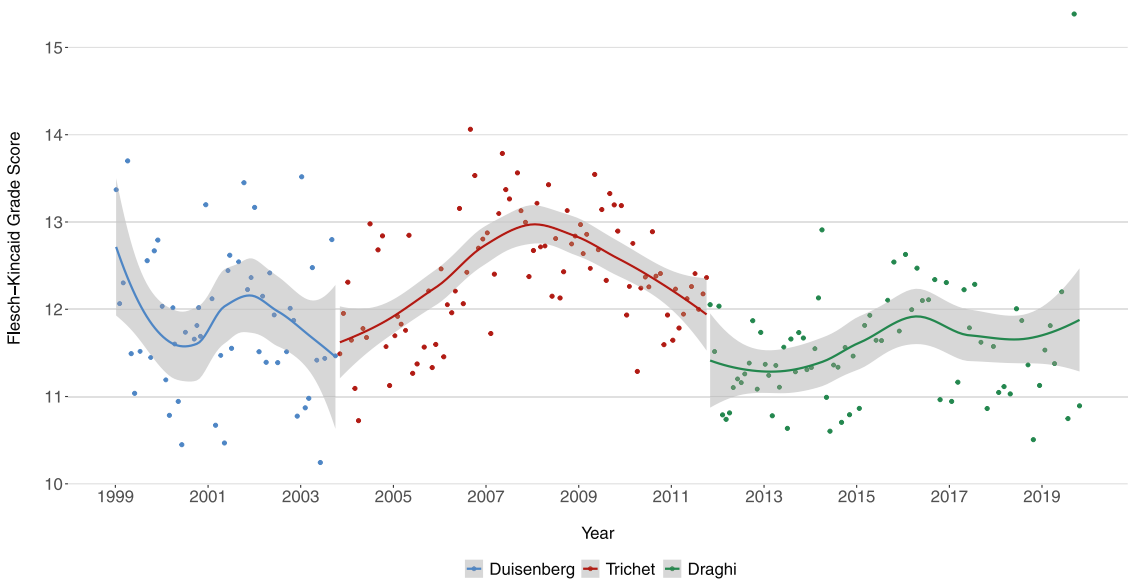

Fig. 2. Complexity in ECB press conferences, 1999–2019 (F–K Grade Level). Notes: This figure displays the F–K Grade Level value of all ECB press conferences from 1999 to 2019, together with Presidency-specific conditional means. Higher (lower) values indicate a greater degree of communication complexity (clarity). Conditional means show 95% confidence intervals.

press conferences is lower than that of speeches (i.e., the level of clarity is higher). Importantly, the higher level of clarity in press conferences is driven by the Q&A session, which accounts for the greatest part of the press conference and whose mean F–K Grade Level is 11. Instead, the IS has a F–K Grade Level above 15, more in line with the level of complexity of ECB speeches.

Fig. 2 shows the over-time evolution of complexity in ECB press conferences, distinguishing between different Presidency terms. The F–K Grade Level is here based on both the ECB introductory statement and the Q&A with the journalists. Presidency-specific conditional means are presented with 95% confidence intervals. The graph shows an increasing trend in communication complexity from 2003 to 2009. Then, communication clarity has significantly improved during the euro crisis. Starting from late 2014, namely around the time of the activation of the ECB Asset Purchase Programme, there is again an upward trend in communication complexity. This is followed by a reduction in 2018 and 2019, with the interesting outlier of the press conference of September 2019, which reaches the highest level of complexity in the sample.

In estimating the effect of press conference clarity on media engagement, we control for the announcement of policy changes on the day of the press conference. Moreover, we attempt to control for the informational content of ECB press conferences by including price changes during the 90-minute window of the communication event. This is important in light of recent studies providing evidence that the textual content of ECB press conferences affects asset prices and market participants' ability to predict future monetary policy decisions (e.g., Parle 2021; Baranowski et al. 2021). In Online Appendix C, we describe and discuss the control variables we employ in the analysis of ECB press conferences. These control variables are based on the timeline of ECB monetary policy measures developed by Hartmann and Smets (2018, 96) and the "Euro Area Monetary Policy Database" by Altavilla et al. (2019).

3.2.3. Traditional media engagement

To evaluate the impact of the clarity of ECB speeches and press conferences on engagement, we make use of a novel dataset of news articles mentioning the ECB, retrieved from the digital archive of Dow Jones Factiva. We employ the Data, News and Analytics (DNA) service: DNA is a platform that draws together more than 8000 premium content sources within the Dow Jones ecosystem and licenced third-party publishers. Different from the standard Factiva archive, the content of Dow Jones DNA is licenced for text-mining and machine-learning use cases. Using a simple query search based on the keyword "ECB", we extract the universe of English articles mentioning the ECB from 1999 to 2019 in Dow Jones DNA archive. This yields a corpus of 1,588,296 news articles produced by more than 3000 English news sources across the world.

Fig. 3 provides a visualisation of the over-time evolution of the monthly volume of ECB-related articles in the considered time period. Figure A1 in Online Appendix A displays the amount of ECB coverage by news source, focusing on those media outlets that have published at least 5000 articles mentioning the ECB in the 1999–2019 period.[8] To verify that the composition of sources

[8] It is worth noting that many of the sources frequently referring to the ECB in our dataset are newswire agencies. Despite being often targeted more at specialised audiences, these outlets can still be seen as quite relevant for measuring public engagement, as communication research shows that news articles in traditional and, especially, online media are highly reliant on agency content (see Boumans et al. 2018).

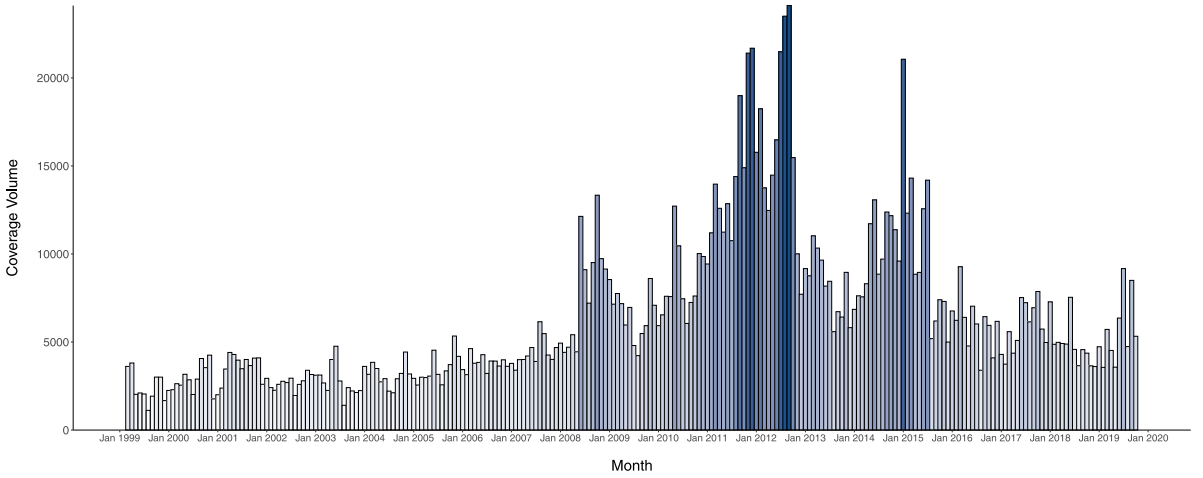

Fig. 3. Volume of English articles mentioning the ECB by year, 1999–2019. NOTES: This figure displays the monthly volumes of ECB articles from Dow Jones Factiva DNA Archive in 1999–2019 period. The colour scale variation is proportional to the monthly volume of media coverage.

remains broadly stable throughout the investigation period, Figure A2 in Online Appendix A shows the yearly volumes of coverage of the most prevalent source in the dataset (i.e., Reuters News) from 1999 to 2019. The figure displays a relative over time stability, with Reuters News's coverage mounting during the global financial crisis and the euro crisis, and returning to pre-crisis levels after 2015. Summary statistics of the volumes of coverage around ECB speeches and press conferences are presented in Tables A2 and A3 in Online Appendix A.

3.3. ECB tweets and social media engagement

Regarding ECB digital communications, we rely on a novel dataset of all the tweets posted by the ECB Twitter account from January 2016 to July 2019, for a total of 6276 tweets. The data were retrieved from the Analytics Dashboard of the Twitter account of the ECB. The dataset contains information about each tweet's engagements (i.e., the amount of any type of Twitter users' interaction with the tweet, namely the sum of likes, replies, retweets, and any type of user click on the tweet), impressions (i.e., the amount of times the tweet has appeared in the timeline of Twitter users), and media content (i.e., the presence of pictures or videos embedded in the tweet). Other tweet features, such as the topic of the tweet, have been manually coded for a sub-sample of the dataset (n=1790). The topic classification is based on eight categories (i.e., Monetary Policy, Banking Supervision, Euro Currency, Financial Stability, Human Resources, Markets & Payments, Statistics, Other).

The main dependent variable we use to measure social media engagement is the engagement rate of ECB tweets. The engagement rate offers an indication of the number of social media reactions generated by an ECB tweet, standardised by the number of users who saw it:

$$\text{Engagement Rate} = \left(\frac{\text{Engagements}}{\text{Impressions}}\right) \text{x } 1000$$

Table A4 in Online Appendix A provides summary statistics of the measures of (lack of) communication clarity in ECB tweets, as well as of engagements, impressions and engagement rate at the time of the data retrieval (i.e., November 2019). Fig. 4 provides a visualisation of the monthly evolution of the average engagement rate of ECB tweets.

In the analysis, we control for the topic of each tweet. Since only a subset of the corpus of ECB tweets has been manually coded, we rely on a supervised machine learning algorithm to automatically extend the topic classification to each non-coded tweet. In particular, we employ Support Vector Machines (SVM) to classify the topic of all tweets in our dataset. The procedure we follow is described in detail in Online Appendix D, which also provides performance metrics of our SVM classifier.

4. Results

Does communication clarity increase public attention towards the messages sent by the ECB? In this section, we shed light on the effects of the clarity of ECB communications on traditional and social media engagement. We perform three sets of analyses.

First, we consider the relationship between the complexity of a given ECB speech and the sum of ECB-related articles published on day t in which the speech is delivered and day $t+1$ after the speech. Thus, our initial dependent variable is the two-day volume of articles about the ECB retrieved from the Dow Jones DNA archive. Considering a two-day $[t, t+1]$ window allows us to avoid making assumptions about exactly when during the event window journalists write, and media outlets publish, articles generated

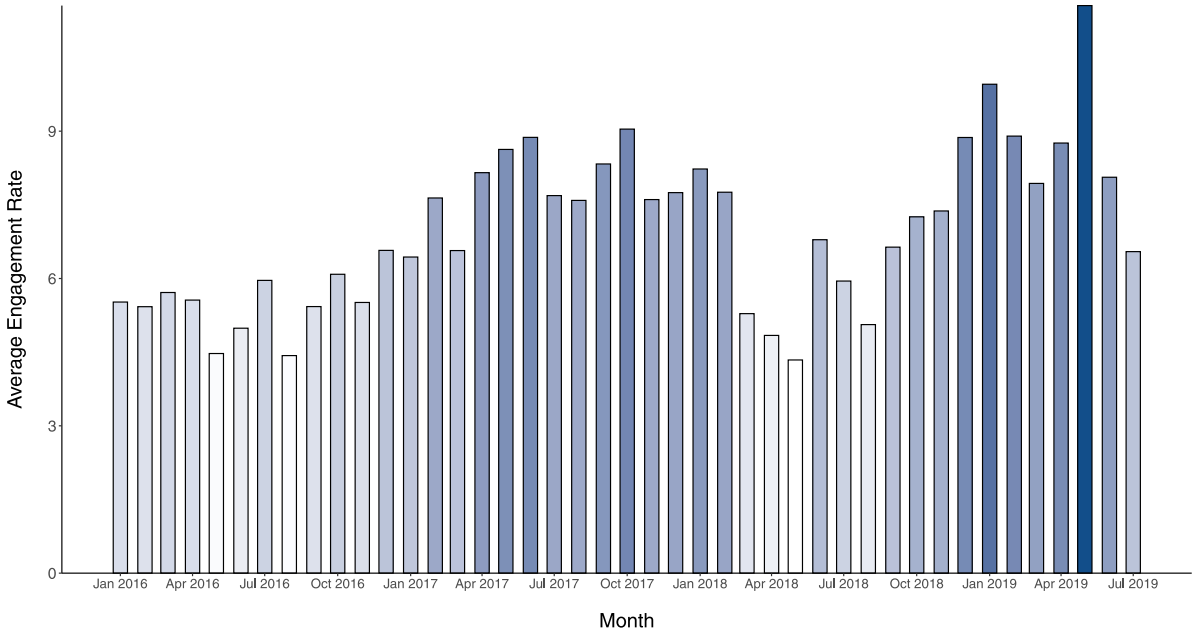

Fig. 4. Engagement rate of ECB tweets by month, 2016–2019. NOTES: This figure displays the monthly average engagement rate of ECB tweets from the ECB Twitter Account in 2016–2019 period. The colour scale variation is proportional to the engagement score.

by the ECB speech.[9] In Section 5, we disaggregate this time window and show that our results are robust when using daily volumes on day t and day $t+1$ separately as dependent variables.

Before performing our analysis, some adjustments to the data are needed. In our dataset, there are 1655 days in which at least one speech was given by an ECB Board member. In 409 of these 1655 days more than one ECB speech was given. For these 409 days, we take the average Flesch–Kincaid Grade Level of all the speeches that were held on the same day as the main independent variable in our analysis. Similarly, as a control variable, we consider the average topic proportions from all the speeches that were given on the same day. Additionally, we include a dummy variable to control for days in which a speech was given by the ECB President and a variable indicating the number of ECB speeches occurring on each day. Finally, to control for the sender type and discriminate between speeches of the Executive Board and those of the Supervisory Board, we introduce a dummy variable for days in which at least one SSM speech was given.

The dependent variable in our analysis is a discrete variable, whose distribution is limited to non-negative values. As shown in Figure A3 in Online Appendix A, the distribution of the volume of articles about the ECB is highly skewed, with most days having a relatively low volume of ECB coverage and few days exhibiting a disproportionately higher one. As a result, the volume of coverage is not normally distributed and the variance of the distribution is higher than its mean. Hence, we model the relationship between speech features and media engagement using a negative binomial model. As robustness checks, in Section 5, we carry out the same analysis using ordinary least squares models and show that the results are not particularly sensitive to the model selection.

Table 1 presents marginal effects from negative binomial models in which the two-day volume of media coverage is regressed onto the F–K Grade Level of ECB speeches. Table A7 in Online Appendix E presents the full set of estimated coefficients. In column (1), the model includes only the measure of clarity of ECB speeches on day t based on the F–K Grade Level, together with a constant. In column (2), we add topic proportions as controls for the different types of content of ECB speeches, using the "Conventional Monetary Policy" topic as a reference category. In column (3), we add controls for days in which the President gave a speech and for the number of speeches given on day t. In column (4), we add time fixed effects, using factor variables for the day of the week, the month and the year in which speeches were given. All models use robust standard errors.

The results indicate a statistically significant negative relationship between speech complexity and media coverage of the ECB. That is, communication clarity is positively associated with higher volumes of ECB-related news articles. The easier it is to understand a speech given by an ECB Board member, the more likely it is that journalists write about the ECB. The inclusion of controls for topics, presidential speeches and number of speeches produces only a slight reduction in the magnitude of the estimated coefficient and in the t-statistic of the F–K Grade Level variable. The inclusion of time fixed effects contributes to a further reduction in the magnitude of the estimated effect of the main independent variable, which, however, remains statistically significant at the 5%

[9] For instance, if an ECB speech is delivered late in the afternoon of day t, it is reasonable to expect most of the speech-related news articles to be published on day $t+1$.

Table 1
ECB speech complexity and media engagement: Marginal effects.

Dependent variable	(1) V_t+V_{t+1}	(2) V_t+V_{t+1}	(3) V_t+V_{t+1}	(4) V_t+V_{t+1}
Flesh–Kincaid (Speeches)	−31.336***	−31.570***	−29.560***	−7.933**
	(−5.49)	(−4.64)	(−4.39)	(−2.23)
Observations	1,655	1,655	1,655	1,655
Topics		✓	✓	✓
Additional controls			✓	✓
Time fixed effects				✓

Marginal effects from negative binomial models. t statistics in parentheses. Robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2
ECB press conference complexity and media engagement: Marginal effects.

Dependent variable	(1) V_t+V_{t+1}	(2) V_t+V_{t+1}	(3) V_t+V_{t+1}	(4) V_t+V_{t+1}	(5) V_t+V_{t+1}	(6) V_t+V_{t+1}	(7) V_t+V_{t+1}
Flesch–Kincaid (All PC)	−104.091*	−129.678**	−117.109***	−101.618**	−63.813**		
	(−1.91)	(−2.44)	(−2.60)	(−2.40)	(−2.50)		
Flesch–Kincaid (Only IS)						−11.247	
						(−0.33)	
Flesch–Kincaid (Only Q&A)							−57.422***
							(−2.84)
Observations	225	225	225	223	223	223	223
Conventional policy change		✓	✓	✓	✓	✓	✓
Unconventional policy change			✓	✓	✓	✓	✓
Asset price changes				✓	✓	✓	✓
Time fixed effects					✓	✓	✓

Marginal effects from negative binomial models. t statistics in parentheses. Robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

level. Our results imply that a unit variation in the F–K Grade Level of ECB speeches corresponds to an average drop of more than 31 articles on the ECB in the most parsimonious specification, and roughly 8 articles in the most stringent one.

Second, we assess the relationship between communication clarity in ECB press conferences and ECB-related media coverage around the press conference. The dependent variable is now given by the number of ECB-related articles that were published on the two-day $[t, t+1]$ window of the ECB press conference. In our analysis, we start by considering the F–K Grade Level of all the textual content of the press conference and subsequently distinguish between the textual content of the introductory statement (IS) given by the ECB President and the Q&A session between the President and the journalists attending the press conference. As for Table 1, our baseline specification is based on a negative binomial model with robust standard errors.

Table 2 presents the marginal effects of our analysis of press conferences, while the full set of results is available in Online Appendix E (Table A8). In columns (1)-(4), the independent variable is the F–K Grade Level of the entire press conference. In column (1), the model includes only the measure of (lack of) communication clarity as an explanatory variable and the intercept. In column (2), we add a control for the announcement of changes in the conventional monetary policy of the ECB. In column (3), we add controls for changes in the unconventional monetary policy of the ECB. In column (4), we include control for asset price changes. In column (5), we add time fixed effects using factor variables for the month and year of each press conference. In column (6), we maintain the specification of column (5) and use the F–K Grade Level of the introductory statement as the main independent variable. In column (7), we assess the relationship between media coverage and the F–K Grade Level of the Q&A session transcript.

The results show that a higher level of complexity (i.e., a lower level of clarity) of the press conference is negatively associated with the volume of media coverage on the ECB on press conference day t and the day $t+1$. Importantly, this relationship is not the product of the inherently higher degree of technicality that may be related to the announcement of new policy measures or the informational content proxied by asset price changes. Also, the understandability of the introductory statement of the ECB President is estimated to have no impact on the amount of articles that journalists write about the ECB on the day of the press conference: what drives the results is the clarity of the President's exchange with the journalists during the Q&A Session. In the most stringent specification, a unit variation in the degree of complexity of the press conference is associated with a drop in the volume of ECB coverage of around 64 articles.

Third, we study the relationship between the clarity of ECB digital communications and social media engagement on Twitter. Table 3 presents the marginal effects from negative binomial regression models with robust standard errors. The full set of estimated coefficients is presented in Online Appendix E (Table A9). In columns (1)-(4), the dependent variable is the engagement rate of each ECB tweet in our dataset. The main independent variable is given by the F–K Grade Level of each tweet. In column (1), the model includes only the F–K Grade Level and the intercept. In column (2), we augment the model with the topic classification obtained with the SVM model discussed in Online Appendix D. In column (3), we add a dummy variable indicating the presence of media content (e.g., picture, video, etc.) as a control variable. In column (4), we add time fixed effects, using factor variables for the day

Table 3
ECB tweet complexity and media engagement: Marginal effects.

Dependent variable	(1) Eng. Rate	(2) Eng. Rate	(3) Eng. Rate	(4) Eng. Rate	(5) Engagements	(6) Impressions
Flesh–Kincaid (Tweets)	−0.187***	−0.161***	−0.089***	−0.093***	−3.709**	−313.169***
	(−6.69)	(−5.58)	(−3.40)	(−3.92)	(−2.31)	(−3.98)
Observations	6,276	6,276	6,276	6,276	6,276	6,276
Topics		✓	✓	✓	✓	✓
Media content			✓	✓	✓	✓
Time fixed effects				✓	✓	✓

Marginal effects from negative binomial models. t statistics in parentheses. Robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

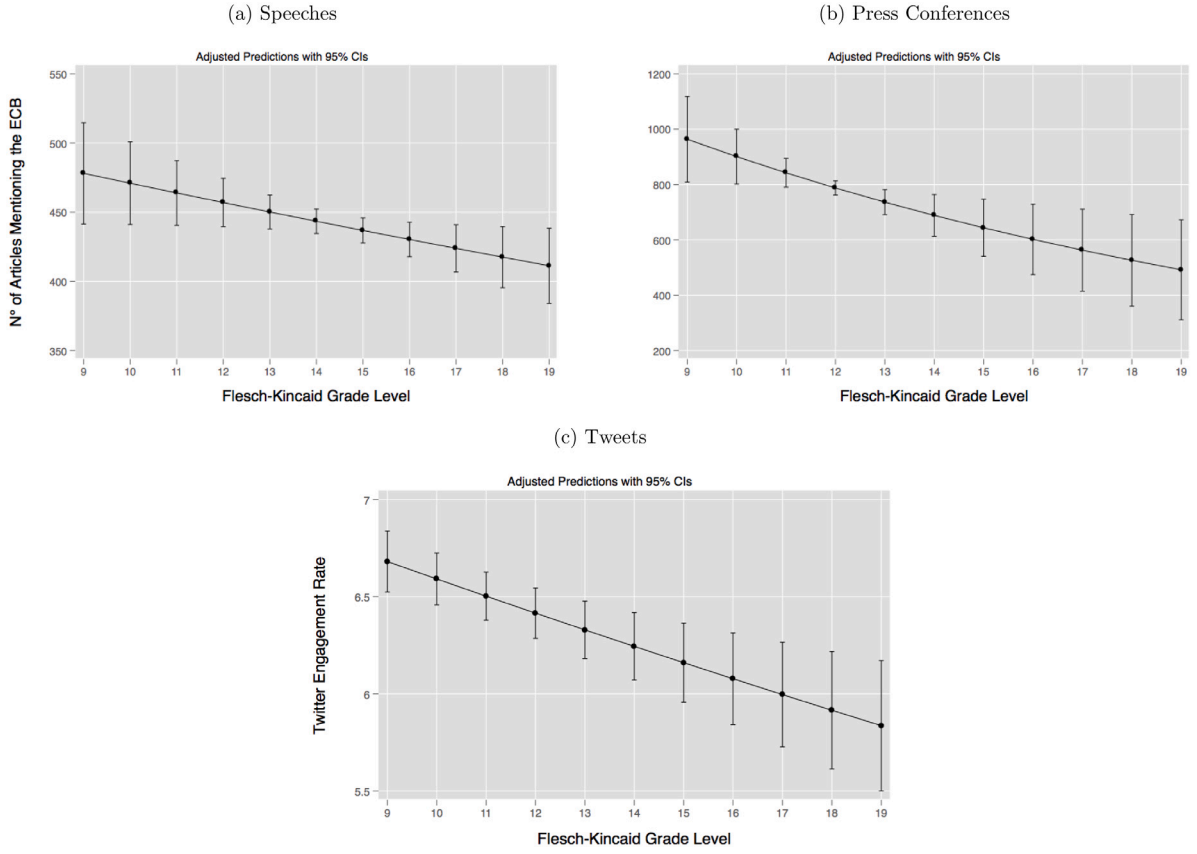

Fig. 5. Predicted engagement of ECB speeches, press conferences and tweets conditional on communication complexity. NOTES: The visualisations presented by the different sub-figures are based on, respectively, (a) column (4) of Table 1, (b) column (5) of Table 2 and (c) column (4) of Table 3.

of the week, the month and the year in which a tweet was posted. In columns (5) and (6), we use the same model specification of column (4), but we consider, respectively, engagements and impressions as dependent variables separately.

The results show that the clarity of central bank digital communications is a significant and strong predictor of social media engagement. Tweets containing more difficult language generate, on average, a lower number of users interacting with them. This effect holds when controlling for tweet-specific features and time-varying factors. Our most conservative estimates imply that, everything else being equal, an ECB tweet with one additional point in its F–K Grade Level is predicted to have at least 4 less users interacting with it and 300 less users seeing it in their timelines.

Fig. 5 provides a visualisation of the predicted levels of engagement from the three sets of analyses carried out in this section. Speeches containing clearer language (e.g., F–K Grade Level ≤ 11) are, on average, estimated to be associated with more than 470 news articles on the ECB in the two-day $[t, t+1]$ window in which they are given. The same speech, but with a lower degree of communication clarity (e.g., F–K Grade Level ≥ 15), is predicted to generate at least 40 articles less over the two days t and $t+1$. The magnitude of this effect is much higher for press conferences. *Ceteris paribus*, the variation between greater clarity (e.g., F–K

Grade Level ≤ 11) and lower clarity (e.g., F–K Grade Level ≥ 15) in press conferences corresponds to a difference in the volume of coverage on the ECB of more than 200 news articles in the two-day $[t, t+1]$ window of the press conference.

Finally, tweets containing clearer language (e.g., F–K score ≤ 11) are estimated to have, on average, an engagement rate that is above 6.5. The engagement rate drops to below 6.25 for tweets with more complex language (i.e., F–K score ≥ 15). As shown in Online Appendix F (Figure A4), if we consider engagements and impressions as dependent variables, this corresponds to a variation of around 14 interactions and 1100 impressions between clearer tweets and more complex ones.

5. Placebo test and robustness checks

In this section, we perform a placebo test and discuss the robustness of our results to different model specifications and measures of communication clarity. First, we focus on ECB speeches and press conferences, and exploit the time-series structure of our dataset of ECB-related articles to (a) disaggregate the volume of coverage in the two-day $[t, t+1]$ window that we use in our baseline specification; (b) verify that media coverage is not correlated with communication clarity *before* the communication event takes place.

Our placebo test is given by the introduction of the volume of coverage at time $t-1$ as a separate dependent variable. This allows us to check that the association between communication clarity and media engagement is not driven by a reverse causality phenomenon in which the level of the treatment (i.e., communication clarity) is affected by the pre-treatment level of the outcome variable (i.e., media engagement).

Table 4 presents the marginal effects of the F–K Grade Level of speeches and full press conferences from models in which the volume of ECB media coverage on, respectively, day t, $t+1$ and $t-1$ are taken separately in each model as a dependent variable. In all cases, we estimate the most stringent specification from Tables 1 and 2, which includes the full set of control variables and time fixed effects. In columns (1)-(3), we present the results for speeches, while the results for press conferences are shown in columns (4)-(6).

Table 4
Placebo test: Speeches and press conferences (marginal effects).

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	V_t	V_{t+1}	V_{t-1}	V_t	V_{t+1}	V_{t-1}
Flesch–Kincaid (Speeches)	−3.514*	−4.830**	0.754			
	(−1.68)	(−2.51)	(0.39)			
Flesch–Kincaid (All PC)				−44.849***	−32.335**	−18.345
				(−3.05)	(−2.23)	(−1.54)
Observations	1,655	1,655	1,655	223	223	223
Controls	✓	✓	✓	✓	✓	✓
Time fixed effects	✓	✓	✓	✓	✓	✓

Marginal effects from negative binomial models. t statistics in parentheses. Robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The results of Table 4 confirm that our findings are robust to the disaggregation of the two-day $[t, t+1]$ window at the time of the communication event. The relationship between (lack of) communication clarity and media engagement is estimated to be particularly strong in terms of magnitude and statistical significance on the day $t+1$ after an ECB speech. Yet the coefficient of the F–K Grade Level of speeches remains negative and statistically significant at the 10% level also on day t. For press conferences, the magnitude and high statistical significance of the estimated coefficient is almost equivalent in the two cases in which we consider ECB coverage on day t and day $t+1$. Instead, confirming our expectations, for both speeches and press conferences, the F–K Grade Level of the communication event at time t is estimated to be non-statistically significant in models considering the volume of ECB coverage at time $t-1$. This reassures us about the validity of our results in the presence of potential threats of reverse causality.

Second, Table 5 presents the marginal effects of different analyses of the relationship between ECB speech and press conference complexity and the volume of ECB media coverage. In particular, we extend the results obtained in Tables 1 and 2 by: (a) making use of the FOG Index (discussed in Section 3.1) instead of the F–K Grade Level; and (b) making use of OLS regression models instead of negative binomial regression models. In all cases, we estimate the most stringent specification including the full set of control variables and time fixed effects. In column (1), we assess the effects of clarity of communication in ECB speeches on ECB media coverage using the FOG Index and a negative binomial model. In column (2), we resort to the F–K Grade Level, but make use of an OLS regression. In column (3), we use the FOG Index in an OLS regression framework. In column (4), we study the effects of clarity of communication in ECB press conferences on ECB media coverage using the FOG Index and a negative binomial model. In column (5), we resort to the F–K Grade Level and OLS, while we use the FOG Index and OLS in column (6).

The results of Table 5 show that our findings are mostly robust across different specifications. The use of the FOG Index and OLS regressions does not substantially alter the conclusions reached in the previous section. Greater complexity in the speeches and press conferences of the ECB is consistently associated with lower volumes of ECB media coverage, with this effect being precisely estimated across the different specifications. The only exception is given by the model using OLS to estimate the effect of the F–K Grade Level on media coverage in the two-day $[t, t+1]$ window: in this case, the magnitude of the coefficient is not substantially altered, but the coefficient is imprecisely estimated.

Table 5
Robustness checks: Speeches and press conferences (marginal effects).

Model	(1) NB	(2) OLS	(3) OLS	(4) NB	(5) OLS	(6) OLS
FOG (Speeches)	−7.06**		−9.62**			
	(−2.12)		(−2.18)			
Flesch–Kincaid (Speeches)		−11.86**				
		(−2.38)				
FOG (All PC)				−58.67**		−51.22*
				(−2.52)		(−1.72)
Flesch–Kincaid (All PC)					−50.87	
					(−1.53)	
Observations	1,655	1,655	1,655	223	223	223
Controls	✓	✓	✓	✓	✓	✓
Time fixed effects	✓	✓	✓	✓	✓	✓

Marginal effects from negative binomial models (columns 1 and 4) and OLS (columns 2, 3, 5 and 7).
t statistics in parentheses. Robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6
Robustness checks and additional analyses: Tweets (marginal effects).

Model Dependent variable	(1) NB Eng. Rate	(2) OLS Eng. Rate	(3) OLS Eng. Rate	(4) NB Engagements	(5) NB Impressions	(6) NB Likes Rate
FOG (Tweets)	−0.056***		−0.057***	−3.718**	−249.098***	
	(−3.45)		(−3.03)	(−2.94)	(−3.79)	
Flesch–Kincaid (Tweets)		−0.094***				−.0003
		(−3.22)				(−0.11)
Observations	6,276	6,276	6,276	6,276	6,276	6,276
Controls	✓	✓	✓	✓	✓	✓
Time fixed effects	✓	✓	✓	✓	✓	✓

Marginal effects from negative binomial models (columns 1, 4, 5 and 6) and OLS (columns 2 and 3).
t statistics in parentheses. Robust standard errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Finally, in Table 6, we extend the analysis of the relationship between digital communication clarity and social media engagement. Similar to Table 5, we assess the sensitivity of our findings when operationalising the complexity variable with the FOG Index and when using OLS regressions. Also, we can here extend the set of dependent variables considered in our assessment of the effects of communication clarity. In columns (1)-(3), the main dependent variable we consider is the tweet-level engagement rate. In columns (4) and (5), we verify our results by decomposing the engagement rate into its two components, namely engagements and impressions, and considering them as dependent variables separately. In column (6), we extend the analysis to consider whether communication clarity has an effect on the likes rate, namely the amount of likes a tweet receives, standardised by the number of impressions. We use the FOG Index in columns (1), (3), (4) and (5), while sticking to the F–K Grade Level in columns (2) and (6). In columns (2) and (3), we use OLS regressions, while the other columns present results from negative binomial models.

We do not detect significant sensitivity of our results to different specifications in the analysis of ECB digital communications. The complexity variable remains a significant predictor of the level of engagements and views obtained by ECB tweets independent of its operationalisation. Interestingly, while these results point to a strong link between communication clarity and media engagement, column (6) of Table 4 provides suggestive evidence that greater clarity and engagement might not directly translate into greater positive attitudes towards the ECB. Indeed, there appears to be no sizeable and significant correlation between the F–K Grade Level of ECB tweets and the amount of likes they receive. We leave the exploration of the relationship between communication clarity and public favourability for future research.

6. Conclusion

Despite radical changes in central bank communication over the past decade, the language of central bankers often remains too difficult to understand for non-specialised audiences. Several key policymakers and privileged observers have been vocal about it, highlighting that the communications of central bankers are inaccessible to the large majority of citizens. A growing consensus around the need for clearer communications in the realm of central banking is starting to emerge, but a systematic assessment of the effects of communication clarity on engagement has so far been missing.

Focusing on the clarity of ECB communication activities, this paper has provided evidence that clearer communication is strongly and robustly correlated with a higher degree of engagement of journalists and social media users. Communication clarity is an important predictor of the volume of articles on the ECB published immediately after ECB communication activities. Moreover, clarity plays an important role in explaining the social media engagement generated by ECB digital communications on Twitter.

In other words, journalists and social media users tend to talk less about, and engage less with, the ECB when its language is more difficult to understand. These results hold when controlling for several potential confounders and when addressing the reverse causality issue that might be generated by communication clarity being sensitive to pre-existent levels of ECB coverage. The findings are robust across different model specifications and operationalisations of communication clarity.

Taken together, these findings have significant implications for the communication policy of central banks. The ECB is a very good case in point in this regard. ECB President Christine Lagarde has never hidden her willingness to promote clear and effective communications with the citizens of the euro area. For instance, during her first hearing as ECB President before the European Parliament in December 2019, she stressed the importance of this objective by saying: "It is important to me that our focus on connecting with the people we serve continues and grows stronger — in particular by improving the ways in which we communicate with the general public" (ECB 2019).

Consistent with other recent contributions (e.g., Bholat et al. 2019), our results provide support for policy efforts aimed at reducing the degree of complexity of central bank communications targeted at the public. Yet, as pointed out by Istrefi (2019b), it is also important to acknowledge that there may be tradeoffs between increased communication, simplicity and the need to convey correctly central bank messages. For instance, various authors have suggested that limits to the transparency and availability of communications may exist (Cukierman and Meltzer 1986; Morris and Shin 2002). Also, while evidence in favour of the institutional transparency of central banks has accumulated over the years (see Geraats 2002; van der Cruijsen and Eijffinger 2007), it is by no means taken for granted that benefits of clearer central bank communications always outweigh their costs (e.g., in reputational terms). Thus, a key challenge for central banks in the 21st century is to design communications that are both accurate and simple. By shedding new light on the effects of clarity in the communication of central banks, this paper constitutes an attempt to advance the lively debate on the appropriate balance between different features of central bank communication.

The evidence provided in this paper is especially relevant in light of the strategy review launched by the ECB in January 2020, which is still ongoing at the time of writing. This review involves several pillars of the ECB's policy strategy, including its communication with the public. The review process has been underpinned by several listening activities with citizens, civil society organisations, think tanks and other relevant actors. The first results of these listening exercises point to a strong societal demand for clearer and more accessible communications by the ECB. For instance, evidence from the "ECB Listens Portal", an online survey conducted with 3960 euro area citizens, indicates that simple language and concrete examples are often suggested by the public as ways to improve the ECB's communication (ECB 2021). Our paper offers additional motivation to address this societal demand.

Future research may extend the analysis of this paper in several interesting directions. In our view, two are particularly promising. First, this paper has focused on the effects of the clarity of central bank communication, while it has said very little about its determinants. Future research should advance our understanding of how central bankers adapt their language based on different targeted audiences, and how different features of central bank communication are responsive to the changing macroeconomic and political environment. Second, it is important to push forward the analysis of the effects produced by different features of central bank communication. As successfully shown by recent studies (e.g., Haldane and McMahon 2018; Kryvtsov and Petersen 2021; Baerg et al. 2021), survey and lab experiments promise to be extremely useful tools to assess the impact of central bankers' language on citizen attitudes, expectations and behaviour.

Declaration of competing interest

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to https://doi.org/10.1016/j.ejpoleco.2021.102146.

Federico Maria Ferrara is employed at the European Central Bank as a Graduate Programme Participant.

Siria Angino is employed at the European Central Bank as a Communications Officer.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.ejpoleco.2021.102146.

References

Altavilla, C., Brugnoli, L., Gürkaynak, R.S., Motto, R., Ragusa, G., 2019. Measuring euro area monetary policy. J. Monetary Econ. 108, 162–179.

Anderes, M., Rathke, A., Streicher, S., Sturm, J.-E., 2021. The role of ECB communication in guiding markets. Public Choice 186, 351–383.

Baerg, N., Duel, D., Lowe, W., 2021. Central bank communication as public opinion? experimental evidence. In: Paper presented at the workshop "Central Banking in the 21st Century – A Crisis of Accountability?". University College Dublin.

Baerg, N., Lowe, W., 2020. A textual Taylor rule: Estimating central bank preferences combining topic and scaling methods. Political Sci. Res. Methods 8 (1), 106–122.

Baranowski, P., Bennani, H., Doryń, W., 2021. Do the ECB's introductory statements help predict monetary policy? Evidence from a tone analysis. Eur. J. Political Econ. 66, 1–14.

Bennani, H., 2018. Media coverage and ECB policy-making: Evidence from an augmented Taylor rule. J. Macroecon. 57, 26–38.

Bennani, H., 2020. Central bank communication in the media and investor sentiment. J. Econ. Behav. Organ. 176, 431–444.

Bennani, H., Fanta, N., Gertler, P., Horvath, R., 2020. Does central bank communication signal future monetary policy in a (post)-crisis era? The case of the ECB. J. Int. Money Finance 104, 102–167.

Benoit, K., Munger, K., Spirling, A., 2019. Measuring and explaining political sophistication through textual complexity. Am. J. Political Sci. 63 (2), 491–508.
Berger, H., Ehrmann, M., Fratzscher, M., 2011. Monetary policy in the media. J. Money Credit Bank. 43 (4), 689–709.
Bholat, D., Broughton, N., Parker, A., Meer, J.T., Walczak, E., 2019. Enhancing central bank communications using simple and relatable information. J. Monetary Econ. 108, 1–15.
Binder, C., 2017. Federal reserve communication and the media. J. Media Econ. 30 (4), 191–214.
Bischof, D., Senninger, R., 2018. Simple politics for the people? Complexity in campaign messages and political knowledge. Eur. J. Political Res. 57, 473–495.
Blinder, A.S., Ehrmann, M., Fratzscher, M., de Haan, J., Jansen, D.-J., 2008. Central bank communication and monetary policy: A survey of theory and evidence. J. Econ. Lit. 46 (4), 910–945.
Boumans, J., Trilling, D., Vliegenthart, R., Boomgaarden, H., 2018. The agency makes the (online) news world go round: The impact of news agency content on print and online news. Int. J. Commun. 12, 1768–1789.
Büchel, K., 2013. Do words matter? The impact of communication on the PIIGS' CDS and bond yield spreads during Europe's sovereign debt crisis. Eur. J. Political Econ. 32, 412–431.
Bulir, A., Cihak, M., Jansen, D.-J., 2014. Does the clarity of inflation reports affect volatility in financial markets? IMF Working Paper No. 14/175.
Bulir, A., Jansen, D.-J., Cihak, M., 2012. Clarity of central bank communication about inflation. IMF Working Paper No. 12/9.
Bulir, A., Jansen, D.-J., Cihak, M., 2013. What drives clarity of central bank communication about inflation? Open Econ. Rev. 24 (1), 122–145.
Coenen, G., Ehrmann, M., Gaballo, G., Hoffmann, P., Nakov, A., Nardelli, S., Persson, E., Strasser, G., 2017. Communication of monetary policy in unconventional times. ECB Working Paper Series No. 2080.
Coibion, O., Gorodnichenko, Y., Weber, M., 2019. Monetary policy communications and their effects on household inflation expectations. NBER Working Paper No. 25482.
Cross, J.P., Greene, D., 2020. Talk is not cheap: Policy agendas, information processing, and the unusually proportional nature of European central bank communications policy responses. Governance 33 (2), 425–444.
Cukierman, A., Meltzer, A., 1986. A theory of ambiguity, credibility and inflation under discretion and asymmetric information. Econometrica 54 (5), 1099–1128.
de Haan, J., Sturm, J.-E., 2019. Central bank communication: How to manage expectations? In: Mayes, D.G., Siklos, P.L., Sturm, J.-E. (Eds.), The Oxford Handbook of the Economics of Central Banking. Oxford University Press, pp. 231–262.
ECB, 2019. Introductory statement at the ECON Committee of the European Parliament. URL https://www.ecb.europa.eu/press/key/date/2019/html/ecb.sp191202~f8d16c9361.en.html. (2 December 2019, Accessed on 1 October 2020).
ECB, 2021. Summary report of the ECB listens portal responses. URL https://www.ecb.europa.eu/home/search/review/html/ecb.strategyreview002.en.html. (Accessed 1 April 2021).
Ferrara, F.M., 2020. The battle of ideas on the euro crisis: Evidence from ECB inter-meeting speeches. J. Eur. Public Policy 27 (10), 1463–1486.
Ferrara, F.M., Masciandaro, D., Moschella, M., Romelli, D., 2021. Political voice on monetary policy: evidence from the parliamentary hearings of the european central bank. Eur. J. Political Econ. (online first).
Flesch, R., 1948. A new readability yardstick. J. Appl. Psychol. 32 (3), 221–233.
Fracasso, A., Genberg, H., Wyplosz, C., 2003. How do central banks write? An evaluation of inflation targeting central banks. Geneva Reports on the World Economy Special Report 2.
Geraats, P., 2002. Central bank transparency. Econom. J. 112 (483), F532–F565.
Gunning, R., 1952. The technique of clear writing. McGraw-Hill, New York, NY.
Haldane, A., 2017. A little more conversation a little less action. URL https://www.bis.org/review/r170403e.pdf. (31 March 2017, Accessed on 1 October 2020),
Haldane, A., 2018. Climbing the public engagement ladder. URL https://www.bankofengland.co.uk/-/media/boe/files/speech/2018/climbing-the-public-engagement-ladder.pdf. (6 March 2018, Accessed on 1 October 2020),
Haldane, A., Macaulay, A., McMahon, M., 2020. The 3 E's of central bank communication with the public. Bank of England Staff Working Paper No. 847.
Haldane, A., McMahon, M., 2018. Central bank communications and the general public. AEA Papers Proc. 108, 578–583.
Hartmann, P., Smets, F., 2018. The first twenty years of the European Central Bank: monetary policy. ECB Working Paper Series No. 2219.
Hayo, B., Neuenkirch, E., 2014. The German public and its trust in the ECB: The role of knowledge and information search. J. Int. Money Finance 47, 286–303.
Istrefi, K., 2019a. In Fed watchers' eyes: Hawks, doves and monetary policy. Banque de France Working Papers No. 725.
Istrefi, K., 2019b. Comment on: Enhancing central bank communications using simple and relatable information. J. Monetary Econ. 108, 16–20.
Jansen, D.-J., 2011a. Does the clarity of central bank communication affect volatility in financial markets? Evidence from Humphrey-Hawkings testimonies. Contem. Econ. Policy 29 (4), 494–509.
Jansen, D.-J., 2011b. Mumbling with great incoherence: Was it really so difficult to understand Alan Greenspan? Econom. Lett. 113 (1), 70–72.
Jansen, D.-J., de Haan, J., 2007. Were verbal efforts to support the euro effective? A high-frequency analysis of ECB statements. Eur. J. Political Econ. 23 (1), 245–259.
Kincaid, J.P., Fishburne, R.P., Rogers, R.L., Chissom, B.S., 1975. Derivation of new readability formulas (automated readability index, Fog count and Flesch Reading Ease formula) for navy enlisted personnel. Research Branch Report 8/75, Chief of Naval Technical Training: Naval Air Station Memphis.
Kryvtsov, O., Petersen, L., 2021. Central bank communication that works: Lessons from lab experiments. J. Monetary Econ. 117, 760–780.
Lamla, M.J., Lein, S.M., 2014. The role of media for consumers? Inflation expectation formation. J. Econ. Behav. Organ. 106, 62–77.
Lamla, M.J., Lein, S.M., 2015. Information rigidities, inflation perceptions, and the media: Lessons from the euro cash changeover. Econ. Inq. 53 (1), 9–22.
Lamla, M.J., Sturm, J.-E., 2013. Interest rate expectations in the media and central bank communication. In: Siklos, P.L., Sturm, J.-E. (Eds.), Central Bank Communication, Decision Making, and Governance. MIT Press, pp. 101–111.
Leonhardt, J.M., Makienko, I., 2017. Keep it simple, readability increases engagement on Twitter: An abstract. In: Krey, N., Rossi, P. (Eds.), Back To the Future: Using Marketing Basics To Provide Customer Value. Springer.
Lim, E., 2008. The anti-intellectual presidency. Oxford University Press, Oxford.
Lin, N., Osnabrügge, M., 2018. Making comprehensible speeches when your constituents need it. Res. Politics 5 (3), 1–8.
Lyziak, T., Paloviita, M., 2017. Anchoring of inflation expectations in the euro area: Recent evidence based on survey data. Eur. J. Political Econ. 46, 52–73.
Montes, G.C., Nicolay, R.T.F., 2017. Does clarity of central bank communication affect credibility? Evidences considering governor-specific effects. Appl. Econ. 49 (32), 3163–3180.
Montes, G.C., de Oliveira, A.J., Curi, A., Nicolay, R.T.F., 2016. Effects of transparency, monetary policy signalling and clarity of central bank communication on disagreement about inflation expectations. Appl. Econ. 48 (7), 590–607.
Morris, S., Shin, H.S., 2002. Social value of public information. Amer. Econ. Rev. 92 (5), 1521–1534.
Neuenkirch, M., 2012. Managing financial market expectations: The role of central bank transparency and central bank communication. Eur. J. Political Econ. 28 (1), 1–13.
Paasche-Orlow, M.K., Taylor, H.A., Brancati, F.L., 2003. Readability standards for informed-consent forms as compared with actual readability. N. Engl. J. Med. 348 (8), 721–726.
Pancer, E., Chandler, V., Poole, M., Noseworthy, T.J., 2019. How readability shapes social media engagement. J. Consum. Psychol. 29 (2), 262–270.
Parle, C., 2021. The financial market impact of ecb monetary policy press conferences – a text based approach. Central Bank of Ireland Research Technical Paper 2021 (4).

Rauh, C., Bes, B.J., Schoonvelde, M., 2020. Undermining, defusing or defending European integration? Assessing public communication of European executives in times of EU politicisation. Eur. J. Political Res. 59 (2), 397–423.

Rosa, C., Verga, G., 2007. On the consistency and effectiveness of central bank communication: Evidence from the ECB. Eur. J. Political Econ. 23 (1), 146–175.

Rozkrut, M., Rybiński, K., Sztaba, L., Szwaja, R., 2007. Quest for central bank communication: Does it pay to be "Talkative"? Eur. J. Political Econ. 23 (1), 176–206.

Schoonvelde, M., Brosius, A., Schumacher, G., Bakker, B.N., 2019. Liberals lecture, conservatives communicate: Analyzing complexity and ideology in 381,609 political speeches. PLoS One 14 (2), 1–15.

Sigelman, L., 1996. Presidential inaugurals: The modernization of a genre. Political Commun. 13 (1), 81–92.

Sims, C.A., 2003. Implications of rational inattention. J. Monetary Econ. 50, 665–690.

Smales, L., Apergis, N., 2017. Does more complex language in FOMC decisions impact financial markets? J. Int. Financial Mark. Inst. Money 51, 171–189.

Spirling, A., 2016. Democratization and linguistic complexity: The effect of franchise extension on parliamentary discourse, 1832-1915. J. Politics 78 (1), 120–136.

Teten, R.L., 2003. Evolution of the modern rhetorical presidency: Presidential presentation and development of the state of the union address. Pres. Stud. Q. 33 (2), 333–346.

van der Cruijsen, C., Eijffinger, S.C.W., 2007. The economic impact of central bank transparency: A survey. DNB Working Paper No. 132.

Wasike, B., 2018. Preaching to the choir? An analysis of newspaper readability vis-a-vis public literacy. Journalism 19 (11), 1570–1587.

Winkler, B., 2000. Which kind of transparency? On the need for clarity in monetary policy-making. ECB Working Paper Series No. 26.