// NO.23-073 | 12/2023

DISCUSSION PAPER

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Talking in a Language That Everyone Can Understand? Clarity of Speeches by the ECB Executive Board

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Talking in a language that everyone can understand? Clarity of speeches by the ECB Executive Board

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December 21, 2023

Abstract

We use data on speeches held by members of the European Central Bank's (ECB) Executive Board to analyze whether clarity of central bank communication has increased over time. Employing readability measures as proxy variables, we find that clarity of information provision is trending upward since the inception of the ECB. The increase is gradual, rather than being induced by changes in the board composition or major macroeconomic events. Clarity is higher for speeches aimed at general audiences and for speeches by female speakers. We also show that media sentiment about the ECB is negatively related to complexity.

Keywords: Central Bank Communication, Monetary Policy Transparency, Clarity, Readability.

JEL classification: E52, E58

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1 Introduction

> "*Since I've become a central banker, I've learned to mumble with great incoherence. If I seem unduly clear to you, you must have misunderstood what I said.*" (Quote by Alan Greenspan when talking to reporters in 1987.)

> "*We will be open, transparent and accessible. We will try to talk in a language that everyone can understand.*" (Quote from a speech held by Christine Lagarde in 2020.)

The quotes above highlight a shift in central bankers' attitude in terms of engaging with the public. In earlier decades, communication about monetary policy decisions was limited and purposefully vague. Besides reflecting a general culture of opaque central bankers (Brunner, 1981), theoretical models suggested that disclosing too much information may not be socially optimal (Cukierman and Meltzer, 1986; Morris and Shin, 2002).

More recently, central banks have aimed for greater monetary policy transparency by informing the public about the current and expected future state of the economy, the objectives behind monetary policy decisions and associated implementation strategies (Blinder, 2018; Hansen et al., 2018; Blinder et al., 2023). One reason for this change in attitude is that central banks increasingly act as political leaders rather than merely as technocratic bureaucrats and that higher transparency increases their democratic legitimacy (Blinder et al., 2008; Dräger, 2023). Improved communications also enhance the effectiveness of monetary policy. A better understanding of the central bank's goals helps to align individual inflation expectations. Reducing disagreement among agents increases the likelihood of stabilizing long-term expectations around the inflation target. Anchored expectations improve the central bank's ability to steer actual inflation and thus increase its chances of achieving price stability.

A natural question is to ask whether the increase in transparency described above is reflected in the language used by central bankers (the "sender") when communicating with the public (the "receiver"). Empirical evidence suggests that households are less receptive to central bank communication than experts (see Section 2 for an overview). It is likely that successful communication with households requires a choice of words that conveys the message with appropriate *clarity*. For this reason, Christine Lagarde declared that improving the language used by the European Central Bank (ECB) is one of the primary goals during her tenure as president.

In this paper, we analyze whether the ECB's communications have become more accessible to the public and how changes in clarity affect perceptions of the ECB in the media. Our analysis is based on a dataset of speeches held by members of the ECB's Executive Board between January 1999 and March 2023. Due to extensive press coverage and the opportunity to tailor contents to specific audiences, speeches provide a unique and timely channel through which central bankers can influence public opinion and behavior. We proxy the clarity of speeches with the widely-used Flesch-Kincaid grade level (Kincaid et al., 1975), which measures the *readability* of their transcripts.

In a first step, we show that the clarity of speeches increased significantly over time. The average years of schooling required to understand an ECB speech declined by approximately two years over the sample period. We conclude that in recent years the ECB has communicated in a more concise and comprehensible way. However, at almost 14 years

of schooling required to understand the content of a speech, the average difficulty is still quite high even during Lagarde's presidency. This implies that further improvements in clarity are required before Lagarde can make good on her promise to 'talk in a language that everyone can understand'. Further, our findings indicate that clarity is higher for speeches aimed at general audiences and if the speaker is female.

In a second step, we show that media sentiment about the ECB depends negatively on the complexity of ECB speeches. In contrast, the relationship between speech sentiment, i.e., the degree of optimism or pessimism conveyed by ECB Board members, and media sentiment does not depend on the level of clarity of speeches. This suggests that complexity in itself is regarded negatively by journalists. We use the dictionaries of Correa et al. (2021) and Picault et al. (2022) to capture the sentiment of speeches and the media, respectively. Our findings are robust to controlling for the macroeconomic environment or changes in the ECB's personnel and pass various robustness checks.

Our paper connects in particular to the literature that studies the role of clarity for the publics' perceptions of and engagement with central banks. Two articles that are closely related to our study are Jansen (2011) and Ferrara and Angino (2021). Jansen (2011) analyzes the trend in clarity of the Humphrey-Hawkins hearings of Paul Volcker and Alan Greenspan and finds—in line with the quote above—that clarity is low during Greenspan's tenure and decreased relative to his predecessor. However, the significance of the time trend disappears after controlling for macroeconomic conditions and expectations. We use the econometric approach of Jansen (2011) to analyze the trend in the clarity of ECB speeches. Focusing instead on the impact of clarity, Ferrara and Angino (2021) show that decreasing complexity of ECB communications, as measured by the Flesch-Kincaid grade level, is associated with higher media engagement in both traditional and social media. In particular, they find that higher clarity of ECB speeches increases the number of ECB-related news articles. While Ferrara and Angino (2021) focus primarily on the quantity of ECB-related news articles, we analyze whether increases in clarity affect media sentiment about the ECB.

The rest of the paper is organized as follows: Section 2 discusses the related literature. Sections 3 and 4 describe the readability measures and the data. In Section 5, we analyze the trend in the clarity of speeches. Section 6 presents our findings for the impact of clarity on the relationship between speech and media sentiment. Section 7 concludes.

2 Literature on Central Bank Communication

Most of the literature on the effectiveness of central bank communication focuses on financial markets. See Blinder et al. (2008) for a review of the early literature. These studies typically find that central bank announcements successfully move asset prices and financial market expectations in the desired direction (e.g., Conrad and Lamla, 2010; Campbell et al., 2012; Du et al., 2018). Evidence on the role of clarity in this context is relatively scarce. Davis and Wynne (2019) find that both the length and frequency of Federal Open Market Committee (FOMC) meeting statements have increased over time, which they interpret as a higher informational content. They show that longer and more complex statements produce a larger monetary policy shock, which helps move markets. Hayo et al. (2020) find that the readability of ECB press conferences has a negative

effect on financial market trading only when unconventional monetary policy measures are announced.

The literature on the effects of central bank communication on household expectations is generally more pessimistic. Due to a lack of high-frequency survey data, most of the early studies focused on U.S. data (see Binder, 2017, for an overview). Recent studies include Lamla and Vinogradov (2019) and Coibion et al. (2022). Blinder et al. (2023) and Dräger (2023) expand the scope to contributions about the ECB and other inflation-targeting central banks. Based on a survey of German households, Conrad et al. (2022) show that the inflation expectations of households who inform themselves about monetary policy directly via ECB communications do not differ from those of households who do not inform themselves.[1] In contrast, households who rely primarily on traditional media (e.g., newspapers or television) as their primary source of information about monetary policy tend to have more accurate expectations.

The weak effects of central bank communication on household expectations can be rationalized through the lens of rational inattention: benefits of following central bank news are perceived as small and costs as high due to the difficult technical jargon used by central bankers and low financial literacy of households (Binder, 2017; Blinder, 2018; Dräger and Nghiem, 2023). As a result, the public often lacks basic knowledge of decision-makers at central banks and their goals (Blinder et al., 2023). For example, van der Cruijsen et al. (2015) find a weak desire of Dutch households to be informed about the ECB's objectives.[2]

Blinder (2008) notes that clearer communications have higher signal-to-noise ratios, which facilitates the extraction of key messages the central bank attempts to convey. Thus, increasing the clarity of communications is a key channel through which central banks can reduce households' perceived costs of attention. In an experimental setting, Kryvtsov and Petersen (2019) show that household expectations react most strongly to simple and relatable messages. Haldane and McMahon (2018) and Bholat et al. (2019) focus on a communication initiative by the Bank of England (BoE), which launched a new, broader-interest version of its quarterly Inflation Report that features considerably higher text accessibility. The new content was perceived to be easier to read and understand by households. As a result, activity on the BoE's website more than doubled. Those who read the new content developed an better understanding of the BoE and an improved ability to form inflation expectations. Ferrara and Angino (2021) show that higher clarity of ECB communications not only increases the number of news articles written about the ECB, but also the amount of ECB-related tweets. These findings suggest that improvements in clarity may help to break through the 'veil of inattention' (Coibion et al., 2018).

Another factor that determines the impact of central bank communication on both financial markets and household expectations is sentiment. Sentiment captures the tone of a text, typically distinguishing between positive (optimistic), neutral or negative (pessimistic) tone. A major challenge in the financial context is to find suitable dictionaries

[1] On a more positive note, Dräger et al. (2016) find some evidence that direct channels of central bank communication increase the likelihood that the expectations of experts and households are consistent with theoretical economic relationships such as the Taylor rule or the Phillips curve.

[2] Kumar et al. (2015) and Coibion et al. (2018) find evidence of inattentiveness of firm managers in New Zealand to the central bank's inflation target and note that the responses of the surveyed firm managers closely resemble those of households.

since popular dictionaries such as that of Loughran and McDonald (2011) may not be suitable to categorize the sentiment of the language used by central bankers. To overcome this issue, the dictionairy of Correa et al. (2021) accounts for the specific meaning of certain words in a financial stability context. Picault et al. (2022) construct an indicator of media sentiment about the ECB based on articles from five major international newspapers. Using the measures of Correa et al. (2021) and Picault et al. (2022), we analyze whether media sentiment about the ECB depends on the level of clarity of speeches.

3 Measuring the Readability of ECB Speeches

To assess the clarity of the language used in ECB speeches, we rely on so-called readability measures. These statistics are based on text characteristics such as sentence length or syllables per word. Thus, they are based purely on objective elements of a text. No subjective judgment of the tone or content of words is needed to classify a document according to its readability. Validation studies have found that they are good predictors of text difficulty (Crossley et al., 2017). One of the earliest text-based readability measures is the Flesch reading ease score (Flesch, 1948), which is defined as

$$F = 206.835 - 1.015 \cdot \frac{\#words}{\#sentences} - 84.6 \cdot \frac{\#syllables}{\#words}. \tag{1}$$

The first expression on the right-hand-side of Eqn. (1) is the average number of words per sentence in the text (average sentence length). The second expression measures the average number of syllables per word (average word length). Increases in both components are associated with lower readability. Unfortunately, the level of the Flesch score has no meaningful interpretation.

The widely used Flesch-Kincaid grade level extends the Flesch score by attributing to a document a value that corresponds to the U.S. grade level needed to fully comprehend the text (Kincaid et al., 1975). It is defined as

$$FK = 0.39 \cdot \frac{\#words}{\#sentences} + 11.8 \cdot \frac{\#syllables}{\#words} - 15.59. \tag{2}$$

More difficult texts require a higher level of schooling and are therefore associated with a higher Flesch-Kincaid grade level. Values in the range from 14 to 18 correspond to college-level education. Although the index measures readability in years of U.S. schooling, we retain the original definition for three reasons: First, there is no clear rule on how to 'translate' years of U.S. schooling to years of education in other geographical areas. Second, the heterogeneous educational systems across euro area countries make it difficult to decide on a representative schooling system. Third, by using the original definition we are able to compare our findings with those from related studies.

When relying exclusively on the Flesch-Kincaid grade level, other aspects of readability not related to textual characteristics such as the amount of uncommon or complicated expressions are omitted. Therefore, we consider alternative proxies of clarity which replace average word length with a measure of the share of 'difficult' or 'complex' words.

The Dale-Chall readability score takes into account the share of 'difficult' words in a text based on the number of words not matching the Dale-Chall dictionary of 3,000

'familiar' words (Chall and Dale, 1995). The Dale-Chall readability formula is

$$DC = 64 - 0.69 \cdot \frac{\#words}{\#sentences} - 95 \cdot \frac{\#difficult\,words}{\#words}. \tag{3}$$

Average sentence length and the ratio of 'difficult' words enter the calculation of the formula as subtrahends. A high Dale-Chall score is therefore attributed to easy texts. Similar to the Flesch score, there is no straightforward interpretation of the level of the Dale-Chall score. Still, values below 16 are usually associated with college-level education.

We also consider the Gunning-Fog index (Gunning, 1952), which includes the proportion of complex words in addition to average sentence length:

$$Fog = 0.4 \cdot \left[\frac{\#words}{\#sentences} + 100 \cdot \frac{\#complex\,words}{\#words} \right]. \tag{4}$$

'Complex' words consist of at least three syllables (excluding common suffixes) and do not include proper nouns or familiar/compound words (which are summarized in a pre-defined list). Broadly speaking, texts intended for a wide audience require values below 12, whereas college-level education is needed for texts with values of 17 and above.

Due to its convenient interpretability, we rely on the Fleisch-Kincaid grade level as the primary readability measure in the following analyses. We use the Dale-Chall score and the Gunning-Fog index to assess the robustness of our findings.

4 Data

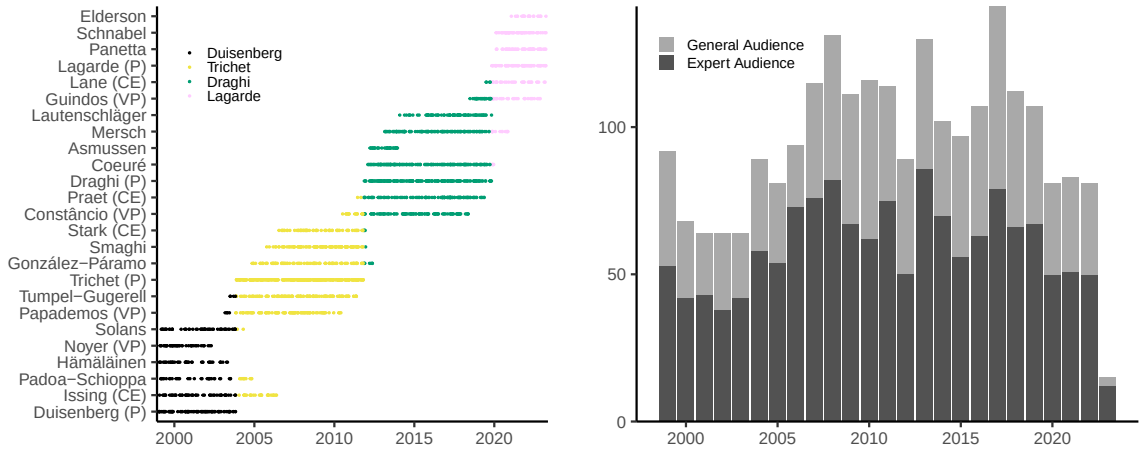
This section describes the employed data on ECB speeches and the macroeconomic variables we use as covariates in the regressions.

4.1 ECB speeches

The ECB provides transcripts of all speeches by members of its Executive Board since 1997 and thus covers the mandates of all presidents since the ECB's foundation, chronologically that is Willem Duisenberg (January 01, 1999 – October 31, 2003), Jean-Claude Trichet (November 01, 2003 – October 31, 2011), Mario Draghi (November 01, 2011 – October 31, 2019) and Christine Lagarde (since November 01, 2019). Besides the president, the Executive Board consists of the vice-president, the chief economist and three additional members. Usually, all board members are replaced along with the president. Thus, the data constitute a rotating panel.

The raw dataset includes 2,756 speeches up to the most recent update included in our sample (March 29, 2023). The sample size is affected by a number of data limitations. First, we discard all speeches for which only slides (but no transcript) were published. Second, since the euro area formally came into existence with the official launch of the euro on January 01, 1999, we exclude speeches held in 1997 or 1998. Third, a few speeches were held in languages other than English, mostly in German or Spanish. Since it is not straightforward to compare readability across languages, we focus exclusively on speeches

Figure 1: Speeches held by ECB Executive Board members



Notes: The left subfigure shows speeches held by individual Executive Board members. Distinct colors represent the individual presidencies. Abbreviations 'P', 'VP' and 'CE' indicate the ECB president, vice-president and chief economist, respectively. The right subfigure shows the number of speeches per year. The sample period is January 14, 1999 – March 27, 2023.

held in English.[3] We also discard two speeches that combine English and other languages. Fourth, we consider only speeches held by a single speaker, i.e., we exclude the joint speech by Willem Duisenberg and Eugenio Solans from August 30, 2001. The processed dataset comprises 2,348 speeches held by $N = 25$ speakers between January 14, 1999 and March 27, 2023 (a period of $T = 9,365$ days).

The left subfigure of Figure 1 shows the allocation of speeches across speakers and presidencies, sorted by the date of each speaker's first speech. The six-member Executive Boards are clearly visible along the respective president's tenure. A notable exception is the unscheduled withdrawal from the Executive Board by Jörg Asmussen in 2014 and the subsequent entry of his successor Sabine Lautenschläger. Yves Mersch's regular tenure ended in 2020. He was succeeded by Frank Elderson.

The right subfigure shows that the frequency of speeches per year is upward trending between 1999 and 2008. With usually more than 100 speeches per year since 2007, the ECB communicates more frequently with the public relative to the years following its inception. We observe spikes during the years 2008, 2013 and 2017, coinciding with the Great Recession, the sovereign debt crisis and the aftermath of the Brexit referendum. The frequency of speeches is notably lower since the outbreak of the COVID-19 pandemic. Similar evidence is documented by Hwang et al. (2023). The number of speeches held is not distributed uniformly among the 25 speakers. The presidents have the highest numbers when considering only speakers that make up their respective Executive Board (see Figure A.1 in the Appendix).

Since the clarity of speeches may differ for specific audiences, we distinguish speeches aimed at 'general audiences' (e.g., the press or the public) and those aimed at 'experts' (e.g., central bankers or politicians). To identify the target audience, we consecutively group speeches into nine subcategories according to keywords in the subtitle (see Table A.1). While this approach clearly has a subjective component, it produces comprehensible

[3]The share of non-English speeches declined from 12.4% in 1999 to 0.7% in 2017 and is 0% thereafter.

groups of speeches.[4] Overall, 37% of speeches are aimed at general audiences. The right subfigure of Figure 1 shows that the share is relatively stable over time.

In the regressions below, we control for the characteristics of speeches. Following Picault et al. (2022), we include the dummy variable $D_{it}^{Whatever}$ which equals one for Draghi's 'whatever it takes'-speech, and zero else. This speech is unique due to its extensive media coverage. Similarly, we account for potential differences in speeches by members of the Executive Board that are featured in the media more frequently by including the variable $D_{it}^{P/CE}$ that equals one if the speech by speaker i on day t is given by the respective president or chief economist, and zero else. To account for potential gender differences in clarity, D_{it}^{Female} identifies speeches by female speakers. The variable $D_{it}^{General}$ equals one if the speech is aimed at a general audience, and zero else. To absorb any shocks induced by the replacement of Executive Board members, we include the variables $D_{it}^{Trichet}$, D_{it}^{Draghi} and $D_{it}^{Lagarde}$, which equal one for speeches held during the respective presidency, and zero else. The presidency of Duisenberg serves as the baseline group.

4.2 Macroeconomic conditions and expectations

Following Jansen (2011), we control for macroeconomic conditions and expectations in all regressions. Monthly data on macroeconomic variables are taken from Eurostat. We include the unemployment rate, u_m, and absolute deviations of the inflation rate, π_m, from the target rate,

$$|\tilde{\pi}_m| = |\pi_m - 2|. \tag{5}$$

We account for the impact of economic downturns by including the recession indicator D_m^{Rec}, which equals one if month m is part of a recession quarter, and zero otherwise.[5]

To capture for the forward-looking component of monetary policy, we use quarterly data from the ECB's Survey of Professional Forecasters (SPF), a survey of macroeconomic expectations in the euro area among experts from financial and research institutions. In particular, we use the absolute difference between the average four-quarter-ahead inflation forecast, $E(\pi_{q+4|q})$, and the inflation target,

$$|E(\tilde{\pi}_{q+4|q})| = |E(\pi_{q+4|q}) - 2|, \tag{6}$$

and the average standard deviation of the inflation density forecasts, $\bar{\sigma}_{q+4|q}$, as a measure of inflation uncertainty.[6] To derive the latter, we assume that the probabilities reported for each outcome interval in the survey questionnaire are centered at the midpoint. Figure A.2 presents the time series for the macroeconomic control variables.

[4] The ordering of categories matters when filtering consecutively. We use broader keywords (e.g., 'conference' or 'workshop') in categories filtered last. We apply the following ordering of keyword categories: event, EU, central bank, university, politics, press, business, private, conference, public. To reduce the possibility of misclassifications, our categorization was cross-checked by other research assistants.

[5] The recession classification is based on the OECD recession indicator for the euro area. Using this definition, five recessions are identified in our sample: January 1999, March 2001 – June 2003, March 2008 – May 2009, June 2011 – March 2013 and December 2017 – May 2020.

[6] An alternative could be to use the ECB projections instead of the SPF predictions. Unfortunately, the ECB projections do not include density forecasts, which precludes the calculation of uncertainty. For this reason, we prefer to use the SPF data.

5 Trend in the Clarity of ECB Speeches

In this section, we analyze whether the clarity of ECB speeches has increased over time. For each speech, we calculate the readability measures from Section 3 based on the body of the transcripts, i.e., we exclude other elements such as titles, subtitles or references. Table 1 shows summary statistics for the readability measures based on the full sample and subsamples for the distinct presidencies.

Table 1: Summary statistics for the clarity of ECB speeches

	Full sample (Obs. = 2348)	W. Duisenberg 01.01.99–31.10.03 (Obs. = 337)	J.C. Trichet 01.11.03–31.10.11 (Obs. = 847)	M. Draghi 01.11.11–31.10.19 (Obs. = 880)	C. Lagarde 01.11.2019–today (Obs. = 284)
Flesch-Kincaid grade level					
Mean	14.54	15.22	15.10	13.91	14.02
SD	1.94	1.48	1.77	2.06	1.78
Dale-Chall score					
Mean	13.70	13.67	12.65	15.23	12.13
SD	5.25	4.11	4.68	5.82	4.96
Gunning-Fog index					
Mean	18.28	19.13	18.89	17.53	17.75
SD	2.20	1.71	1.99	2.30	2.05

Notes: This table presents means and standard deviations for the readability of ECB speeches for the full sample from January 14, 1999 to March 27, 2023 and the individual presidencies.

The average Flesch-Kincaid grade level based on all speeches is 14.5 years (with a standard deviation of approximately two years), which corresponds to college-level education. A similar picture emerges for the Dale-Chall score and the Gunning-Fog index.[7] Thus, the overall readability of ECB speeches is rather low.[8]

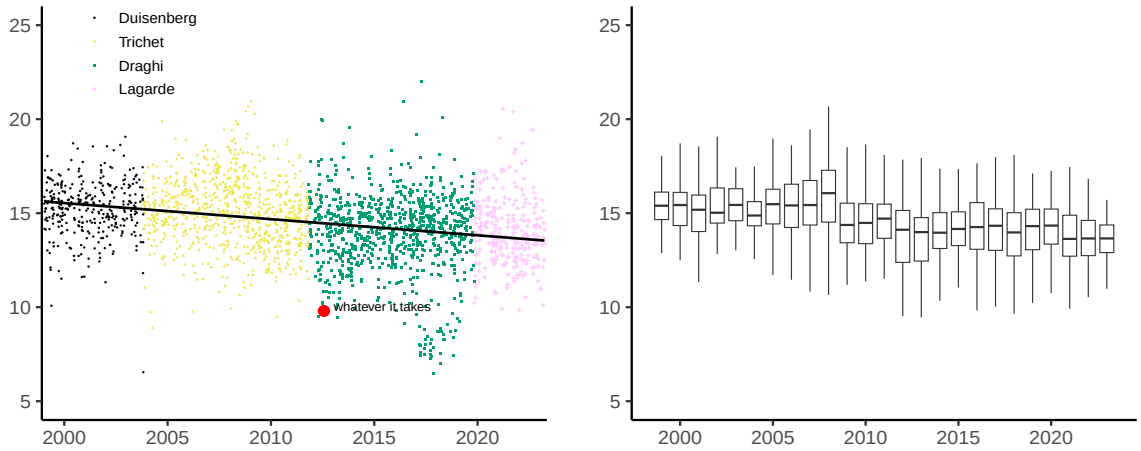
The average Flesch-Kincaid grade level is in a similar range as that found in other studies for the ECB. The mean in Ferrara and Angino (2021) is 14.4 for a smaller sample of ECB speeches that ends in October 2019. Hayo et al. (2020) show that the readability of the Introductory Statement of ECB press conferences is also rather low with average Flesch-Kincaid grade levels above 15. This contrasts with lower values of approximately 11 for the Q&A session.

We observe the highest level of clarity during Draghi's tenure with an average Flesch-Kincaid grade level of 13.9 years. Notably, the clarity of speeches during Lagarde's presidency is slightly *lower* than that during Draghi's presidency (14.0). This finding is at odds with her target of improving the language used when communicating with the public and could be related to the COVID-19 pandemic and/or the Russian invasion of Ukraine. During these events, the ECB had to communicate more complex information and respond timely to ongoing developments, potentially diverting attention from maintaining

[7]The correlation coefficient between FK and DC (Fog) is -0.88 (0.99).

[8]Since March 13, 2020, the ECB also publishes 'The ECB Blog' in which Executive Board members provide insights on recent policy decisions. Table A.2 shows that the 66 blogposts published in our sample period are significantly shorter than the 240 speeches held during the same time ($p = 0.00$). This can at least partially be explained by the lack of introductory and closing remarks. The readability of blogposts is slightly higher, although the difference in means is not statistically significant ($p = 0.53$). We conclude that Executive Board members use a similar language in blogposts and speeches.

Figure 2: Flesch-Kincaid grade level of ECB speeches



Notes: The left subfigure shows the Flesch-Kincaid grade level of each speech. Distinct colors represent the individual presidencies. The solid black line represents a linear regression of the Flesch-Kincaid grade level on a constant and a time trend. The right subfigure shows year-specific boxplots with outliers not shown. The sample period is January 14, 1999 – March 27, 2023.

clear language. However, Table A.3 shows that the difference in means is not significant ($p = 0.38$).

The left plot of Figure 2 shows that the Flesch.Kincaid grade levels of ECB speeches exhibits a gradual downward trend over time.[9,10] The solid line is obtained by regressing the Flesch-Kincaid grade levels on a constant and a time trend. The right plot shows year-specific boxplots for the Flesch-Kincaid grade level (outliers are not shown). Overall, the downward trend in the difficulty of ECB speeches appears to be continuous over the transitional periods between presidents. Figure A.4 suggests that the improvements in clarity are mostly attributed to a decline in average sentence length.

We observe considerable heterogeneity in clarity also within the distinct presidencies. Both the minimum and maximum Flesch-Kincaid grade levels of 6.5 respectively 21 years are associated with speeches during Draghi's presidency. The red dot in the left plot of Figure 2 represents Draghi's 'whatever it takes' speech, which is characterized by high clarity. This speech is accessible for readers with 9.7 years of schooling. A notable cluster of 40 speeches with distinctively low Flesch-Kincaid grade levels between 2016 and 2019 consists mostly of speeches by Sabine Lautenschläger and a further two by Mario Draghi. Generally speaking, the speeches held by Sabine Lautenschläger yield the lowest Flesch-Kincaid grade levels (Figure A.1). This may be related to her dual role as a member of both the Executive Board and the Supervisory Board and/or the fact that most of her speeches focus on banking supervision and are produced by a speechwriting unit.

In order to test whether the increase in the clarity of speeches is statistically significant, we follow the econometric approach of Jansen (2011) and run regressions of the form

$$FK_{it} = \alpha + \beta t + \mathbf{x}_t'\boldsymbol{\gamma} + \lambda_i + \varepsilon_{it}, \tag{7}$$

[9]Similar evidence based on a sample that ends in 2021 is documented in Gardt et al. (2021).
[10]Figure A.3 shows similar plots for the Dale-Chall score and the Gunning-Fog index.

where FK_{it} is the Flesch-Kincaid grade level associated with the speech by speaker i on day t, $\mathbf{x}_t$ is a vector of control variables related to macroeconomic conditions (u_m, $|\tilde{\pi}_m|$, D_t^{Rec}), expectations ($|E(\tilde{\pi}_{q+4|q})|$, $\bar{\sigma}_{q+4|q}$) and speech characteristics ($D_{it}^{Whatever}$, $D_{it}^{P/CE}$, D_{it}^{Female}, $D_{it}^{General}$, $D_{it}^{Trichet}$, D_{it}^{Draghi}, $D_{it}^{Lagarde}$), λ_i denotes a speaker-fixed effect (which is not included in all specifications) and ε_{it} is the error term. The main parameter of interest is β, i.e., the slope coefficient of the time trend. Christine Lagarde's aim of 'talking in a language that everyone can understand' implies the testable hypothesis H_0: $\beta \geq 0$ against H_1: $\beta < 0$. Rejection of the null hypothesis suggests that clarity is trending upward, which is a prerequisite for Lagarde's goal.

Table 2 presents ordinary least squares (OLS) estimates of the parameters in Eqn. (7). We apply the variance-covariance estimator of Newey and West (1987) to account for heteroskedasticity and autocorrelation in the residuals. The reported coefficients and standard errors for the time trend are the estimated ones times 1,000. The remaining figures show the actual estimates. We report one-sided p-values for the hypothesis H_0: $\beta \geq 0$ at the bottom of the table.

The estimates in Column (1) correspond to the black line in the left panel of Figure 2. The estimate of β is significantly negative at the 1% level. The effect size is also economically relevant. Based on the estimates, the average Flesch-Kincaid grade level of ECB speeches has declined from approximately 15.6 to 13.4 years over the sample period.[11] The effect size increases after including macroeconomic conditions and expectations in Column (2). We also find a negative correlation between the Flesch-Kincaid grade level and the unemployment rate. This finding suggests that the central bank attempts to send clearer messages at times when unemployment is rising. The coefficients on the other macroeconomic variables are insignificant.

Controlling for speech characteristics in Column (3) has little impact on the estimate for the time trend.[12] The coefficient on $D_{it}^{Whatever}$ is negative and significant at the 1% level. The readability of the 'whatever-it-takes'-speech is approximately 4.4 years below the average level of the other speeches. The estimate for $D_{it}^{P/CE}$ is also negative and weakly significant, which suggests that speeches by the president or chief economist exhibit higher clarity than those by other Executive Board members. Speeches by female speakers are significantly clearer than those by their male counterparts, with an average readability difference of almost 1.8 years of schooling. The effect size is affected by the notable cluster of speeches by Sabine Lautenschläger visible in Figure 2.[13] Lastly, the coefficient on $D_{it}^{General}$ is negative and highly significant. Thus, speeches aimed at the public are conveyed with a higher clarity than those aimed primarily at expert audiences. The average difference in readability is approximately 0.4 years of schooling.

[11] To account for the influence of outliers, Table A.4 presents monthly regressions using the median Flesch-Kincaid grade level as the dependent variable. These regressions also yield significantly negative coefficients on the (monthly) time trend. The estimates in Column (1) imply that the median monthly Flesch-Kincaid grade level declined from 15.6 to 13.9 years, which is close to our findings based on daily data. Note that we lose two observations due to a lack of speeches in August 2006 and January 2012.

[12] Note that we lose 24 speeches for which information on the target audience is not available.

[13] When re-estimating Column (3) on a subsample that excludes speeches by Sabine Lautenschläger, the coefficient on D_{it}^{Female} reduces to -1.12, although it is still significant at the 1% level. The coefficient on the time trend is essentially unchanged.

Table 2: Trend in the Flesch-Kincaid grade level of ECB speeches

	Dependent variable: Flesch-Kincaid grade level (FK_{it})					
	(1)	(2)	(3)	(4)	(5)	(6)
t	-0.235^{***}	-0.273^{***}	-0.293^{***}	-0.308^{***}	-0.404^{***}	-0.249^{***}
	(0.019)	(0.055)	(0.058)	(0.059)	(0.101)	(0.086)
u_m		-0.181^{***}	-0.311^{***}	-0.311^{***}	-0.281^{***}	-0.194^{***}
		(0.051)	(0.056)	(0.055)	(0.072)	(0.060)
$\lvert\tilde{\pi}_m\rvert$		0.046	0.016	0.017	-0.033	0.028
		(0.059)	(0.066)	(0.064)	(0.058)	(0.052)
D_m^{Rec}		0.029	-0.153	-0.153	0.033	-0.001
		(0.103)	(0.115)	(0.112)	(0.101)	(0.088)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		-0.164	-0.151	-0.147	0.217	0.057
		(0.174)	(0.180)	(0.176)	(0.170)	(0.152)
$\bar{\sigma}_{q+4\lvert q}$		0.714	2.581	2.593	2.008	0.610
		(1.568)	(1.647)	(1.608)	(1.772)	(1.509)
$D_{it}^{Whatever}$			-4.381^{***}	-4.376^{***}	-4.427^{***}	-3.904^{***}
			(0.111)	(0.110)	(0.128)	(0.136)
$D_{it}^{P/CE}$			-0.168^{*}	-0.168^{*}	-0.209^{**}	
			(0.098)	(0.094)	(0.090)	
D_{it}^{Female}			-1.752^{***}	-1.760^{***}	-1.859^{***}	
			(0.217)	(0.208)	(0.204)	
$D_{it}^{General}$			-0.398^{***}	-0.563^{***}	-0.388^{***}	-0.329^{***}
			(0.081)	(0.157)	(0.080)	(0.073)
$D_{it}^{General} \times t$				0.036		
				(0.030)		
$D_{it}^{Trichet}$					1.024^{***}	
					(0.230)	
D_{it}^{Draghi}					0.867^{**}	
					(0.392)	
$D_{it}^{Lagarde}$					1.521^{***}	
					(0.502)	
Constant	15.621^{***}	17.121^{***}	18.005^{***}	18.064^{***}	17.506^{***}	17.458^{***}
	(0.101)	(0.392)	(0.392)	(0.388)	(0.366)	(0.607)
p-value (H_0: $\beta \geq 0$)	0.000	0.000	0.000	0.000	0.000	0.002
Speaker fixed-effects	No	No	No	No	No	Yes
Observations	2,348	2,348	2,324	2,324	2,324	2,324
Adjusted R^2	0.083	0.101	0.202	0.202	0.219	0.373

Notes: This table presents the estimates of Eqn. (7). The estimation sample covers the period January 14, 1999 – March 27, 2023. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Trend and interaction coefficients and standard errors are multiplied by 1000. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Motivated by this finding, Column (4) introduces an interaction between t and $D_{it}^{General}$ (again multiplying the coefficient and standard error by 1,000) to test whether there is evidence of differential time trends for speeches aimed at different audiences. However, this is not the case since the interaction term is insignificant. Next, Column (5) includes dummy variables for the distinct presidencies. While the significantly positive coefficients imply that readability is lower relative to Duisenberg, this is not the case once the time trend is also taken into account. In fact, including the presidency dummies increases the negative estimate of β.

Column (6) presents the estimates from Column (3) once speaker-fixed effects are added to the model. The coefficient on the time trend is again significantly negative and the effect size is similar to that for the other specifications. Thus, we are able to detect improvements in clarity even when relying solely on within-speaker variation.

Next, we test which component of the Flesch-Kincaid grade level is responsible for its downward trend by replacing the dependent variable in Eqn. (7) with average sentence length (Table A.5) and average word length (Table A.6). In both cases, the coefficient on the time trend is significantly negative. We conclude that the improved clarity of speeches is related to a reduction in both constituents of the Flesch-Kincaid grade level. However, the goodness of fit statistics are higher in Table A.5, suggesting that the reduction in average sentence length is more pronounced than that in average word length.

We assess the sensitivity of our results to the employed readability measure by replacing the Flesch-Kincaid grade level with the Dale-Chall score (Table A.7) and the Gunning-Fog index (Table A.8) as the dependent variable. The prediction of increasing clarity of central bank communications translates into a positive (negative) slope coefficient on the trend variable for the Dale-Chall score (Gunning-Fog index). In both cases, the estimates of β are significant and have the expected sign. We conclude that our findings are robust to the choice of the employed proxy for clarity.

In addition to clarity, we also consider whether the length of speeches has changed over time. Table A.9 presents the estimates for the (log) number of words per speech as the dependent variable. To improve readability, the reported coefficients and standard errors for the time trend are the estimated ones times 100. Based on the p-values for the hypotheses pair H_0: $\beta \geq 0$ against H_1: $\beta < 0$, the null hypothesis is rejected in all specifications at least at the 10% level. This finding suggests that the ECB speeches have not only improved in terms of clarity but that they also became shorter over time.

6 Impact of Clarity on the Sentiment Linkage

The results from the previous section suggest that the clarity of ECB speeches has increased over time. It is tempting to analyze whether higher clarity of speeches increases the impact of central bank communication on households' inflation expectations. A key challenge is the lack of survey data on quantitative household expectations in the euro area with a sufficiently long time series, although recently established surveys by the German Bundesbank and the ECB will help to fill that gap over time. Instead, our analysis in this section is motivated by Bholat et al. (2019) who state that *"an important avenue for future research is to assess whether better designed communications affect the way in which policy messages are reflected in the media."* The media channel matters for in-

Table 3: Absolute frequencies of media and speeches sentiment

		Media sentiment		$\sum$
		negative	positive	
Speeches sentiment	negative	393	321	714
	neutral	18	12	30
	positive	191	217	408
$\sum$		602	550	1152

Notes: This table shows the absolute frequencies of the categorical measures for media sentiment and speeches sentiment.

flation expectations since Conrad et al. (2022) show that news about monetary policy affect households' inflation expectations primarily when they are transmitted via traditional media such as newspapers. Similarly, Pinter and Kocenda (2023) find that the effect of monetary policy surprises on households' expectations depends on whether or not the surprise is accurately reflected in media reports. At the same time, Ferrara and Angino (2021) find that higher clarity of ECB speeches (and other communication avenues) increases the number of newspaper articles written about the ECB. Unlike Ferrara and Angino (2021), we do not focus on the impact of clarity on the quantity of media coverage about the ECB. Instead, we assess the impact of clarity on media sentiment about the ECB and whether clarity affects the relationship between media and speech sentiment. The underlying hypothesis is that a more optimistic (pessimistic) tone conveyed in speeches translates into a more optimistic (pessimistic) tone in the ECB's media coverage and that this relationship depends positively on the clarity of ECB speeches.

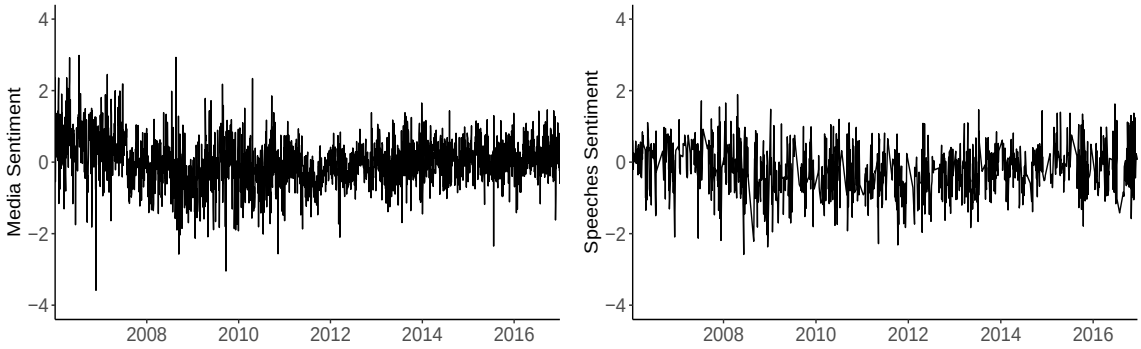
Daily media sentiment about the ECB is measured using the index of Picault et al. (2022), which is based on 25,000 ECB-related articles from five major newspapers published between January 2006 and December 2016. Importantly, quotes by ECB Governing Council members are not considered in the calculation of the index, so that its value adequately captures only the sentiment of the journalists and not that of the ECB. For each article $j = 1, \ldots, m_t$ published on day t, the continuous index is calculated as

$$S_{jt}^{media} = \frac{\#positive_{jt}^{media} - \#negative_{jt}^{media}}{\#total_{jt}^{media}}, \tag{8}$$

where $\#total_{jt}^{media}$ denotes the total number of words. The number of positive (negative) words, $\#positive_{jt}^{media}$ ($\#negative_{jt}^{media}$), is based on the dictionary of Loughran and McDonald (2011). The index takes values between -1 and 1 with higher values representing an increasingly optimistic tone. Overall daily sentiment is calculated as the average of the m_t ECB-related articles published on day t:

$$S_t^{media} = 100 \times \frac{\sum_{j=1}^{m_t} S_{jt}^{media}}{m_t}. \tag{9}$$

Figure 3: Development of media and speech sentiment over time



Notes: The left figure shows the media sentiment index by Picault et al. (2022). The right figure shows the sentiment of ECB speeches according to the dictionary by Correa et al. (2021). The sample period is January 02, 2006 – December 30, 2016.

Picault et al. (2022) show that higher values of S_t^{media} predict higher (long-term) inflation expectations of financial markets based on inflation-linked forward swaps. However, they do not account for the clarity or sentiment of central bank communication in their analysis.

The dictionary of Loughran and McDonald (2011) is suitable to assess media sentiment since it is the job of journalists to explain the decisions of central banks in a comprehensible manner. However, it may not be appropriate to capture the degree of optimism or pessimism conveyed in the language used by central bankers. Thus, we estimate the sentiment of speeches using the dictionary of Correa et al. (2021), which is tailored towards central bank communications related to financial stability. Their sentiment measure is based on financial stability reports from 66 institutions including the ECB and 63 national central banks. The dictionary consists of 391 words, of which 295 are negative and 96 are positive. Almost 31% of these words are not included in the dictionary of Loughran and McDonald (2011). Correa et al. (2021) show that their index has predictive power for future banking crises. Like S_t^{media}, the continuous sentiment index,

$$S_{it}^{speech} = 100 \times \frac{\#positive_{it}^{speech} - \#negative_{it}^{speech}}{\#total_{it}^{speech}}, \tag{10}$$

takes values between -100 and 100 with higher values representing higher optimism. Relative to the original definition in Correa et al. (2021), our version of the index in equation 10 is multiplied by -1 and scaled by 100 to match the definition of the media sentiment index.

Due to limited availability of the index by Picault et al. (2022), our analysis is restricted to the period January 02, 2006 and December 30, 2016 where speeches took place and data on media sentiment is available. Although this subsample focuses exclusively on speeches held during the presidencies of Trichet and Draghi—and thus does not cover Lagarde's presidency—we observe the largest average increase in clarity in this period (see Table 1).

Based on the values of S_t^{media} and S_{it}^{speech}, days are classified as having negative, neutral or positive overall media/speech sentiment if the respective index takes values below, equal to, or above zero. We observe 602 days with negative media sentiment, 0 neutral days

and 550 days with positive sentiment (see Table 3). Similarly, 714, 30 and 408 speeches are categorized as negative, neutral and positive.[14]

Figure 3 shows the time series for the continuous sentiment indices. Both time series are stationary and fluctuate around average values of -0.029 (media sentiment) respectively -0.210 (speeches).[15] Thus, ECB-related news in the media tend to be slightly less pessimistic than the sentiment expressed by Executive Board members in their speeches. However, the volatility of S_t^{media} is also considerably higher than that of S_{it}^{speech}. The contemporaneous correlation between the two series is 0.12.

To assess the role of clarity for the link between speech and media sentiment, we estimate the following regression model:

$$S_t^{media} = \alpha + \beta_1 S_{t-1}^{media} + \beta_2 S_{t-1}^{speech} + \beta_3 FK_{t-1} + \beta_4 S_{t-1}^{speech} \times FK_{t-1} + \mathbf{x}_m' \boldsymbol{\gamma} + \varepsilon_t. \quad (11)$$

The dependent variable, S_t^{media}, denotes the media sentiment index on day t. Similarly, S_{t-1}^{speech} is the average sentiment of all ECB speeches held on the previous day. FK_{t-1} corresponds to the average Flesch-Kincaid grade level of all speeches taking place on the same day. We expect a more positive media tone after clearer speeches, which translates to testing $H_0 : \beta_3 < 0$ against $H_1 : \beta_3 \geq 0$. The coefficient on the interaction between S_{t-1}^{speech} and FK_{t-1}, β_4, captures how the relationship between S_t^{media} and S_{t-1}^{speech} varies with rising values of FK_{t-1}, i.e., lower clarity. The underlying hypotheses pair is H_0: $\beta_2 > 0, \beta_4 < 0$ against H_1: $\beta_2 \leq 0$ and/or $\beta_4 \geq 0$. The vector of control variables includes the same macroeconomic conditions and expectations as in Eqn. (7) but excludes speech characteristics.

The estimates in Column (1) of Table 4 show that the relationship between media and speech sentiment is positive and significant. This implies that the tone of media coverage concerning the ECB tends to be more positive when ECB speeches convey a more positive tone. Specifically, a one-standard-deviation increase in speech sentiment corresponds to an increase in the media index by about 0.08 points. This effect persists, albeit slightly weakened, when controlling for macroeconomic conditions in Column (2). In Column (3), we include Flesch-Kincaid level of the speech(es) from the previous day. The coefficient – significant at the 5%-level – suggests that media tone tends to be more negative after more challenging speeches by ECB Board members. Speech sentiment stays highly significant.

In Column (4), we add the interaction between speech sentiment and readability. We observe a negative sign on the coefficient which suggests a weakening link between media and speech sentiment as readability decreases in line with our expectation. However, the estimate is not significant at conventional levels.

As in Section 5, we assess the sensitivity of our results by replacing the Flesch-Kincaid grade level in Eqn. (11) with the Dale-Chall score and the Gunning-Fog index (Table A.11). The coefficients on the sentiment and clarity measures have expected signs

[14] For comparison, 879 speeches are classified as negative, 9 as neutral and 264 as positive when using the dictionary of Loughran and McDonald (2011) to measure the sentiment of ECB speeches. We assess the robustness of our results to the employed dictionary used to measure speech sentiment below.

[15] During Trichet's (Draghi's) presidency, the average media sentiment is -0.049 (-0.004) and the average sentiment of speeches is -0.211 (-0.209). Table A.10 presents trend regressions for the sentiment indices similar to those in Section 5. We find no evidence of a time trend in media sentiment. There is weak evidence for an upward trend in speech sentiment but only when controlling for macroeconomic conditions.

Table 4: Effect on media sentiment

	Dependent variable: Media Sentiment Index (S_t^{media})			
	(1)	(2)	(3)	(4)
S_{t-1}^{media}	0.565***	0.528***	0.531***	0.531***
	(0.040)	(0.039)	(0.039)	(0.039)
S_{t-1}^{speech}	0.120***	0.102***	0.097***	0.183
	(0.034)	(0.036)	(0.036)	(0.206)
FK_{t-1}			−0.021**	−0.022**
			(0.010)	(0.011)
$S_{t-1}^{speech} \times FK_{t-1}$				−0.006
				(0.015)
u_m		0.046*	0.039	0.039
		(0.025)	(0.025)	(0.025)
$\lvert\tilde{\pi}_m\rvert$		0.014	0.017	0.016
		(0.054)	(0.055)	(0.055)
D_m^{Rec}		−0.076	−0.075	−0.075
		(0.055)	(0.055)	(0.055)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		0.034	0.024	0.026
		(0.117)	(0.119)	(0.118)
$\bar{\sigma}_{q+4\lvert q}$		−1.502**	−1.530**	−1.534**
		(0.603)	(0.621)	(0.619)
Constant	−0.017	0.318*	0.708***	0.723***
	(0.023)	(0.187)	(0.269)	(0.279)
Observations	846	846	846	846
Adjusted R^2	0.292	0.300	0.302	0.301

Notes: This table depicts the estimates of Eqn. (11). The estimation sample covers the period from the January 13, 2006 until December 07, 2016. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

and are again significant. As in Table 4, the interactions are not significant. We conclude that our results are robust to the employed readability measure.

We also consider whether our findings change if we use the dictionary of Loughran and McDonald (2011) to measure the sentiment of ECB speeches. Although Correa et al. (2021) argue that their approach is more suitable when analyzing text related to financial stability, one may nevertheless be interested in the relationship between media and speech

sentiment when both indices are based on the same dictionary. However, the estimates in Table A.12 are similar to those we obtain in our main specification. The smaller speech sentiment coefficients are expected, given the Loughran-McDonald index has a standard deviation nearly four times higher than the index by Correa et al. (2021).

Overall, we find that the linkage between media and speech sentiment is positive. Moreover, higher clarity is associated with higher media sentiment. While it seems that the relationship between media and speech sentiment weakens for more difficult speeches, it is important to note that this outcome is not statistically different from zero. We attribute the lack of significance to the relatively short time period covered by the media sentiment index and the somewhat low variation of clarity during this period.

7 Conclusion

We show that the clarity of speeches held by members of the ECB's Executive Board has increased over time. Clarity is higher for speeches targeted at the general public and when the speaker is female. In addition, we find that media sentiment about the ECB is more optimistic after less complex speeches. Since traditional media are one of the most important channels through which central banks can influence public opinion and macroeconomic expectations, our findings suggest that Christine Lagarde's goal to improve relations with the public may still become a reality. However, the overall level of clarity remains low even in recent years. In fact, the clarity of speeches held during Lagarde's presidency has slightly decreased when compared to those held under Mario Draghi's presidency. It is possible that the ECB's response to the outbreak of the COVID-19 pandemic and/or the Russian invasion of Ukraine is at least partially responsible for this development.

On the one hand, our results underscore the attempts by the ECB to better connect with the public. On the other hand, we provide insights into how communicating more clearly becomes difficult during times of crisis when monetary policy tends to become increasingly more discretionary and complex. However, it is precisely during these times when the public is looking for guidance and leadership. The evidence for the BoE's broader interest version of its Inflation Report documented in Haldane and McMahon (2018) suggests that it is possible to communicate clearly and that households respond to such stimuli by paying more attention to central bank communication. Thus, the ECB may improve its clarity by drawing upon the lessons learned by other central banks.

Further research may investigate the connection between clarity of central bank communication and public perceptions of monetary policy in a broader context. One option would be to directly estimate the impact of clarity of speeches on households' inflation expectations once quantitative expectations become available with a sufficiently large time dimension. Recently established surveys by several national central banks and the ECB will help fill this gap in the future. Alternatively, one could analyze the impact of clarity on inflation expectations using randomized control trials in the spirit of Coibion et al. (2022), i.e., by providing survey respondents with the same information expressed at different levels of clarity. It would also be interesting to compare the effects of clarity on the expectations of households and financial markets. Finally, future research may test how our results for the role of clarity for the relationship between media and speech sentiment change once data on media sentiment during Lagarde's presidency becomes available.

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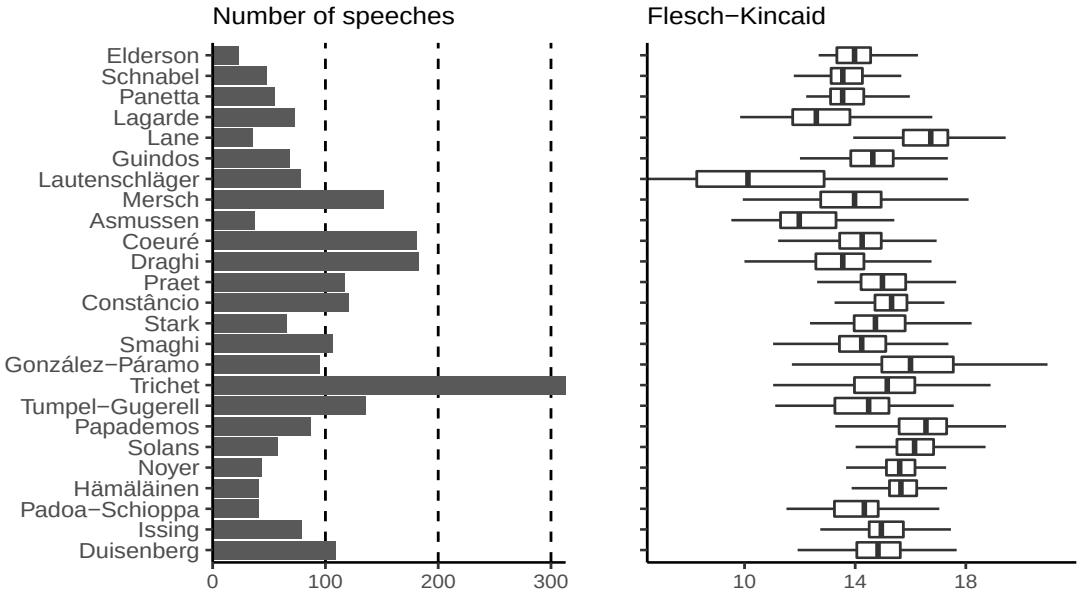
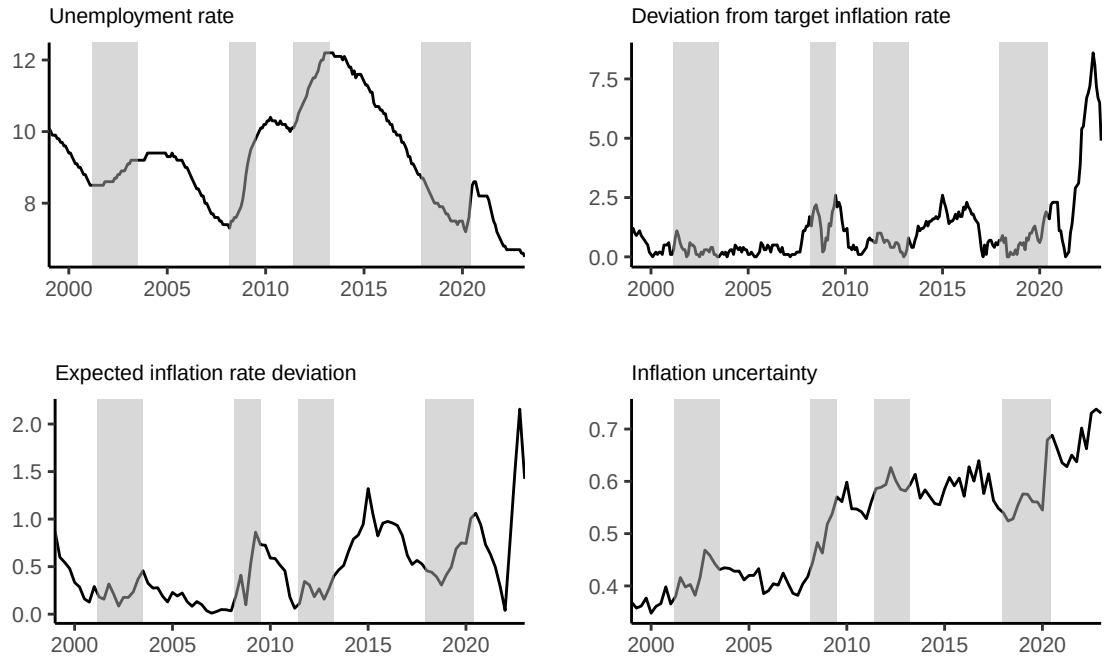
Appendix

Figure A.1: Frequency and clarity of ECB speeches by speaker



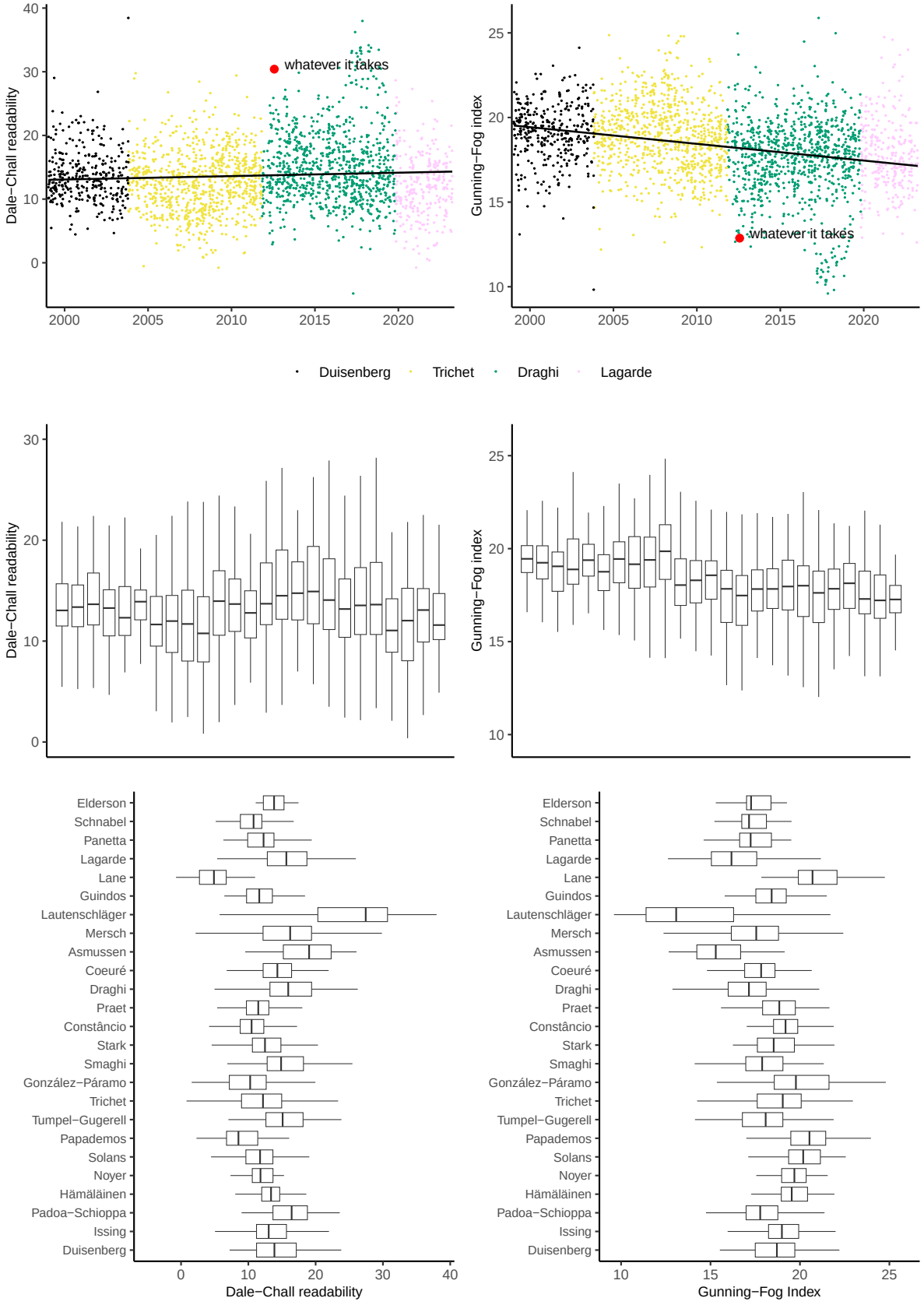
Notes: The subfigures show the number of speeches per speaker (left) and boxplots for the Flesch-Kincaid grade levels (right). The sample period is January 14, 1999 – March 27, 2023.

Figure A.2: Macroeconomic conditions and expectations



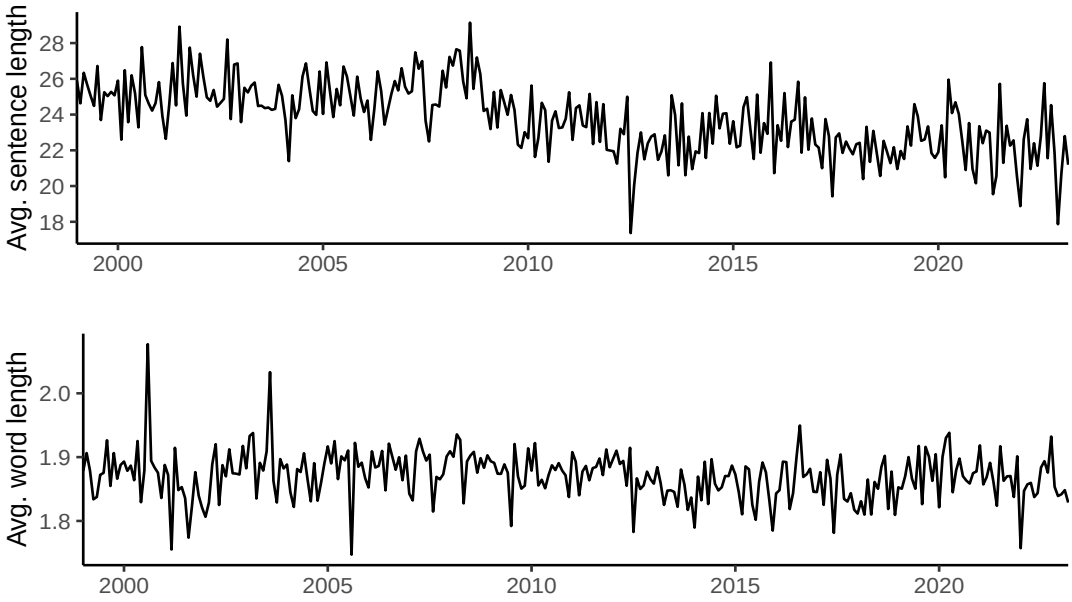
Notes: This figure shows the time series of macroeconomic conditions and expectations in the euro area from January 1999 to March 2023. Shaded gray areas represent recessions as classified by the OECD recession indicator.

Figure A.3: Dale-Chall score and Gunning-Fog index



Notes: This figure shows the Dale-Chall readability score and the Gunning-Fog index by speech, year and speaker, respectively. The sample period is January 14, 1999 – March 27, 2023.

Figure A.4: Development of Flesch-Kincaid components



Notes: This figure shows monthly averages of the Flesch-Kincaid components, i.e., average sentence length and average word length. The sample period is January 14, 1999 – March 27, 2023.

Table A.1: Keywords used to categorize ECB speeches

Category	Keywords
Audience: General	
event	anniversary, award, breakfast, celebration, centenary, ceremonial, ceremony, cérémonie, closing remarks, countdown, culture, dinner, diner, eulogy, evening, exhibition, farewell, festival, gespräche, hommage, honour, inaugural, inauguration, jubilee, karlspreis, laudatio, laudatory, launch, laureate, lunch, luncheon, memorial, millenium, millennium, opening statement, order of merit, prize, prix, reception, star event, tribute, unveiling, welcome address, welcome message, welcome remarks wochenende
press	press, areena, die zeit, wdr, bild am sonntag, voxeu.org, project syndicate, le monde, frankfurter, wall street journal, journalist, financial times, süddeutsche zeitung
business	investors, salzburg, stiftung, market news, wirtschaftsgipfel, mercados financieros, venture capital, industry association, crafts, aci, commerzbank, natixis, abc, eurex, business day, italian banking association, aedbf, bond market association, omfif, parsifal, unice, ngo, caixa, american business, duisburger banking, landesbank, kellog, recoletos, boursière, spruce meadows, foundation, katholisch, jp morgan, gesellschaft, okobank, forex, swedbank, nordea, society, waarborgfonds, nomura, ernst & young, the economist's, swedish enterprises, pöhl, mas, villa, european affairs, eco libération, 21st century forum, mentor, ambrosetti, etuc, unternehmerforum, convention, retail, afme, finleap, finanzmarktklausur, international banking event, ubs, city, safe policy center, deutsche boerse, expansión, nieuwspoort, brookings institution, federation of german industries, sparkassenverband, observatory group, cdu, icma, efr, european people's party, cyber resilience, bcl, confindustria, paediatrics congress, mni connect, bvr, konrad-adenauer-stiftung, konrad adenauer, morgan stanley, business meeting, nabe, bloomberg, handelsblatt, atlantik-brücke, bruegel, pwc, corporate, monnet project, sz finance day, zeit konferenz, atlantic, rencontres, asociación, associazione, entreprises, treasury management agency, pagamenti, center for monetary, les champs, la granda, wirtschaftstag, peterson institute, círculo de economía, ambassadors, finanzplatztag, welt-währungskonferenz, bretton, cesifin, mercados, mercado, risk europe, konjunkturgespräch, industrial, cesfin, wirtschaftskonferenz, eurofi, febelfin, cercle, headquarter, wirtschaftsinitiative, entrepreneurs' talk, club, juristische, european affairs dublin, citigroup, european banking federation, banks in bulgaria, dz bank, federation of international banks, alpbach talks, mellon headquarter, unicredit, uni credit, bankenverband, banking day, bmw, prometeia, evangelische akademie, unione cristiana, juristentag, bavarian, statistics day, international studies washington, jahresimpuls, dialog, mittagsgespräch
public	visit, german british, design, cop 26, cop26, bundestag, social science, heidelberg, workshop, lecture, statistical, topic, colloquium, colloquia, roundtable discussion, staten-generaal, constitutional court, keynote, davos, forum, american studies

Table A.1: Key Words for Categorization of Speeches (cont.)

Category	Keywords
Audience: Finance/Central Banking	
EU	ecb representative office, ecb-cfs, european union committee, monetary commission, eurosystem, eea, european commission, european parliament, economic and monetary affairs, epc, ecb financial stability review, european stability mechanism, european policy centre, eu presidency conference, euro50, euro 50, ercc, european economic and social committee, contact committee, euro cyber resilience board, european payments council, european securities regulators, financial integration in europe, cepr/esi, ecb and its watchers, european systemic risk board, euro finance week, council of the european union, european systemic risk board, council on foreign relations, parliament, hearing, european union accounts
central bank	central bank of, national bank, banque nationale, policy roundtable, banque de france, ecb workshop, banque centrale du luxembourg, banco de portugal, financial services authority, ecb forum, estonian central bank, asian development bank, bank of greece, danmarks nationalbank, oenb, imf, bank of finland, ecb conference on statistics, t2s, oesterreichische nationalbank, renminbi, finlands bank, nederlandsche bank, banca, ecb colloquium, esrb, jackson hole, contact group, ecb legal conference, cepr, bundesbank, banco de españa, bank for international settlements, bank of china, riksbank, banco central, federal reserve, ecb-cfs research network
university	research forum, sciences, florence school, university, sefa, ie business school, london business, lse, università, academy of european law, sciences po, harvard, yale, académie, deusto business school, cass business school, european institute, nyu stern, trinity college, school of finance, school of banking and finance, ludwig erhard lecture, jean monnet lecture, financial studies, deutsches institut für wirtschaftsforschung, hochschule, universidad, universität, zew, luiss school, hec, kiel institute, université, school of economics, hertie, institut d'études, academy of athens, otto beisheim school of management, higher education
politics	chamber, cámara, commonwealth office, embassy, group of thirty, council, finance ministers, oecd, ministry of finance, government of greece, g30, g20, china's, troika, representative office
conference	conference, congress, monetary policy forum, financial analysts, encuentro financiero, financial markets association, association d'économie financière, fixed income market forum, workshop m̈onetary, european economic and financial, european economics and financial, european economic association, seminar of the european economics, bcbs-fsi, institute, eurofonds, mortgage federation, instituto, institut, wirtschaftssymposium, risk management, transparency international, eurofi, monetary and financial stability, conférence, finanz- und wirtschaftsforum, european treasury symposium, iif annual meeting, economic policy panel, banking union, moneda, china-europe, credit expansion forum, risk officer, membership meeting, european seminar, rtgs, financial institutions forum, europa forum, european forum, zinsforum, banking supervision, world bank, credit risk, investment forum, capital markets forum, euro finance week, baft-ifsa, finance forum, congress of actuaries, financial market forum, financial forum, public finance, meeting on financial inclusion, aebdf, asba-bcbs-fsi, summit, panel on ïnternational monetary policy, us financial services roundtable, general assembly of the european savings banks group, institutional money congress, european financial congress, international monetary and financial committee, european banking congress, financial market authority's, global financial linkages, finance summit, economic forum

Notes: This table shows keywords we use consecutively to group speeches into nine subcategories for identifying the target audience. The identified subcategories are shown according to their order of identification.

Table A.2: Summary statistics for characteristics of ECB blogposts

	Blogposts (Obs. = 66)	Speeches (Obs. = 240)	p-value for mean difference
#words			
Mean	1338.52	2845.77	0.00
SD	837.16	1621.91	
Flesch-Kincaid grade level			
Mean	13.82	14.01	0.53
SD	2.24	1.79	

Notes: This table shows summary statistics for the number of words and Flesch-Kincaid grade levels for of ECB blogsposts and speeches and the p-values when testing for differences in the means for both types of communication. The sample period is March 12, 2020 – March 27, 2023.

Table A.3: t-tests for differences in averages of Flesch-Kincaid grade levels

	Duisenberg	Trichet	Draghi
Trichet	−0.13		
	[0.21]		
Draghi	−1.32	−1.19	
	[0.00]	[0.00]	
Lagarde	−1.21	−1.08	0.11
	[0.00]	[0.00]	[0.38]

Notes: This table depicts the differences in the average Flesch-Kincaid grade levels across presidencies as well as the corresponding p-values.

Table A.4: Trend in Flesch-Kincaid grade level – monthly median

	Dependent variable: Flesch-Kincaid grade level (FK_m)			
	(1)	(2)	(3)	(4)
m	-0.006^{***}	-0.006^{***}	-0.011^{***}	-0.011^{***}
	(0.001)	(0.002)	(0.004)	(0.004)
u_m		-0.181^{***}	-0.320^{***}	-0.312^{***}
		(0.055)	(0.074)	(0.074)
$\lvert\tilde{\pi}_m\rvert$		-0.002	-0.068	-0.063
		(0.076)	(0.063)	(0.064)
D_m^{Rec}		-0.050	-0.052	-0.030
		(0.131)	(0.131)	(0.132)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		0.005	0.282	0.288
		(0.300)	(0.229)	(0.233)
$\bar{\sigma}_{q+4\lvert q}$		-0.845	1.924	1.552
		(1.771)	(1.825)	(1.768)
$S_m^{P/CE}$			-0.206	-0.236
			(0.279)	(0.265)
$S_m^{General}$			-0.653^{**}	-0.569^{**}
			(0.255)	(0.253)
S_m^{Female}			-0.716	-0.681
			(0.527)	(0.487)
$D_m^{Trichet}$			0.706^{**}	0.747^{**}
			(0.273)	(0.299)
D_m^{Draghi}			0.705	0.773
			(0.493)	(0.541)
$D_m^{Lagarde}$			0.613	0.744
			(0.570)	(0.634)
Constant	15.590^{***}	17.650^{***}	18.041^{***}	17.955^{***}
	(0.130)	(0.517)	(0.552)	(0.583)
p-value (H_0: $\beta \geq 0$)	0.000	0.000	0.002	0.003
Monthly dummies	No	No	No	Yes
Observations	289	289	289	289
Adjusted R^2	0.268	0.329	0.371	0.365

Notes: This table presents the estimates of Eqn. (7) with the monthly median of the Flesch-Kincaid grade level as the dependent variable. $S_m^{P/CE}/S_m^{General}/S_m^{Female}$ measure the share of speeches held by the ECB president or chief economist/aimed at general audiences/by female speakers in month m. The estimation sample covers the period January 1999 – March 2023. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Table A.5: Trend in the average sentence length of ECB speeches

	Dependent variable: Average sentence length					
	(1)	(2)	(3)	(4)	(5)	(6)
t	-0.493^{***}	-0.473^{***}	-0.503^{***}	-0.541^{***}	-0.653^{***}	-0.374^{**}
	(0.032)	(0.096)	(0.099)	(0.101)	(0.200)	(0.171)
u_m		-0.256^{***}	-0.455^{***}	-0.455^{***}	-0.470^{***}	-0.336^{***}
		(0.093)	(0.099)	(0.098)	(0.141)	(0.116)
$\lvert\tilde{\pi}_m\rvert$		0.112	0.073	0.076	0.021	0.101
		(0.115)	(0.124)	(0.122)	(0.123)	(0.111)
D_m^{Rec}		0.104	-0.166	-0.164	0.040	0.005
		(0.181)	(0.199)	(0.196)	(0.190)	(0.169)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		-0.158	-0.145	-0.135	0.369	0.225
		(0.330)	(0.331)	(0.330)	(0.358)	(0.311)
$\bar{\sigma}_{q+4\lvert q}$		-1.550	1.103	1.135	1.312	-1.477
		(2.775)	(2.828)	(2.809)	(3.415)	(2.933)
$D_{it}^{Whatever}$			-3.101^{***}	-3.089^{***}	-3.109^{***}	-2.080^{***}
			(0.224)	(0.225)	(0.267)	(0.323)
$D_{it}^{P/CE}$			-0.356^{*}	-0.355^{*}	-0.407^{**}	
			(0.195)	(0.190)	(0.192)	
D_{it}^{Female}			-2.654^{***}	-2.676^{***}	-2.768^{***}	
			(0.332)	(0.323)	(0.338)	
$D_{it}^{General}$			-0.459^{***}	-0.903^{***}	-0.449^{***}	-0.340^{**}
			(0.150)	(0.287)	(0.150)	(0.140)
$D_{it}^{General} \times t$				0.096*		
				(0.053)		
$D_{it}^{Trichet}$					1.377***	
					(0.435)	
D_{it}^{Draghi}					1.128	
					(0.756)	
$D_{it}^{Lagarde}$					1.527	
					(0.950)	
Constant	25.944^{***}	28.967^{***}	30.386^{***}	30.546^{***}	29.794^{***}	29.713^{***}
	(0.182)	(0.703)	(0.727)	(0.735)	(0.726)	(1.162)
p-value (H_0: $\beta \geq 0$)	0.000	0.000	0.000	0.000	0.001	0.014
Speaker fixed effects	No	No	No	No	No	Yes
Observations	2,348	2,348	2,324	2,324	2,324	2,324
Adjusted R^2	0.108	0.124	0.189	0.190	0.198	0.342

Notes: This table presents the estimates of Eqn. (7) when we use the average number of words per sentence in a speech as the dependent variable. The estimation sample covers the period January 14, 1999 – March 27, 2023. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Trend and interaction coefficients and standard errors are multiplied by 1000. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Table A.6: Trend in the average word length of ECB speeches

	Dependent variable: Average word length					
	(1)	(2)	(3)	(4)	(5)	(6)
t	-0.003^{***}	-0.005^{***}	-0.006^{***}	-0.006^{***}	-0.012^{***}	-0.009^{***}
	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)
u_m		-0.005^{***}	-0.010^{***}	-0.010^{***}	-0.009^{***}	-0.006^{***}
		(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
$\lvert\tilde{\pi}_m\rvert$		-0.002	-0.004^{*}	-0.004^{*}	-0.006^{***}	-0.003^{*}
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
D_m^{Rec}		0.001	-0.006	-0.006	0.002	-0.000
		(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		-0.003	-0.002	-0.002	0.013^{**}	0.004
		(0.006)	(0.007)	(0.006)	(0.006)	(0.006)
$\bar{\sigma}_{q+4\lvert q}$		0.076	0.153^{***}	0.153^{***}	0.140^{**}	0.112^{**}
		(0.056)	(0.057)	(0.051)	(0.063)	(0.055)
$D_{it}^{Whatever}$			-0.280^{***}	-0.280^{***}	-0.283^{***}	-0.271^{***}
			(0.005)	(0.005)	(0.006)	(0.006)
$D_{it}^{P/CE}$			-0.009^{**}	-0.009^{***}	-0.010^{***}	
			(0.003)	(0.003)	(0.004)	
D_{it}^{Female}			-0.063^{***}	-0.063^{***}	-0.067^{***}	
			(0.007)	(0.005)	(0.008)	
$D_{it}^{General}$			-0.021^{***}	-0.021^{***}	-0.020^{***}	-0.019^{***}
			(0.003)	(0.007)	(0.003)	(0.003)
$D_{it}^{General} \times t$				0.000		
				(0.001)		
$D_{it}^{Trichet}$					0.044^{***}	
					(0.009)	
D_{it}^{Draghi}					0.042^{***}	
					(0.016)	
$D_{it}^{Lagarde}$					0.069^{***}	
					(0.019)	
Constant	1.883^{***}	1.905^{***}	1.938^{***}	1.938^{***}	1.921^{***}	1.929^{***}
	(0.004)	(0.016)	(0.015)	(0.015)	(0.015)	(0.023)
p-value (H_0: $\beta \geq 0$)	0.000	0.005	0.001	0.000	0.000	0.003
Speaker fixed effects	No	No	No	No	No	Yes
Observations	2,348	2,348	2,324	2,324	2,324	2,324
Adjusted R^2	0.008	0.011	0.101	0.100	0.117	0.217

Notes: This table presents the estimates of Eqn. (7) when we use the average number of syllables per word in a speech as the dependent variable. The estimation sample covers the period January 14, 1999 – March 27, 2023. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Trend and interaction coefficients and standard errors are multiplied by 1000. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Table A.7: Trend in the Dale-Chall score of ECB speeches

	Dependent variable: Dale-Chall score (DC_{it})					
	(1)	(2)	(3)	(4)	(5)	(6)
t	0.146*	0.616***	0.666***	0.716***	0.836***	0.362*
	(0.078)	(0.151)	(0.168)	(0.172)	(0.257)	(0.210)
u_m		0.784***	1.135***	1.136***	0.707***	0.469***
		(0.147)	(0.164)	(0.161)	(0.167)	(0.140)
$\lvert\tilde{\pi}_m\rvert$		−0.094	0.001	−0.002	0.206	0.051
		(0.176)	(0.210)	(0.205)	(0.129)	(0.111)
D_m^{Rec}		0.389	0.884**	0.882**	0.061	0.097
		(0.315)	(0.360)	(0.352)	(0.277)	(0.218)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		0.774	0.726	0.712	−0.406	−0.181
		(0.540)	(0.601)	(0.594)	(0.431)	(0.366)
$\bar{\sigma}_{q+4\lvert q}$		−12.440***	−17.829***	−17.871***	−10.304**	−5.126
		(4.476)	(4.985)	(4.909)	(4.355)	(3.480)
$D_{it}^{Whatever}$			16.198***	16.183***	16.387***	14.556***
			(0.323)	(0.318)	(0.365)	(0.420)
$D_{it}^{P/CE}$			−0.034	−0.036	0.123	
			(0.250)	(0.247)	(0.209)	
D_{it}^{Female}			4.792***	4.820***	5.286***	
			(0.697)	(0.677)	(0.447)	
$D_{it}^{General}$			1.467***	2.047***	1.420***	1.252***
			(0.213)	(0.425)	(0.211)	(0.186)
$D_{it}^{General} \times t$				−0.125		
				(0.087)		
$D_{it}^{Trichet}$					−3.142***	
					(0.582)	
D_{it}^{Draghi}					−2.183**	
					(1.030)	
$D_{it}^{Lagarde}$					−6.337***	
					(1.301)	
Constant	13.024***	9.697***	7.552***	7.343***	9.984***	9.880***
	(0.331)	(1.109)	(1.155)	(1.135)	(0.963)	(1.424)
p-value (H_0: $\beta \leq 0$)	0.031	0.000	0.000	0.000	0.001	0.043
Speaker fixed-effects	No	No	No	No	No	Yes
Observations	2,348	2,348	2,324	2,324	2,324	2,324
Adjusted R^2	0.004	0.039	0.156	0.156	0.193	0.386

Notes: This table presents the estimates of Eqn. (7) when we use the Dale-Chall score, DC_{it}, as the dependent variable. The estimation sample covers the period January 14, 1999 – March 27, 2023. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Trend and interaction coefficients and standard errors are multiplied by 1000. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Table A.8: Trend in the Gunning-Fog index of ECB speeches

	Dependent variable: Gunning-Fog index (Fog_{it})					
	(1)	(2)	(3)	(4)	(5)	(6)
t	−0.270***	−0.331***	−0.351***	−0.369***	−0.464***	−0.296***
	(0.022)	(0.060)	(0.064)	(0.064)	(0.110)	(0.094)
u_m		−0.221***	−0.365***	−0.366***	−0.312***	−0.219***
		(0.056)	(0.063)	(0.060)	(0.077)	(0.065)
$\lvert\tilde{\pi}_m\rvert$		0.046	0.012	0.013	−0.045	0.025
		(0.063)	(0.071)	(0.068)	(0.062)	(0.056)
D_m^{Rec}		−0.017	−0.224*	−0.223*	−0.015	−0.048
		(0.111)	(0.123)	(0.119)	(0.112)	(0.096)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		−0.169	−0.154	−0.149	0.219	0.035
		(0.183)	(0.191)	(0.186)	(0.187)	(0.167)
$\bar{\sigma}_{q+4\lvert q}$		1.280	3.352*	3.367*	2.384	0.959
		(1.708)	(1.818)	(1.757)	(1.942)	(1.652)
$D_{it}^{Whatever}$			−5.015***	−5.010***	−5.081***	−4.513***
			(0.123)	(0.123)	(0.146)	(0.149)
$D_{it}^{P/CE}$			−0.133	−0.132	−0.177*	
			(0.108)	(0.103)	(0.096)	
D_{it}^{Female}			−1.972***	−1.981***	−2.094***	
			(0.236)	(0.222)	(0.212)	
$D_{it}^{General}$			−0.497***	−0.701***	−0.485***	−0.417***
			(0.091)	(0.177)	(0.089)	(0.082)
$D_{it}^{General} \times t$				0.044		
				(0.034)		
$D_{it}^{Trichet}$					1.058***	
					(0.254)	
D_{it}^{Draghi}					0.905**	
					(0.434)	
$D_{it}^{Lagarde}$					1.760***	
					(0.549)	
Constant	19.524***	21.227***	22.198***	22.271***	21.647***	21.435***
	(0.109)	(0.429)	(0.426)	(0.420)	(0.395)	(0.661)
p-value (H_0: $\beta \geq 0$)	0.000	0.000	0.000	0.000	0.000	0.001
Speaker fixed-effects	No	No	No	No	No	Yes
Observations	2,348	2,348	2,324	2,324	2,324	2,324
Adjusted R^2	0.086	0.105	0.208	0.208	0.223	0.373

Notes: This table presents the estimates of Eqn. (7) when we use the Gunning-Fog index, Fog_{it}, as the dependent variable. The estimation sample covers the period January 14, 1999 – March 27, 2023. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Trend and interaction coefficients and standard errors are multiplied by 1000. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Table A.9: Trend in the number of words in ECB speeches

	Dependent variable: (Log) number of words per speech ($\#words_{it}$)					
	(1)	(2)	(3)	(4)	(5)	(6)
t	-0.005^{***}	-0.004^{***}	-0.005^{***}	-0.004^{***}	-0.005	-0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
u_m		0.010	-0.002	-0.002	0.028	0.033^{*}
		(0.012)	(0.013)	(0.013)	(0.019)	(0.018)
$\lvert\tilde{\pi}_m\rvert$		0.069^{***}	0.064^{***}	0.064^{***}	0.054^{***}	0.053^{***}
		(0.015)	(0.016)	(0.016)	(0.016)	(0.015)
D_m^{Rec}		-0.035	-0.052^{**}	-0.052^{**}	-0.012	0.011
		(0.026)	(0.026)	(0.026)	(0.028)	(0.027)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		-0.027	-0.025	-0.026	0.009	0.048
		(0.049)	(0.049)	(0.049)	(0.053)	(0.050)
$\bar{\sigma}_{q+4\lvert q}$		-0.694^{*}	-0.490	-0.490	-1.030^{**}	-1.517^{***}
		(0.371)	(0.375)	(0.377)	(0.441)	(0.430)
$D_{it}^{Whatever}$			-0.482^{***}	-0.482^{***}	-0.498^{***}	-0.424^{***}
			(0.034)	(0.034)	(0.040)	(0.050)
$D_{it}^{P/CE}$			-0.085^{***}	-0.085^{***}	-0.092^{***}	
			(0.024)	(0.024)	(0.024)	
D_{it}^{Female}			-0.152^{***}	-0.152^{***}	-0.178^{***}	
			(0.040)	(0.041)	(0.039)	
$D_{it}^{General}$			-0.153^{***}	-0.148^{***}	-0.150^{***}	-0.148^{***}
			(0.024)	(0.049)	(0.024)	(0.023)
$D_{it}^{General} \times t$				-0.000		
				(0.000)		
$D_{it}^{Trichet}$					0.106*	
					(0.061)	
D_{it}^{Draghi}					0.071	
					(0.117)	
$D_{it}^{Lagarde}$					0.338^{**}	
					(0.138)	
Constant	8.063^{***}	8.237^{***}	8.389^{***}	8.388^{***}	8.276^{***}	8.564^{***}
	(0.027)	(0.096)	(0.098)	(0.097)	(0.113)	(0.182)
p-value (H_0: $\beta \geq 0$)	0.000	0.001	0.000	0.001	0.050	0.062
Speaker fixed-effects	No	No	No	No	No	Yes
Observations	2,348	2,348	2,324	2,324	2,324	2,324
Adjusted R^2	0.047	0.062	0.090	0.090	0.098	0.193

Notes: This table presents the estimates of Eqn. (7). The estimation sample covers the period January 14, 1999 – March 27, 2023. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Trend coefficients and standard errors are multiplied by 100. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Table A.10: Trend in speeches and media sentiment

	Dependent variable:			
	Media Sentiment Index (S_t^{media})		Speech Sentiment (S_t^{speech})	
	(1)	(2)	(3)	(4)
t	−0.0001	0.0004	−0.0019	0.0001*
	(0.0002)	(0.0003)	(0.0047)	(0.0001)
u_m		0.0683		−0.0007
		(0.0514)		(0.0308)
$\lvert\tilde{\pi}_m\rvert$		−0.0222		−0.0507
		(0.1035)		(0.0623)
D_m^{Rec}		−0.2059*		−0.1616**
		(0.1081)		(0.0775)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		0.1158		0.2443
		(0.2474)		(0.1524)
$\bar{\sigma}_{q+4\lvert q}$		−4.1161***		−2.5550***
		(1.1120)		(0.9211)
Constant	0.0072	1.2915***	−17.4349**	0.9942***
	(0.1421)	(0.4854)	(7.0799)	(0.3562)
Observations	846	846	846	846
Adjusted R^2	0.0019	0.0846	-0.0008	0.0496

Notes: The estimation sample covers the period January 14, 1999 – March 27, 2023. Central bank sentiment is multiplied by 100 for comparability with media sentiment. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Trend coefficients and standard errors are multiplied by 1000. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Table A.11: Effect on media sentiment using alternative readability measures

	Dependent variable: Media Sentiment Index (S_t^{media})			
	(1)	(2)	(3)	(4)
S_{t-1}^{media}	0.531***	0.533***	0.532***	0.532***
	(0.039)	(0.039)	(0.039)	(0.039)
S_{t-1}^{speech}	0.094***	0.013	0.097***	0.277
	(0.036)	(0.083)	(0.036)	(0.235)
DC_{t-1}	0.008**	0.008**		
	(0.004)	(0.004)		
Fog_{t-1}			−0.019**	−0.020**
			(0.009)	(0.009)
$S_{t-1}^{speech} \times DC_{t-1}$		0.006		
		(0.005)		
$S_{t-1}^{speech} \times Fog_{t-1}$				−0.010
				(0.013)
u_m	0.040	0.040	0.039	0.039
	(0.025)	(0.025)	(0.025)	(0.025)
$\lvert\tilde{\pi}_m\rvert$	0.014	0.011	0.016	0.014
	(0.054)	(0.054)	(0.055)	(0.055)
Rec_m	−0.075	−0.074	−0.074	−0.073
	(0.055)	(0.055)	(0.055)	(0.055)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$	0.023	0.026	0.025	0.028
	(0.117)	(0.118)	(0.118)	(0.117)
$\bar{\sigma}_{q+4\lvert q}$	−1.500**	−1.510**	−1.536**	−1.542**
	(0.600)	(0.619)	(0.622)	(0.620)
Constant	0.272	0.267	0.749***	0.774***
	(0.190)	(0.192)	(0.277)	(0.285)
Observations	846	846	846	846
Adjusted R^2	0.302	0.302	0.302	0.301

Notes: This table depicts the estimates of Eqn. (11) when using the Dale-Chall or Gunning-Fog index to measure readability. The estimation sample covers the period from the January 13, 2006 until December 07, 2016. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

Table A.12: Effect on media sentiment – Loughran and McDonald (2011) sentiment

	Dependent variable: Media Sentiment Index (S_t^{media})			
	(1)	(2)	(3)	(4)
S_{t-1}^{media}	0.565***	0.529***	0.532***	0.534***
	(0.039)	(0.039)	(0.040)	(0.040)
S_{t-1}^{speech}	3.731***	3.425***	3.401***	8.793*
	(0.854)	(0.866)	(0.857)	(5.055)
FK_{t-1}			−0.024**	−0.030**
			(0.010)	(0.012)
$S_{t-1}^{speech} \times FK_{t-1}$				−0.365
				(0.354)
u_m		0.056**	0.048*	0.048*
		(0.025)	(0.025)	(0.026)
$\lvert\tilde{\pi}_m\rvert$		0.018	0.021	0.020
		(0.055)	(0.055)	(0.055)
Rec_m		−0.080	−0.079	−0.079
		(0.055)	(0.055)	(0.055)
$\lvert E(\tilde{\pi}_{q+4\lvert q})\rvert$		0.039	0.027	0.024
		(0.119)	(0.119)	(0.120)
$\bar{\sigma}_{q+4\lvert q}$		−1.440**	−1.462**	−1.471**
		(0.593)	(0.620)	(0.633)
Constant	0.026	0.219	0.656**	0.752**
	(0.028)	(0.184)	(0.266)	(0.301)
Observations	846	846	846	846
Adjusted R^2	0.298	0.305	0.308	0.308

Notes: This table depicts the estimates of Eqn. (11) when using the dictionary by Loughran and McDonald (2011) to measure speech sentiment. The estimation sample covers the period from the January 13, 2006 until December 07, 2016. We estimate parameters by OLS. To account for arbitrary levels of heteroskedasticity and autocorrelation we report Newey and West (1987) standard errors in parentheses. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively.

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