

What do central banks talk about?

A European perspective on central bank communication

Martin Feldkircher, Paul Hofmarcher, Pierre Siklos¹

In this paper, we apply a structural topic model (STM) to analyze over 7,000 speeches delivered by European central bankers and ECB staff over the period from 1996 to 2019. Our findings indicate that neither the size of an economy nor its monetary policy regime appear to be related to how frequently a country's central bank communicates through speeches with the public. We moreover find that the following four topics dominate in central bank speeches: (1) European integration, (2) monetary policy and price stability, (3) financial stability, and (4) "outside the box" content, subsuming rhetoric on issues beyond central banks' core responsibilities. While coverage of monetary policy topics has been stable over time, European integration has been discussed less in central bank speeches since the early days of the euro and at least up until the Brexit referendum. Speeches on financial stability surged in the aftermath of the global financial crisis. When examining the regional distribution of topic prevalence, we find that speeches given by central bankers from non-euro area countries broadly follow the trends described above. Interestingly, many speeches delivered by central bank staff from Central, Eastern and Southeastern Europe (CESEE) fall under the "outside the box" category, suggesting that CESEE central banks cover a broader range of topics than the rest of their European counterparts.

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Central banks have been at the forefront of business cycle stabilization for almost four decades. In the aftermath of the global financial crisis of 2008/2009 and the euro area sovereign debt crisis, central banks eventually came to be called “the only game in town” (El-Erian, 2016). This perception is attributable to three developments: First, institutional reforms of central banks lead to greater autonomy, transparency and accountability (e.g., Siklos, 2002; Bordo and Siklos, 2019). Second, the dramatic reduction in policy rates following the global financial crisis and the euro area sovereign debt crisis also played a role. A reversal in policy rates continues to be delayed due to the economic fallout from the ongoing COVID-19 pandemic. Third, both economic theory and accumulated empirical evidence increasingly point to the critical role central bank communication plays for market expectations (e.g., Woodford, 2003; Blinder et al., 2018). Putting greater emphasis on communication means recognizing the power of narratives to drive expectations (Shiller, 2019). Central bankers are also well aware of the fact that central bank communication in crisis times differs from that in normal times (e.g., Carney, 2009).

¹ Vienna School of International Studies (DA), martin.feldkircher@da-vienna.ac.at; Paris Lodron University of Salzburg (PLUS), paul.hofmarcher@sbg.ac.at; Wilfrid Laurier University (WLU), psiklos@wlu.ac.ca. Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the DA, the PLUS, WLU or the Eurosystem. The authors would like to thank two anonymous referees as well as OeNB staff for helpful comments and valuable suggestions. Pierre Siklos is grateful to the OeNB for funding from the Klaus Liebscher Economic Research Scholarship.

Speeches represent the most consistent format through which senior central bank staff inform the public about central bank decisions and the economic outlook. In our empirical analysis, we thus focus on speeches, even though central bank communication, of course, takes place along several dimensions (see, e.g., De Haan and Sturm, 2019).

The remainder of the paper is structured as follows: Section 1 provides a brief literature survey outlining methodological innovations in assessing the quality and impact of central bank communication. In section 2, to illustrate the role of central bank communication in monetary policy, we construct a dataset consisting of approximately 7,000 speeches given by European central bankers and ECB staff. The speeches were taken from the speech repository compiled by the Bank for International Settlements (BIS),² which covers the period from 1996 to date. In Section 3, we then present the methodological framework used to quantify the content of speeches. Following analysis of the results in section 4, section 5 concludes.

1 A brief introduction to central bank communication

1.1 The theory and practice of central bank communication

Central bank communication is often linked to central bank transparency and accountability (see, e.g., Dincer et al., 2019). Both follow directly from the provision of greater autonomy. Greater autonomy has theoretically been linked to the avoidance of the time-inconsistency problem that may lead to undesirably high inflation, as was prominently shown by Kydland and Prescott (1987).

Diagrams of monetary policy transmission mechanisms as published by many central banks do not explicitly mention communication as a separate instrument in the toolkit of central banks (see Reid and Siklos, 2020). Instead, one is left to assume, for example, that inflation expectations allow to draw some conclusions about central bank communication or that, more generally, communication may serve as a complement or substitute for policy rate changes.

Still, carving out a separate role and function for central bank communication is seen as essential by central banks,³ and there are at least three reasons why central bank communication can play a distinct role in monetary policy transmission mechanisms. First, inflation expectations are not the only expectations that matter. Expectations of future interest rates, that is, forward guidance, is also on the minds of investors, households and firms.⁴ Second, central banks provide information not only about inflation but also about a wide variety of issues and challenges. Accordingly, academic studies have begun to examine the relationship between the remit of central banks and the topics covered in speeches and other forms of central bank communication. Third, since the global financial crisis and the euro area sovereign debt crisis, the emphasis of central bank communication has shifted toward topics related to ensuing implications for financial stability (e.g., Born et al., 2014; Lombardi and Siklos, 2016).

² See <https://www.bis.org/cbspeeches/index.htm>.

³ At least from a strategic perspective, communication can also impact how monetary policy is perceived by the public (see, e.g., Bernanke, 2004; 2015).

⁴ Short- and long-run interest rates are linked to beliefs about future inflation.

If central bank communication has not yet become as important a tool for enhancing monetary policy transmission as other tools, this may be because theory continues to lag behind empirical work (see, e.g., Blinder et al., 2008). Additionally, economics has been slow to adopt what can be learned from other disciplines (e.g., psychology or political science). The following examples moreover illustrate an apparent heterogeneity in communication strategies across central banks. The Bank of Canada states that communication serves to “enhance the effectiveness of monetary policy;” the Sveriges Riksbank’s communication policy, by contrast, aims at ensuring that “target groups not only understand but are able to predict the monetary policy deliberations.” At the Bank of England communication is a device to “promote the reputational integrity of the Bank,” while the Fed sees communication as a means to “reinforce the public’s confidence in the transparency and integrity of the monetary policy process.”⁵

Monetary policy is usually decided by a monetary policy committee (MPC). Since not all MPC members share the same opinion, there can be an element of noise in communication. Such issues have spawned a separate literature (see, e.g., Visser and Swank, 2007; Swank et al., 2006; Eijffinger and Raes, 2018).

Another source of cacophony in central bank communication stems from governance structures. At the Bank of England, for example, MPC members do not represent entire groups or areas – they are independent. In the United States, some members of the Federal Open Market Committee (FOMC) are appointed regionally, while others are nominated by the President and subject to Congressional approval. Consequently, loyalties potentially differ across regions or even between the financial sector and other constituencies. In the euro area, even if the ECB’s mandate pertains to the single currency area, individual committee members may, at times, voice opinions influenced by member states’ national priorities (James, 2012; Mody, 2018).

Taken together, it is clear that communication about monetary policy serves a multitude of purposes. It must also make sure that financial markets and the public do not think of central banks as being solely concerned with inflation, which may possibly be to the detriment of central bank policies and their real economic outcomes.⁶

1.2 The “how” and “what” of central bank communication

How do central banks communicate? Several decades ago, the primary means of central bank communication were annual reports and the occasional speech typically given by the central bank’s governor and, occasionally, by senior central bank staff. Since the 1990s, the number of speeches has grown tremendously, as has the number of central bank decision makers delivering these speeches. The number and types of central bank publications have mushroomed as well, ranging from inflation or monetary policy reports to publications aimed at the general

⁵ The quotes listed here are drawn from statements on central bank communication published on the respective central bank’s website. For further details, see Reid and Siklos (2020), the Bank of Canada (2017) and the US Federal Reserve Board of Governors (2017).

⁶ This is well captured by Friedman (2003): “By forcing participants in the monetary policy debate to conduct the discussion in a vocabulary pertaining solely to inflation, inflation targeting fosters over time the atrophication of concerns for real outcomes.” Another apt characterization – coming from former Governor of the Bank of England, Mervyn King – is that central bankers are not “inflation nutters” (King 1997).

public and, more recently, educational materials for all ages on monetary policy and the financial system. In addition, central banks now publish information regarding financial stability risks (e.g., Horváth and Vasko, 2016; Oosterloo et al., 2007). Last but not least, central banks pay keen attention to the statements accompanying the decisions taken by MPCs by increasingly relying on press conferences following MPC decisions. The ECB acts a pioneer in this respect.

To shed light on the “what” of central bank communication, a variety of methodologies has been applied. We will discuss the following four approaches adopted in the literature so far: (1) specifying dummy variables to determine whether central bank communication is predominantly “dovish” or “hawkish;” (2) quantifying the tone and content of central banks’ verbal and written communications by collecting data on word frequencies (a convenient and intuitive way to communicate the resulting findings is via word clouds; for details, see below); (3) conducting surveys in which data from different groups of respondents, ranging from central bankers to the general public, are collected; and (4) analyzing central bank communication by examining the topics senior central bankers cover, e.g., in their speeches. In the following, we briefly summarize each approach.

The most convenient way to interpret the content of central bank communication is by reading central bank documents and assigning values ranging from, e.g., -1 to $+1$ to a variable in order to determine whether central banks’ messages are “dovish” (-1), neutral (0), or “hawkish” ($+1$). The coding need not be limited to the categories of “dovish” or “hawkish” or to the numerical interval between -1 and $+1$ in case finer distinctions seem more practicable (see, e.g., Balke and Petersen, 2002; Rosa, 2016; Ehrmann and Fratzscher, 2007; Hayo et al., 2015). An obvious concern is the possibility of human error when interpreting and/or numerically scoring the documents. To counter this possibility, several researchers may be tasked with assessing the same material prior to assigning values to the variables in question.

The “bag of words” approach analyzes the entire corpus of text and builds a dictionary of all words that convey some meaning about the content or tone of central bank communication. The methodology of this approach ranges from simple word counts to more sophisticated algorithms⁷ for more accurate analyses of the underlying data. An intuitive way to summarize the content of a given document is by using word clouds (see, e.g., Bholat et al., 2015; Hansen and McMahon, 2016). The “bag of words” approach is particularly useful for identifying the words used most frequently in a document, and hence the most relevant topics. At least two concerns emerge from this line of research, however. First, as pointed out by Loughran and McDonald (2011), developing a dictionary that is suited to the kind of language used in central bank publications can be challenging. Second, it may prove difficult to capture word combinations (e.g., high versus low unemployment or inflation) using word counts. Nevertheless, several studies have used this methodology (e.g., Bligh and Hess, 2007; Lombardi et al., 2019; Siklos, 2020).⁸

⁷ Algorithms range from open source algorithms to “black box” algorithms. For further details, see Schonhardt-Bailey (2013), Holmes (2014) and Siklos (2017, 2020).

⁸ To apply this methodology, the documents need to be preprocessed to remove “stop words” (e.g., “a,” “the,” “and”) from the corpus. While beyond the scope of this paper, another less explored issue pertains to the impact of texts that are translated into English from the central bank’s official language.

Other attempts to capture the tone or sentiment of central bank publications focus on the readability of documents. Clearly, any message published by central banks will require its recipients to have a certain level of understanding of monetary policy. Several studies have therefore relied on readability indicators,⁹ which are considered a function of education (e.g., Davis and Wynne, 2019).

Surveys may be more instructive to get a sense of the impact central bank communication may have on the public. As a case in point, the Eurobarometer survey, which has been conducted twice a year since 1999, asks respondents whether or not they trust the ECB (see, e.g., Ehrmann et al., 2013; Siklos, 2017, 215–217). A criticism of surveys is that the questions may be too general to allow for direct conclusions to be drawn between the aims of the survey and the effectiveness of communication strategies. While surveys on inflation expectations may help reveal to what extent central banks may drive expectations of the general public, it remains difficult to determine to what extent central banks' communication efforts – as opposed to their actions (e.g., interest rate changes) – may explain the findings (see, e.g., Coibion et al., 2020).

A more recent methodology recognizes that taking a closer look at the topics or themes covered in central bank communication may be just as illuminating as examining the words used.¹⁰ By estimating a probabilistic distribution of words over topics and, in addition, words over topics by type of document (e.g., minutes or speeches), one can further refine the assessment of central bank communication. Applications include Hansen et al. (2018), Jegadeesh and Wu (2017), Oshima and Matsubayashi (2018) as well as Siklos et al. (2018).

Undoubtedly, other methodologies, as well as combinations of existing ones, will be developed. One risk will remain, however. As central banks themselves engage in evaluating the content and tone of their communications, it is possible that the more emphasis we put on the quantification of communication, the fewer insights we may gain. In other words, Goodhart's law, applied to central bank communication, may come into play. Language is rich and complex, and central banks may not always find their communication efforts to be entirely successful. Finally, central banks are faced with the challenging task of adjusting communication strategies to both normal and crisis times – a critical ingredient in the success of a policy regime.

2 Data and descriptive statistics

To shed light on the role of central bank communication in monetary policy, we collected data on central bankers' speeches (i.a. through web scraping) from the BIS speech repository,¹¹ a global archive consisting of over 16,500 speeches dating back to 1996. We collected both the text (in PDF format) and the metadata of each speech, with the latter containing information on the speech's title, the speaker's

⁹ E.g., the Flesch-Kincaid grade level readability metric, the Gunning-Fog index, the Coleman-Liau index, the SMOG readability formula and other automated readability indices. See, for example, Deslongchamps (2018) and DuBay (2004).

¹⁰ Siklos and Bohl (2007) have been among the first to recognize the importance of topics, as opposed to words, in deciphering central bank communication.

¹¹ Available at: <https://www.bis.org/cbspeeches/index.htm>. The ECB also offers a speech dataset which is only available for a subsample of our study (euro area), however. For further information, see <https://www.ecb.europa.eu/press/key/date/2019/html/index.en.html>.

name and affiliation and the occasion at which the speech was delivered. Unfortunately, most of the metadata cannot be obtained through web scraping from the BIS website; rather, the metadata need to be extracted from the PDF files, which increases the probability of wrongly assigned speeches, since these files are not consistently formatted. Hence, we had to manually verify the speakers' affiliation, which led to a correction of about 10% of all speeches considered.

We then singled out speeches delivered by European central bankers from both euro area countries and non-euro area countries. The euro area countries were further divided into two blocks: euro area core countries (i.e. Austria, Belgium, Finland, France, Germany, the Netherlands and Sweden) and euro area periphery countries (i.e. Greece, Italy, Ireland, Malta, Portugal and Spain). Since it is a priori unclear to which block the “new” euro area member states (i.e. the countries that joined the euro area in or after 2007) belong, we created a third category: new euro area countries (i.e. Estonia, Latvia, Lithuania, Slovakia and Slovenia). The estimations made for the latter will reveal whether central bank representatives from these countries deliver speeches on topics comparable with those addressed in other regions. Malkin and Nechio (2012) previously used a similar approach to compare the conduct of monetary policy at the regional level within the euro area and the US.

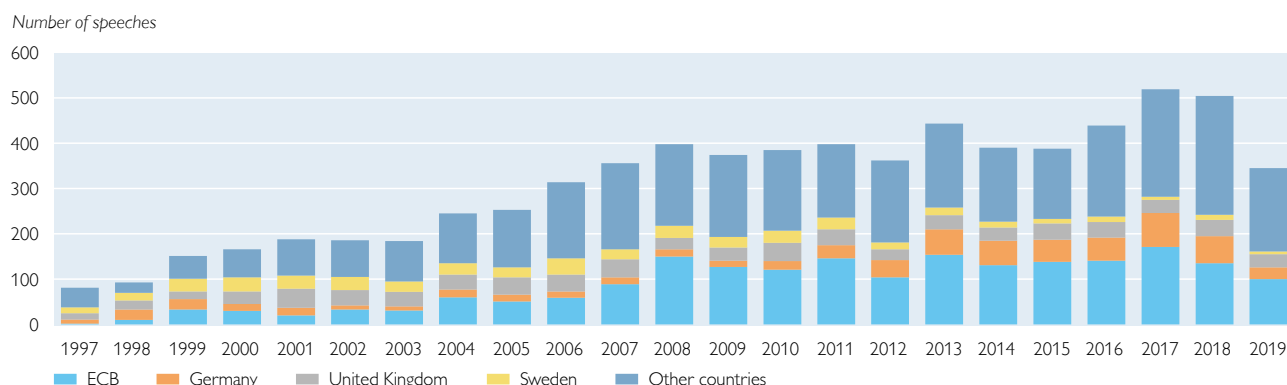
Next, we set up a fourth category – non-euro area countries – regrouping more advanced economies that do not belong to the euro area (i.e. Denmark, Iceland, Luxembourg, Norway, Switzerland and the UK). Last but not least, the fifth group comprises the CESEE countries, that is, emerging economies in Central, Eastern and Southeastern Europe (CESEE) that are not (yet) part of the euro area (i.e. Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Hungary, North Macedonia, Poland, Romania, Russia, Serbia, Ukraine and Turkey). The last group is quite heterogeneous, covering countries that are at different stages of development and differ in their economic size. Some of these countries have fixed, others have flexible, exchange rate regimes; some are in the process of adopting the euro, while others are candidate countries for EU membership.

Our analysis aims to identify whether the topics covered by central banks from non-euro area countries and CESEE differ from those covered by euro area countries' central banks, and, if so, in what ways. Most speeches of our dataset were delivered by ECB representatives (2,040 speeches over the sample period) and by central bank staff from euro area core countries (1,831) and non-euro area countries (1,579). The ECB is one of the largest central banks globally; the two regions mentioned before include the Deutsche Bundesbank and the Bank of England. Central banks from euro area periphery countries follow with 962 speeches and CESEE central banks with 705. Central bank staff from new euro area countries contributed 53 speeches. This adds up to a total of 7,170 speeches delivered by ECB staff and by central bankers from the regions listed above. Chart 1 displays the number of speeches per year, highlighting those countries whose central bank representatives delivered more than 35 speeches in any given year from 1997 to 2019.

As can be seen in chart 1, the number of central bank speeches rose steadily, particularly after crisis events. Central bankers saw a need to communicate more often with the public after 2007, 2012 and 2016. During the global financial crisis of 2008/2009, central bankers had to explain more frequently newly implemented

Chart 1

Number of central bank speeches over time



Source: Authors' calculations.

monetary policy measures, such as quantitative easing or other forms of unconventional monetary policy. In 2012, Deutsche Bundesbank staff delivered more speeches than in the years before. In 2017, the number of speeches given by Deutsche Bundesbank and ECB staff increased markedly. A considerable number of speeches were devoted to economic challenges including the architecture of monetary policy and banking regulation in Europe. The correlation between the number of speeches and economic uncertainty can also be assessed by adopting a more empirical approach. When using the economic policy uncertainty index for Europe,¹² the correlation between economic policy uncertainty and the number of speeches per month over the sample period is about 0.5, with the largest spikes in uncertainty occurring in 2008, 2012 and late 2016. This finding suggests that central banks communicate more during times of financial stress or, more generally, heightened uncertainty.

The regional distribution of central bank speeches is displayed in chart 2. For the sake of brevity and due to the small number of speeches, new euro area countries are not shown.

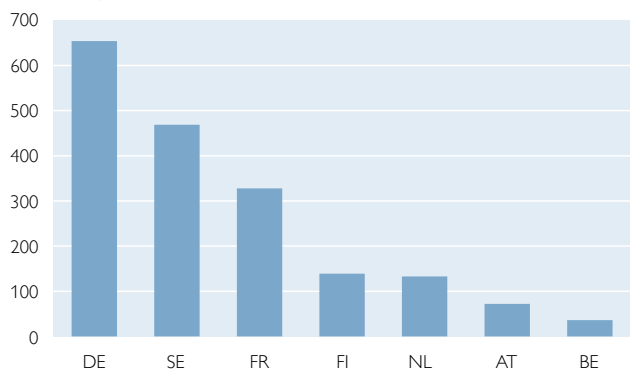
¹² Available at www.policyuncertainty.com.

Chart 2

Number of central bank speeches by country in selected European regions

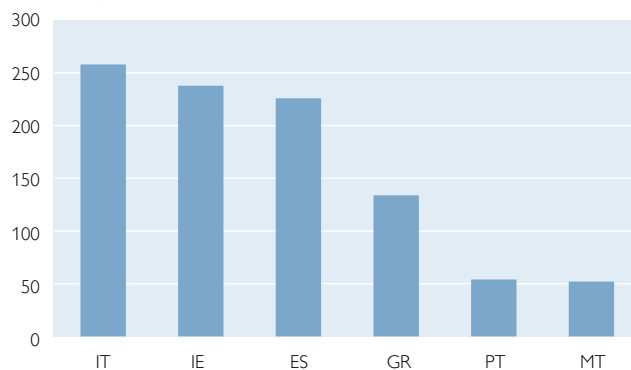
Euro area core countries

Number of speeches



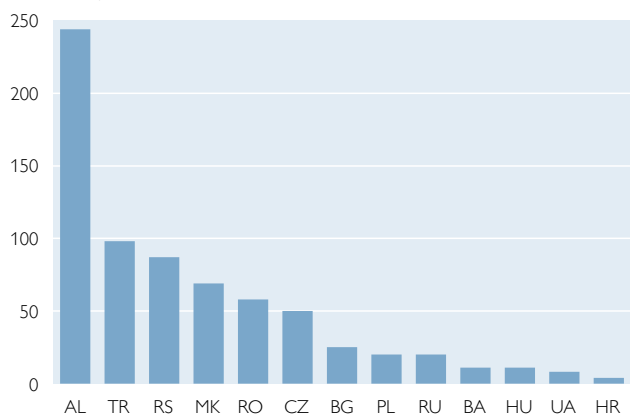
Euro area periphery countries

Number of speeches



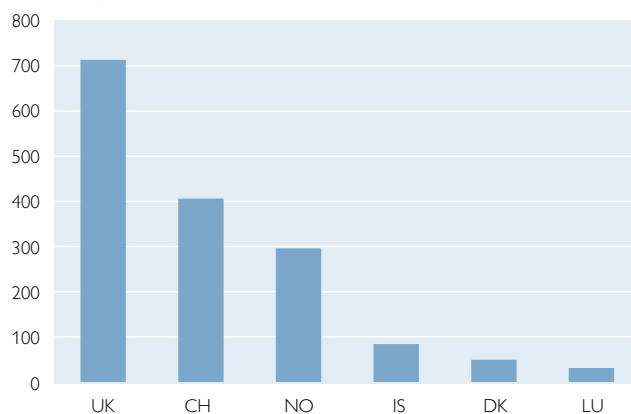
CESEE countries

Number of speeches



Non-euro area countries

Number of speeches



Source: Authors' calculations.

Chart 2 reveals two very active central banks whose representatives delivered some 700 speeches, respectively, over the sample period – the Deutsche Bundesbank among the central banks of euro area core countries and the Bank of England as part of the central banks of non-euro area countries. The Sveriges Riksbank and the Schweizerische Nationalbank come in third and fourth with more than 400 speeches each. These simple descriptive statistics tell us that the frequency of communication need not depend on the (economic) size of a country, nor on whether the country pursues an independent monetary policy or is part of a monetary union. Looking at the CESEE region, our data show that the Bank of Albania frequently communicates with the public, while other central banks from the CESEE region lag far behind. Speeches delivered by central bank staff from non-euro area member states, such as Bulgaria, Croatia, Czechia, Hungary and Poland, are far less frequent. Again, our findings show that the number of speeches does not correlate with the size of the economy. Rather, the frequency of communication seems to be driven by differences in central banks' overall views on economic conditions.

However, there is also a common factor that may influence the number of and topics covered in speeches, namely the state of the business cycle. It is fairly straightforward to quantify the extent to which business cycles in the regions considered are synchronous. The indicator used to this effect is based on a technique originally proposed by Bry and Boschan (1971) as well as Harding and Pagan (2002), according to which we identify and quantify turning points in series such as real GDP. This approach relies on observable economic performance, while closely mimicking the methodology used by the National Bureau of Economic Research (NBER).¹³ Next, we combine the cross-country estimates by asking how often the indicator sends the same signal about overall economic conditions. The resulting indicator ranges between 0 and 1, with 1 representing complete business cycle synchronicity.¹⁴ Our results indicate that the global financial crisis developed into a recession in all regions reviewed in this paper. The euro area sovereign debt crisis, by contrast, emerged as a recession period in the euro area only, but not in the other regions analyzed, including CESEE.

3 Methodological framework

Automated textual analysis has a long tradition in the social sciences (Gentzkow et al., 2019) of evaluating, e.g., partisanship in political debates, analyzing consumer sentiment or quantifying contents by topic for a collection of text documents. To perform such a content analysis, researchers often use so-called topic models. Intuitively, given that each document is about a particular topic, one would expect certain terms to appear more often in a given document than others. The most prominent topic model is the Latent Dirichlet Allocation (LDA), a generative statistical model. It assumes (1) that each text document potentially covers not only a single topic, but a larger number of a priori unknown topics (think of “themes” such as economic growth or financial crises), and (2) that each topic is defined by how often specific sets of words occur (e.g., in connection with the topic “financial crisis,” the words “bankruptcy” or “debt” are likely to occur more often; see Blei et al., 2003). For the purposes of our analysis, we use structural topic models (STMs; see Roberts et al., 2016). STMs extend LDA models in two ways: first, by allowing the occurrence (“prevalence” in the following) of topics in documents to depend on document-specific covariates such as the documents’ time stamp; second, by taking into account that the distribution of words in the vocabulary of a given topic might also depend on external covariates such as metadata (including, e.g., the author of the document). In the context of central banking, this would allow for a comparison of texts on a certain topic in which the authors adopted either a “hawkish” or “dovish” tone. Still, as with LDA models, the underlying assumption of STMs is that every document can be represented by a statistical mix of topics and that each topic can be described by a distribution of words.

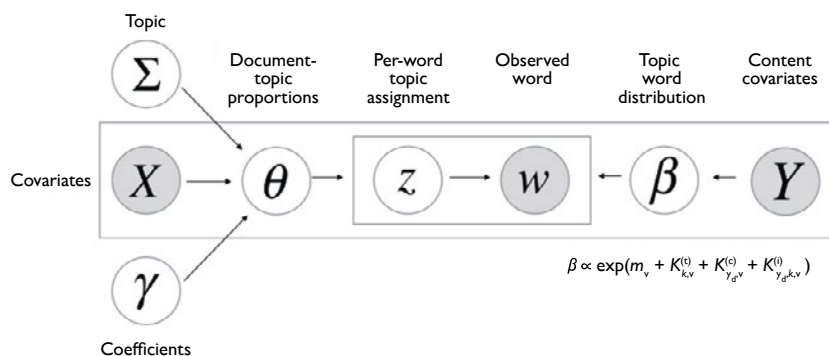
More formally, an STM can be divided into three components: (1) a *topic prevalence model*, which controls how words are allocated to topics as a function of covariates; (2) a *topical content model*, which controls the frequency of the terms in

¹³ The similarity between the Bry-Boschan algorithm and NBER business cycle chronologies is considered a strength of the approach adopted in this paper and helps explain its wide applicability in dating business cycles.

¹⁴ Estimates are combined using a “wiring ratio,” defined as the frequency with which two (or more) business cycle chronologies generate the same signal of a downturn in economic activity. For further details, see, e.g., Berge (2012).

Figure 1

Graphical representation of a structural topic model



Source: Roberts et al. (2016).

each topic as a function of covariates; and (3) a *language model*, which combines (1) and (2) to model the words in each document.

Figure 1 illustrates the data generating process of an STM using plate notation (see Roberts et al., 2016). Each document d can cover multiple topics, which is indicated by the topical prevalence parameter θ_d . If we denote the number of different topics by K , θ_d is a $K \times 1$ dimensional vector and sums up to unity. θ_d may depend on document-level covariates X_d , which is modeled by $\theta_d \sim \text{LogisticNormal}_{K-1}(\Gamma'x_d, \Sigma)$, and $\Gamma = [\gamma_1 | \dots | \gamma_K]$ is a matrix of coefficients for the topic prevalence model, which is used to estimate θ_d . For our purposes, we solely use the date of the speech as well as the country of the speaker's affiliation as determinants of topical prevalence (i.e. X_d). Those single γ_K are usually drawn from a multivariate normal distribution. Σ denotes the variance-covariance matrix of the topic proportions. In this paper, we use a simplified STM, which does not allow us to model the distribution of words for a topic as a function of covariates (i.e. Y). Given θ_d , we draw for each word in a document a topic z from a K -dimensional multinomial distribution, i.e. $z \sim \text{Multinomial}(\theta_d)$. Finally, we draw a word w conditional on the topic assignment z from the appropriate distribution over terms depending on β : $w \sim \text{Multinomial}_V(\beta_d)$.

4 Results

In a first step, we fit the STM to the 7,170 speeches contained in our sample. We opt for a pragmatic approach to fix the maximum number of topics fitting STMs, which comes to 3, 5, 10, 15 or 20 topics (Krippendorff, 2013). To be able to interpret the final set of topics, we examine the characteristics of every topic in two ways. First, we create word clouds that represent the words used most frequently in connection with certain topics. The more frequent a word appears in our data, the bigger it will become. Thus, by looking at the clouds in figure 2, we can identify the big words and hence the top topics. Second, we manually analyze those speeches that were assigned, with high probability, to the respective topics.

Word cloud 1, which represents topic 1 covers structural economic policies, economic growth as well as monetary and economic integration. In the speeches

Topic 2



Topic 4



that were, to a high degree, assigned to topic 1 central bankers talk about the introduction of the euro or euro area enlargement. Examples include Mario Draghi's (ECB) statement about stability and prosperity in Monetary Union (January 2, 2015), Jean-Claude Trichet's (ECB) speeches on the introduction of the euro in Slovakia (January 8, 2009) and the enlargement of the euro area (January 15, 2007), as well as Willem Duisenberg's (ECB) address on the coordination of structural policies in Europe (May 9, 2003). Topic 2 is defined by inflation, inflation expectations, price stability and monetary policy. Many speeches that belong, with a high probability, to this topic are about monetary policy tools, such as forward guidance or quantitative easing, and, more generally, about central banking in a low interest rate environment. Central banks in Europe implemented these

policies with the aim of raising inflation. Typical speeches comprise Peter Praet's (ECB) speech on the assessment of quantitative easing and challenges of policy normalization (March 14, 2018) as well as his statement on forward guidance and the ECB (August 6, 2013), Benoît Cœuré's (ECB) speech on the usefulness of forward guidance (September 26, 2013), and Philip R. Lane's (Central Bank of Ireland) remarks on the macroeconomics of price and wage-setting (June 19, 2018). For topic 3, we find speeches that deal with financial stability risks as well as the banking sector and banking regulation, such as speeches by Benoît Cœuré (ECB) on central counterparty recovery and resolution (November 24, 2014), Luis M. Linde (Banco de España) on new challenges for a new era (November 26, 2015), Andreas Dombret (Deutsche Bundesbank) on systemic risks of shadow banking (August 20, 2013), and Andrew Gracie (Bank of England) on making resolution work in Europe and beyond – the case for gone concern loss absorbing capacity (July 17, 2014). Topic 4 consists of “outside the box” content, i.e. speeches related to technological innovation, education and other issues not directly associated with the remit of central banks. Exemplary speeches include Andrew Haldane's (Bank of England) remarks on the diversity project, i.e. reflections on the lack of diversity in financial services (November 8, 2016), his speech on the creative economy (November 2, 2018), as well as Krzysztof Rybiński's (National Bank of Poland) address on a day in the life of Homo Sapiens Globalus (September 21, 2006). The findings are summarized in table 1.¹⁵

Our analysis also allows us to assess how frequently central bankers address each of the four topics in their speeches over time. This is displayed in chart 3, with topic prevalence ranging from 0 to 1.

Table 1

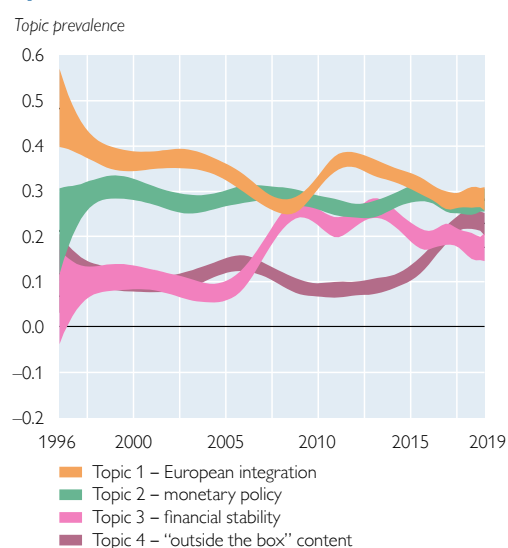
Topics covered in central bank speeches

Nr.	Topics
1	Economic integration and structural policy
2	Monetary policy and price stability
3	Financial stability, financial stability risks, banking sector and banking regulation
4	“Outside the box” content, including education, creativity, the economy of the future and payment systems

Source: Authors' compilations.

Chart 3

Topic prevalence in central bank speeches over time



Source: Authors' calculations.

Note: The width of the bands displays the 95% confidence intervals.

¹⁵ Our sample also yielded a fifth, residual topic which is ignored in our analysis.

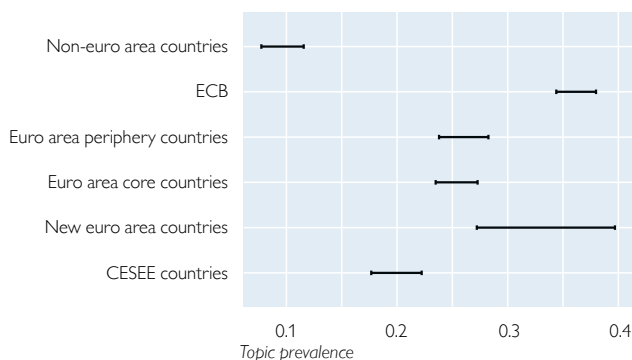
Chart 3 shows some striking differences in topic prevalence over time. Topic 1 – European integration – was the subject of many central bankers’ speeches in the early 1990s and in the run-up to monetary union. With the mid-2000s, a declining trend in the proportion of speeches addressing economic integration set in; this trend reversed with the onset of the euro area sovereign debt crisis and when talk of a euro area break-up emerged. Topic 2 – monetary policy – is much more time-invariant over our sample period, while topic 3 – financial stability – gained a certain momentum with the onset of the global financial crisis. Topic 4 has received more coverage in recent years, which could imply that central bankers increasingly addressed issues beyond their usual remit toward the end of the sample.

We furthermore analyze whether there are substantive differences in topic prevalence across central banks, examining, e.g., where CESEE central banks and their euro area peers differ. We do this in chart 4, which shows the distribution of topics covered in central bank speeches by region. Even though some countries in the CESEE region are in the process of adopting the euro, chart 4 indicates that CESEE central banks talk comparatively seldom about European integration (topic 1). The leading central banks in this respect are the ECB and national euro area central banks. Monetary policy (topic 2) dominates in speeches delivered by ECB staff, which is also due to new forms of monetary policy implemented since 2008. CESEE central banks do not differ from their peers in euro area core countries, nor from their peers outside the euro area as regards the coverage of monetary policy in their speeches. Interestingly, within the euro area, central bank communication in euro area periphery countries is less geared toward monetary policy and price stability. Financial stability (topic 3) features most frequently in speeches given by central bankers from euro area periphery countries, such as Spain and Greece, which experienced particularly strong booms in their housing markets. Moreover, their banks came under severe pressure during the euro area sovereign debt crisis, which might explain why this topic became a particular focus. Central banks from other regions, including the CESEE region, devote about the same proportion of their speeches to financial stability. When turning to “outside the box” content (topic 4), we see some striking cross-regional differences. “Outside the box” content is very prominent in speeches by central bank staff from CESEE and non-euro area countries as well as from new euro area member states. The latter are made up of CESEE countries that adopted the euro during our sample period. “Outside the box” content is of lesser concern to the ECB, which thus suggests that the range of topics central bankers talk about is broader in the CESEE region and more narrowly defined at the ECB level.

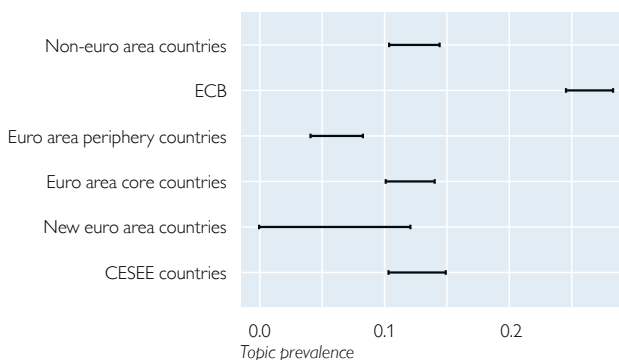
Chart 4

Topic prevalence in central bank speeches by selected European regions

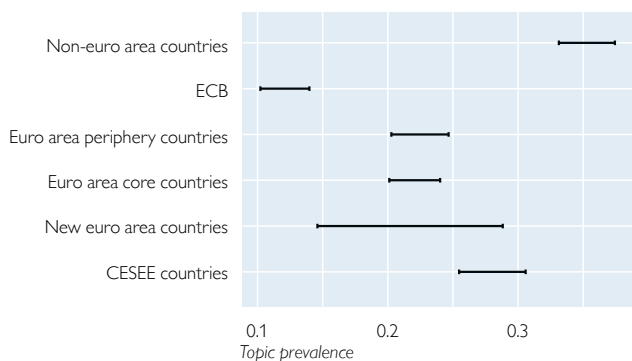
Topic 1



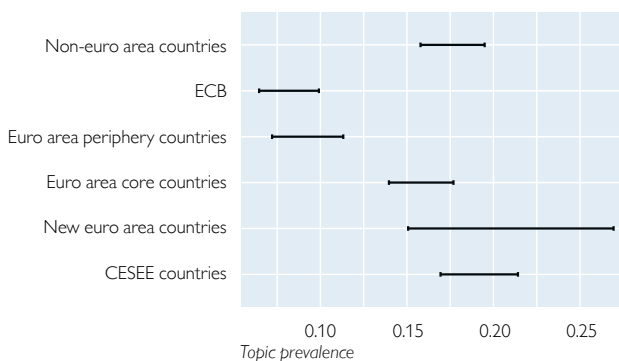
Topic 2



Topic 3



Topic 4



Source: Authors' calculations.

Note: The graphs show the 95% credible interval of topic prevalence by region.

For the CESEE region, we further break down the distribution of topics to the country level, with table 2 displaying the mean distribution of topics by CESEE country.

Structural convergence and European integration (topic 1) are addressed in speeches by central bank staff from two countries that are in the process of euro adoption, namely Bulgaria and Croatia, as well as by central bankers from Bosnia and Herzegovina and Romania. In some of these countries, financial stability (topic 3) also plays an important role, with the share of speeches addressing financial stability exceeding 30% in Bosnia and Herzegovina as well as in Bulgaria. Financial stability also accounts for the lion's share of speeches delivered by central bankers from Albania and Russia. Monetary policy and price stability (topic 2) are particularly important in Turkey. Here, the mean probability of topic assignment comes to about 25%, which might be explained by the historically high rate of inflation witnessed in the country. With the exception of Russia and Turkey, a surprisingly high number of central bank speeches in all CESEE countries was assigned to "outside the box" content (topic 4). Exploring the reasons for the relative importance of topic 4 seen in the data (e.g., monetary policy strategy reviews or societal pressures) might be an interesting avenue for future study, especially since many central banks have taken on additional responsibilities since the global financial crisis (e.g., in the realm of financial stability and digitalization).

Central bank communication is about explaining to the public the actions taken by central banks which have increasingly come to affect certain areas of public life in recent years. That said, and with interest rates remaining the principal instrument of policy, the general public follows with interest the decisions taken by central banks. Nevertheless, in an era of historically low and unchanged policy rates over long periods of time, communication serves as a means to guide expectations regarding the stance of monetary policy. In academic and policy circles, the stance of central banks may, i.a., be assessed by applying policy rules which seek to describe the interest rate-setting behavior of monetary policy committees. The best-known rule is associated with John Taylor (1999).

If communication serves to manage expectations and explain why central banks act by changing the policy rate, differences between the actual policy rate and the one predicted by a policy rule might indicate, e.g., the relative importance of the topic “inflation.” Of course, one has to bear in mind that all policy rules include unobservable variables subject to considerable disagreement. Nevertheless, central bankers themselves have, for a long time, used the Taylor rule as a communication tool. Poole (1999) was among the first to do so; many others have followed since. Chart 5 plots the ECB’s policy rate against a range of policy rates predicted by the Taylor rule. This is repeated for the CESEE countries (not shown in chart 5).¹⁶ The resulting findings show that financial stability concerns have become far more important since the global financial crisis and the euro area sovereign debt crisis, which may be reflected in more persistent deviations from the Taylor rule prescription as central banks adhere less to such rules. Turning to the CESEE countries, we find that the heterogeneity in the policy rates implied by the Taylor rule is much larger than that observed for the euro area core countries, particularly around the peak of the euro area sovereign debt crisis. This heterogeneity is also reflected in the topics covered in speeches by central bankers from the CESEE region (see table 2). Otherwise, the policy rates observed for the CESEE countries hew fairly closely to the median policy rates advocated by the Taylor rule, perhaps mirroring the efforts of central bankers in the region to follow best practice in the conduct of monetary policy which covers a wide variety of aspects.

Table 2

Topic prevalence in central bank speeches by CESEE country

Country	Topic 1	Topic 2	Topic 3	Topic 4
Albania	0.10	0.13	0.28	0.22
Bosnia and Herzegovina	0.28	0.05	0.30	0.26
Bulgaria	0.26	0.05	0.40	0.25
Croatia	0.31	0.11	0.09	0.35
Czechia	0.21	0.15	0.14	0.43
Hungary	0.23	0.18	0.19	0.23
North Macedonia	0.19	0.10	0.25	0.29
Poland	0.17	0.13	0.09	0.39
Romania	0.31	0.10	0.15	0.30
Russia	0.04	0.13	0.27	0.13
Serbia	0.15	0.08	0.20	0.29
Ukraine	0.04	0.17	0.11	0.33
Turkey	0.10	0.25	0.21	0.12

Source: Authors' calculations.

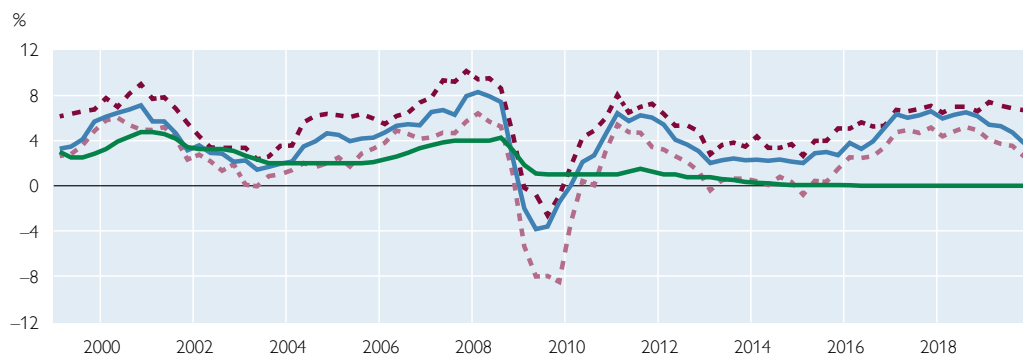
Note: The table shows the probability of topic assignment (θ), averaged over documents per central bank. The highest mean probability per central bank is marked in bold.

¹⁶ We also estimated many variants for other regions and for individual countries of our dataset. As space limitations do not allow for a full discussion of the resulting findings, please see the annex for additional information.

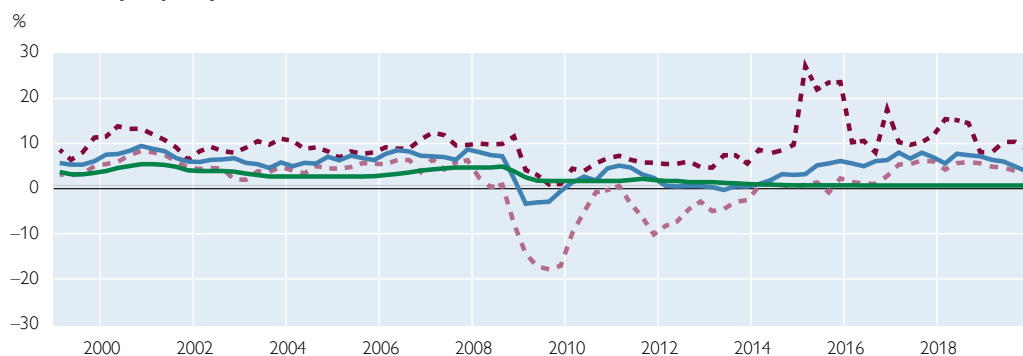
Chart 5

Taylor rule by selected European regions

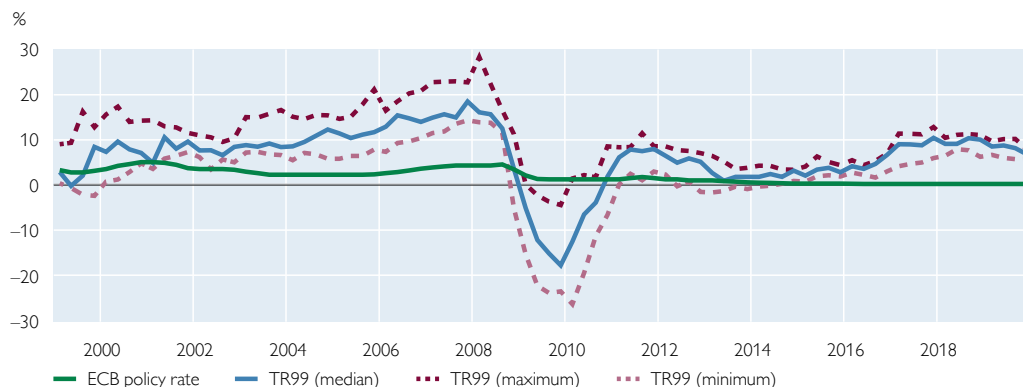
Euro area core countries



Euro area periphery countries



New euro area countries



Source: Authors' calculations.

Note: Individual country estimates are based on a modification of the standard Taylor rule (TR99; Taylor 1999). A version augmenting the Taylor rule with the rate of change of the real exchange rate is also considered. The range of estimates and the median across all estimates are captured by the TR99-implied maximum, minimum and median policy rate. The ECB's policy rate reflects the official EONIA rate. For further details, see the annex.

5 Conclusions

Speeches are an important tool for central bankers to communicate with the public. In our paper, we fit topic models to central bankers' speeches collected by the BIS over the period from 1996 to 2019. Our analysis reveals that central banks mainly focus on four topics: (1) European integration, (2) monetary policy, (3) financial stability, and (4) "outside the box" content, subsuming a broad range of subtopics

often discussed at academic conferences. We find that some of these four topics were regularly addressed by central bankers in Europe over our sample period, while others gained momentum as a result of certain economic events. Naturally, there is always a certain proportion of central bank speeches that deal with monetary policy proper. Speeches on economic integration and structural policies figured prominently before the establishment of the euro area and then dropped off in numbers, before regaining some momentum in the aftermath of the euro area sovereign debt crisis. Unsurprisingly, the global financial crisis triggered a surge in speeches on financial stability.

Moreover, we find that the frequency of communication across central banks is unrelated to the size of the underlying economy. Both the Schweizerische Nationalbank and the Bank of Albania, for example, are very active compared to their European counterparts despite their country's small population. Communication frequency does not depend on the monetary regime either: Some central banks that are part of the euro area contribute to the same extent as other central banks that pursue their own, independent monetary policy. Rather, it appears that the frequency of delivering speeches is part of a central bank's overall monetary policy strategy.

Finally, we delve deeper into the regional distribution of speech topics, putting a particular focus on the CESEE region. Our findings suggest that the ECB, CESEE central banks and other non-euro area central banks devote much of their communication to issues related directly to monetary policy and price stability. Speeches given by ECB staff and central bankers from euro area countries also frequently address issues related to European integration and monetary union enlargement. Central bankers from the CESEE region, by contrast, address these topics very rarely, with the exception of central bank staff from countries in the process of adopting the euro. Modern central banking, with fairly autonomous institutions, is a far more recent experience in most CESEE countries. Hence, central banks in the region are seen to cover a wider array of topics than their euro area counterparts, perhaps as a means of educating policymakers and the general public about the role and influence of monetary policy.

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Annex

Table A1

Measuring deviations from the Taylor rule

Country/region	Mean deviation (full sample)	Mean deviation (recessions)	
	%		
Switzerland	-2.44 -2.58	-2.04 -3.61	39
Germany	-2.20 -2.33	-1.72 -2.63	44
Spain	-2.65 -2.94	-1.91 -3.25	36
France	-1.94 -2.24	-1.93 -1.92	37
United Kingdom	-1.86 -1.71	-1.76 1.13	27
Ireland	-3.71 -3.73	-2.27 -3.02	37
Italy	-1.92 -2.09	-1.92 -2.26	35
Netherlands	-2.46 -2.70	-2.20 -3.34	39
Norway	-2.79 -2.69	-2.73 -3.13	38
Sweden	-1.52 -1.80	-0.73 -1.49	32
Euro area countries	-2.29 -2.54	-2.01 -2.68	34
New euro area countries	-4.62 -4.38	-4.04 -7.27	7
Non-euro area countries	-3.01 -3.08	-2.16 -0.58	7
Euro area core countries	-2.17 -2.46	-0.59 -1.65	15
Euro area periphery countries	-2.72 -2.98	0.88 -2.12	8
CESEE countries	-3.07 NA	NA NA	NA
Euro area (shadow policy rate)	-0.89	-1.07	34
United Kingdom (shadow policy rate)	-0.64	-0.46	27

Source: Authors' calculations.

Note: Deviations refer to the difference between actual policy rates and those prescribed by the Taylor rule (Taylor, 1999) as specified below. To ensure comparability of findings, we used OECD recession dates for the sample period from Q4 1996 to Q4 2019. Data are quarterly. For the regions listed in the table, recessions are the intersection of recession dates registered in the individual countries of each region. The last two lines refer to the mean difference between observed policy rates and Krippner's estimates of shadow policy rates (Krippner, 2013). Estimates of the output and real exchange rate gaps (see below) are means of three proxies: H-P filter, Hamilton filter, and annualized growth rates. Estimates of the inflation objective (see below) represent the trend from the Hamilton filter or the H-P filter. The results shown in table A1 are for the H-P filter. Results for the Hamilton filter are very similar. The Taylor rules are:

$$i_t = 2 + \pi_t + 0.5(\pi_t - \pi_t^*) + \tilde{y}_t$$

$$i_t = 2 + \pi_t + 0.5(\pi_t - \pi_t^*) + \tilde{y}_t + \tilde{\varepsilon}_t$$

where i is the prescribed policy rate, π actual inflation, and π^* the central bank's inflation objective, and where \tilde{y} , $\tilde{\varepsilon}$ are the estimates of the output gap and the real exchange rate gap, respectively. A negative deviation means that the observed policy rate is, on average, below the Taylor rule prescription. Please note that the real exchange rate version of the Taylor rule could not be estimated for Albania, North Macedonia and Serbia as the data were either not available or based on too few observations. NA means not applicable; series were unavailable.