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Monetary policy; text-based ideal point model; central bankers' speeches.

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Cacophony in Central Banking? Evidence from euro area speeches on monetary policy*

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Transparent communication is a prerequisite for delivering an effective monetary policy. In this paper, we examine over 3000 speeches from central bankers to investigate the topics euro area national banks and the ECB most frequently talk about. Text-based ideal point analysis enables us to estimate for each central bank a measure of its ideological position, which is based on differences in the tone they use to talk about the identified topics. As far as we are aware this methodology has not been applied in the present context. Our results are fourthfold: Firstly, price stability and financial stability communication lie at the core of central bank communication in the euro area. Second, the ECB's ideal points tend to lie systematically above that of other euro area national banks, which suggests differing outstanding, ideological position. This implies that we cannot think of the ECB's ideal point as being formed by the ideological positions of its member states. Third, we observe variability in member states' ideal points over time, whereas the ECB's ideal point is rather stable. The latter finding suggests remarkable consistency in the ECB's communication strategy through both normal and crisis times. Finally, in a VAR setting, we find that changes in ideological positions impact longer-run macroeconomic expectations.

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"The cacophony problem on monetary policy committees will not go away soon." Blinder (2018)

1 Introduction

The analysis of texts has evolved to the point where content can be used to discern the position of someone who delivers a speech along a range of potential positions.[1] This is particularly helpful when voting data, where the votes are known and hence the individuals in question take a position on an issue or in an election, are unavailable. An important implication is that this kind of approach significantly broadens our understanding of texts as data. For example, the usual dichotomy between hawks and doves is often used to characterize, in the case of monetary policy, whether central bankers in a monetary policy committee lean towards tightening or loosening the stance of policy. However, this is inherently limiting since the range of opinions likely goes well beyond the corner solutions of hawks and doves. In part because the data requirements are much greater and the models more complex, this type of analysis of electronic texts has attracted the attention of data scientists.

Until fairly recently, identification of positions was made easier when voting data, for or against a position, are available. For example, Eijffinger et al. (2019) use ideal point analysis to explore the voting behavior of the Riksbank's monetary policy committee (MPC). Voting in favor of a position (e.g., tighten policy) takes place if it shifts policy toward to their most preferred (i.e., ideal) policy. Hence, the notion of 'hawk' versus 'doves' can be inferred from voting patterns. Until recently, ideal points could not be identified from texts. Vafa et al. (2020) propose text-based ideal point analysis (TBIP) which allows the researcher to evaluate the position of central bankers along a range when votes are not available. As discussed in greater detail below, it is a particularly appealing approach to study the communication of monetary policy in the euro area in part since neither the governing council nor the wider committee publish voting records.

Compared to estimating ideological positions of texts, content analysis tries to decompose texts by exploiting the co-occurrence patterns of terms within documents. Latent Dirichlet Allocations (LDA, Blei et al., 2003; Hansen and McMahon, 2016) became the workhorse within the class of topic models which try to quantify the content of text documents. The basic idea of those models is that they assume each document is a mixture of different topics and that each topic is characterized by its own prob-

[1] In the psychology, medical, and political science fields, automated textual analysis has a long tradition. This kind of methodology was used to identify partisanship in political discussions (Gentzkow et al., 2019) or to study the effects of political slant (see Gentzkow and Shapiro, 2010). Laver et al. (2003) created Wordscores which uses pre-defined reference texts to estimate political party positions. Slapin and Proksch (2008) extend Wordscore. The result is Wordfish, a Poisson scaling model of document positions, which does not require the use of reference texts. Economists have also used these methodologies to study the texts generated by central banks (e.g., see Siklos, 2020, and references therein).

abilistic distribution of terms. Therefore, LDA is a powerful generative hierarchical model for clustering words into topics and representing documents as mixtures of topics. However, it does have a serious limitation in the quest to understand the (latent) ideological position taken by a speaker. In particular, LDA treats topics in a text as independent of each other, clearly an unappealing assumption.

Instead, Vafa et al. (2020) set out to *combine* both branches of the literature, namely the scoring methods from political science and the computer science driven topic model approach. They propose TBIP which is able to identify for each estimated topic the ideological position of an author. As in topic models, the TBIP finds latent topics. In addition, the TBIP model also allows for intensity values that describe how the wording changes as a function of the (ideological) position of the author. This is an especially interesting advance for the study of monetary policy since, in the case of central bank speeches, the object of our study, the number of potential authors is large, it changes over time, as does the vocabulary and, given the strong desire of central bankers to demonstrate consensus in Monetary Policy Committee (MPC) meetings, this approach can better reveal how this process can shape or change opinions over time.[2]

We examine more than 3000 speeches by central bankers in the EA and evaluate their positions along several topics most directly relevant for understanding the conduct of monetary policy. Next, we examine the distance between the position of the ECB, which carries out monetary policy decided by the Executive Board, and those of central bankers at EA national central banks. We conclude that the insight of Blinder (2004) about the likelihood of 'cacophony' in central bank communication, a phenomenon that emerges because of the sheer number and variety of speech content, can be identified and its size quantified. Nevertheless, a convergence of sorts begins to emerge after the Euro Area sovereign debt crisis (ESDC). This convergence takes place across all the national central banks of the EA. That is, both core (e.g., France, Germany) and peripheral (e.g., Greece, Ireland) national central banks begin to speak, if not with one voice, but with less disagreement than in the early years of the single currency area.

Other authors have also noted the potential for cacophony (e.g., Lustenberger and Rossi, 2017). However, their findings are not based on a formal attempt to quantify how disparate the voices are that speak about monetary policy in the EA. And although we cannot determine whether the cacophony is economically harmful or increases the biases in economic forecasts, they do reflect the fact that, since the future is uncertain, differences of opinion reflect differences in ideology and in the differing economic prospects faced by individual member states of the EA, at least in the case of the data used in this study.

Ours is the first study to identify differences in ideological positions about monetary policy and financial stability between the ECB and the national, central banks

[2]According to Leonard (2022), Bernanke, when he was Chair of the FOMC, believed consensus was important. Vocal dissent was deemed to be akin to a show of disloyalty. Bernanke (2020) also places great importance on consensus, especially during crisis periods.

that constitute the Governing Council. These differences are also found to have economic implications since, in an empirical exercise, we find that changes in ideological positions impact macroeconomic expectations.

The rest of the paper is organized as follows. The next section summarizes the relevant literature that identifies central bank positions about the conduct of monetary policy. The oft-mentioned distinction between hawks and doves is relevant, although other elements of the literature on central bank communication are also touched upon. The data are introduced and described in section 3. Section 4 outlines the TBIP methodology while section 5 presents and discusses the results. Section 6 concludes with the suggestion that following from the lessons learned according to Blinder et al. (2008), namely that disagreement within central banks is a sign of healthy discourse and should make the public more, not less attentive, thereby offsetting the theoretical possibility (see Morris and Shin, 2005) that markets and individuals will excessively rely on central banks' views about the economic outlook.

2 Central banks and the conduct and communication of monetary policy

Topic modeling has considerably grown in popularity in recent years. Several variations of topic modeling exist nowadays, including correlated topic models (see Blei and Lafferty, 2007), or structural topic models (STMs) developed by Roberts et al. (2016). STMs extend the class of topic models by allowing for additional explanatory covariates to govern both the topical prevalence as well as the topical content. An application to central banking is Bohl et al. (2022) who use STM to determine the extent to which the mandate of a central bank constrains the content of speeches given by members of the Fed's FOMC and the ECB's Executive Board. More importantly perhaps, STM models relax the strong assumption of independence of topics made in LDA modelling. This assumption is easily violated in texts of the kind produced by central banks where, for example, matters dealing with monetary policy cannot be easily divorced from financial stability concerns or the stance of monetary policy from past and expected inflation.

By the late 1990s, central banks around the world made policy rate decisions in a committee type setting (hereafter referred to as the monetary policy committee or MPC). Since the size, composition, and voting processes used to render decisions is heterogeneous (e.g., see Maier, 2010) there is understandably considerable interest in a committee's actual decision which generally rests on a majority voting rule. That said, the committee chair, ordinarily the Governor or President of the central bank, is often treated as 'primus inter pares' and therefore can cast the deciding vote or influence the majority opinion (e.g., see El-Shagi and Jung, 2015; Ball, 2016).[3]

[3]Part of the reason is that the Governor is usually the individual who makes the motion to change, or not, the stance of policy. A separate area of study has focused on the optimal size and governance of committee decision-making. Committees can give rise to free riders who, depending on voting rules, follow the majority, "swingers", namely committee members that shift between different majority

More generally, policy analysts, academics and other outside observers have been keenly interested in any bias or policy leanings inside MPCs. Biases can originate from a variety of sources. A non-exhaustive list includes: regional bias (Jung and Latsos, 2015), in the case of the ECB, a country-specific bias (e.g., see Heinemann and Huefner, 2004; Bennani and Neuenkirch, 2017), or an ideological bias stemming perhaps from career aspirations or education (e.g., see Hüser, 2014). There is also the potential for a political bias due to the process by which MPC appointments are made, or biases that originate from the manner in which policy rate proposals are voted on (e.g., Riboni and Ruge-Murcia, 2010). A central bank's monetary policy strategy can also generate a bias perhaps because the MPC is accountable for a single objective (i.e., inflation) or must adhere to a dual objective (i.e., inflation and unemployment), or because an MPC members' own experience with inflation matters (e.g., see Malmendier and Nagel, 2016).

There is at least one more type of bias that can be added to the foregoing list. Indeed, it is one that is critical for our study. There can be an institutional bias that reflects the consensus or majority view of the central bank as opposed to the biases that individual MPC members can project via speeches or other forms of communication. In the case of institutional forms of bias this can be seen from the variety of forms of communication that central banks produce, including inflation reports, press releases, minutes of MPC meetings, monetary policy and financial stability reports, news conferences and, most recently, social media. In the case of individual MPC members, speeches arguably provide the most effective way of identifying individual MPC members‘ preferences and policy inclinations. Both are worthy subjects of research although the present paper focuses on the later form of communication.[4]

MPC members who want to tighten, or are primarily concerned about inflationary developments, are usually referred to as hawks while those who recommend policy easing, and are swayed by real economic conditions, are called doves. However, there is no agreed upon metric or consensus about how best to identify hawks or doves. Other than a smaller literature that considers, for example, whether central bankers express optimism or pessimism about the outlook (e.g., see Madigan and York, 2020), or the simplicity or complexity of central bank communication (e.g., see Siklos et al., 2018), much of the effort has focused on establishing the evolution of hawkish versus dovish attitudes of central bank decision makers. The bottom line is that the hawks and doves distinction risks over-simplifying the ideological position

groups over time, or "pigeons" who are members that may be difficult to classify when using binary categorizations of committee membership (e.g., hawks and doves; see below). Committees also create the risk of groupthink due to insufficient diversity in the background and education of committee members. These details are beyond the scope of the paper. However, see, for example, Sibert (2003, 2006), Favaretto and Masciandaro (2016), Bordo and Istrefi (2018), Archer and Levin (2018).

[4]Blinder et al. (2008) is an early survey of central bank communication. The literature has grown rapidly in recent years and analyses run the gamut of the rapidly growing forms of central bank communication. Another useful survey is De Haan and Sturm (2019).

of individual central bankers since their position is likely to lie somewhere in a fairly wide spectrum between between the most hawkish and dovish positions.

Another complication has been the shift toward 'data dependence' as one of the driving forces behind rate and quantitative easing (QE) positions adopted by MPC members. This translates into less emphasis on forward-looking views in favor of more emphasis on past economic outcomes (e.g., inflation rate, real GDP growth). Therefore, deciding whether an MPC member is a hawk, or a dove, may well rest not as much on that member's inflation or real GDP growth outlook alone but on whether inflation has been high enough for long enough before recommending a tightening or a loosening of monetary policy. These subtleties cannot be boiled down to a [0,1] or [+1, -1] labelling of the position of central bankers.

Dissent inside an MPC alone may not be enough to decide an MPC member's ideological position since disagreement can emerge about the current but not the anticipated future direction of monetary policy, or vice-versa. The Fed's dot plot[5] illustrates the limitations of the hawk versus dove distinction when there exists a range of views about whether members favor a higher policy rate, what that rate might be, when it might be achieved, as well as what long-run or equilibrium policy rate level might be appropriate.

Other than looking at the direction of change in policy rates, the other approaches employed include: assessing the MPC's voting record (e.g., Thornton et al., 2014), relying on voting models to extract MPC member policy preferences and dissent from the majority (e.g., Eijffinger et al., 2015; 2018; 2019), interpreting the speeches or comments by MPC members for signs of bias (e.g., Siklos and Bohl, 2007; Bennani and Neuenkirch, 2017), or deriving MPC member positions based on how the financial market interprets their speeches (Istrefi, 2019). Naturally, each methodology has its advantages and pitfalls.

In MPCs where voting records are published (e.g., as in the US and the UK) researchers have examined the number of dissents from the policy rate decision taken by the majority of votes in the committee over time. Given data availability, the history of Federal Reserve (Fed) decisions (i.e., the FOMC which is the name of that central bank's MPC) and, more recently, Bank of England (BoE) MPC decisions have received the most scrutiny (inter alia, see Blinder and Morgan, 2008; Thornton et al., 2014). Although many determinants have been identified, the precariousness of the overall economic environment, and whether accountability rests with the committee as a whole or individual members of the committee, appear to be critical ingredients.

A different approach, used widely in political science, is to determine the likely voting position of an MPC member based on the policy alternatives on offer. Spatial voting models can be helpful in deciding the balance of positions inside an MPC since, in the simplest case, the policy position consists of tightening, or hawkish, versus loosening, or dovish, outcomes. Latent variables dictate voting outcomes. Hence,

[5]Also known as the projections of FOMC members concerning the appropriate policy rate two years ahead as well as in the "longer run". See, for example, https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20210616.pdf for the June 2021 version.

the overall economic environment (e.g., inflation, real GDP growth) dictates the likelihood that an MPC member will be inclined to loosen or tighten the stance of monetary policy, while a so-called discrimination parameter indicates how individuals' preferences lead them to be pre-disposed to be in the tightening or loosening camps. Eijffinger et al. (2015, 2018, 2019), for example, use this technique to examine the voting records of the FOMC, the Bank of England, and the Swedish Riksbank. The authors conclude that the hawk-dove distinction is empirically meaningful. Of course, this is only because voting records are available. Without these records, establishing hawkishness or dovishness is not possible.[6]

In the past few years, no doubt assisted by long periods of policy rates at or close to zero in many advanced economies, quantifying and interpreting the content of central bank communication via reports and speeches, has become increasingly popular. Space constraints prevent a detailed account of the variety of approaches taken to analyze central bank texts.[7] Generally, the extant literature compares statements made by senior officials over time and assesses whether the content of the messages, or the direction of policy actions taken, can be likened to a preference for tightening (hence, hawkish), or loosening (hence, dovish) of monetary policy (e.g., Appelbaum, 2013; Eijffinger et al., 2015; Lombardi et al., 2018). That said, there is considerable diversity in the manner in which texts are interpreted for signs of ideological positions in policy recommendations. Quantification is accomplished either by reading and interpreting text or relying on algorithms, supervised or unsupervised, to decide the position of an MPC member along a scale that ranges from hawkish to dovish.[8]

In addition, in central banks whose mandate consists of a target range for the inflation objective, the distinction between hawkish and dovish positions may well be constrained though far from eliminated for at least three reasons (e.g., see Lombardi et al., 2018). First, an inflation control strategy typically requires the central bank be forward looking. Expressions of policy leanings thus matter and tightening versus loosening biases in statements are seen as signals of the future direction of monetary policy. Second, there is always the risk that inflation falls below an inflation objective for possibly extended periods of time. The ECB is a case in point with inflation well

[6]Political biases due to appointments procedures appear to play no role in voting behaviour at the Fed while the appointment of external members (i.e., outsiders from the central bank who sit on an MPC) adds diversity in voting outcomes and the classification of hawkish versus dovish committee members. A difficulty is that voting may represent an incomplete and imperfect measure of the preferences of individual MPC members because of how committees are structured, and decisions are made, as previously noted

[7]Feldkircher et al. (2021) provide a brief survey and some key recent references in the area.

[8]Quantification can proceed, for example, by estimating the frequency with which key words appear in a document. This is the so-called bag of words approach. There are several challenges with this approach including whether individual or groups of words should be considered (i.e., unigram versus n-grams), and the dictionary used to quantify the content of documents (e.g., see Picault and Renault, 2017, for the case of the ECB).

below its "...below, but close to, 2%..." target.[9] Sufficiently persistent deviations from an inflation objective may well help identify hawks versus doves concerning the appropriate stance of monetary policy. Of course, deviations from the inflation target need not imply an imminent tightening or loosening of monetary policy. The Fed, for example, raised the policy rate from the zero lower bound beginning in 2015 despite inflation remaining persistently below the 2% medium-term inflation objective. Finally, even if the impact of a policy change can take around two years to reach its full potential the actual horizon is likely more variable. This may also be reflected in the positions taken about whether tightening or loosening of monetary policy is desired.

3 Data

We collected data on central bankers' speeches through web scraping from the BIS speech repository, a global archive consisting of over 15,500 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 name and affiliation and the occasion at which the speech was delivered.

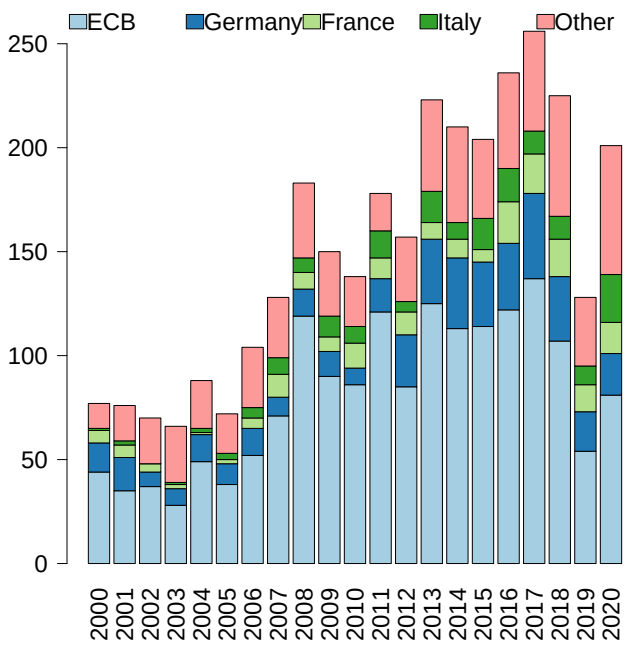
We then singled out speeches delivered by euro area central bankers and the ECB. Furthermore, each speech had to contain the word "monetary policy" at least once in order to be selected. This left us with 3,170 speeches covering the period from 2000 to 2020 for the 19 euro area member states (excluding Cyprus) and the ECB. Most of these speeches were given by representatives of the ECB (1,708), followed by representatives of the major euro area central banks from Germany (403), France (193), and Italy (173). In Fig. 1, we show the distribution of speeches delivered by central bankers in the euro area over our sample period.

The figure reveals a steady increase in the total number of central bank speeches, particularly around the time of crisis events (viz., GFC, ESDC). For example, the number of speeches spikes in 2008 and then subsides until a new surge in the number of speeches beginning in 2013, arguably when the ESDC once again threatened the euro. Every year in the post-2008 period, more speeches were delivered than prior to the GFC.[10] The trend of delivering more speeches is broken in 2019 but the situation is quickly reversed in 2020 due to the onset of the pandemic and the emergence of speeches given remotely. We also observe that the Deutsche Bundesbank has been much more active since 2012 – the height of the sovereign debt crisis. This development takes place as Jens Weidmann becomes Bundesbank President and differences of opinion emerge, notably between the Bundesbank and the ECB.

[9] This changed to a 2% medium-term objective following the ECB's strategy review completed and recommendations implemented in 2021.

[10] This finding is in line with Feldkircher et al. (2021), who used a broader data set of speeches to show that the number of speeches increase with economic uncertainty, as measured by the economic policy uncertainty index of Baker et al. (2016).

Fig. 1: Distribution of speeches



Notes: The figure shows the number of speeches per year, given by either the ECB and the national banks from Germany, France and Italy. Remaining speeches are summarized as "Other".

4 Time-Varying Text Ideal Point Model: Description

In order to estimate economic positions of the individual central banks in the euro area in a time-varying (TV) setting, we make use of time varying text based ideal point models (TV-TBIP), put forward by Vafa et al. (2020) and Hofmarcher et al. (2022). The basic idea of this model class is to estimate, ideological positions of speakers from the differences in word choice on a shared set of topics by using Poisson factorization techniques. In the following, $\boldsymbol{c_t}$ denotes the document-term matrix at time t, which is created by row-wise stacking of the frequency counts of terms of the single speeches at time t, obtained for a fixed time-invariant set of terms V (vocabulary). For each time t, in TV-TBIP the observed document term matrix $\boldsymbol{c}_t$ is modelled in the following way:

$$c_{t,dv} \sim \text{Poisson}\left(\sum_k \pi_{t,dk}\beta_{t,kv}\exp\{x_{t,a_d}\eta_{t,kv}\}\right). \tag{4.1}$$

Here $c_{t,dv}$ denotes the observed term frequency of term v in speech d. This speech is assumed to be a mixture of topic intensities, $\boldsymbol{\pi}_d$ (a vector of length K), and the topics themselves are characterized by word distributions$\boldsymbol{\beta}_k$. The second part of equation 4.1 captures the ideological component of the TV-TBIP, which is governed by

polarity of the single terms,$\eta_{t,kv}$ and the ideological position of the speaker of document d, x_{t,a_d}. We refer to the $x_{t,ad}$ as ideal points. Both $\boldsymbol{\beta}_t$ and $\boldsymbol{\eta}_t$ are matrices of dimension K (number of topics) times V (number of unique terms), while x_t is a vector of length S, including the ideological positions of institutions.

From equation 4.1 we can infer, that for topic k, document d and term v a non-zero $\eta_{t,kv}$ increases the Poisson rate of word counts if and only if the author's ideal point x_{t,a_d} has the same sign as $\eta_{t,kv}$ and decreases the Poisson rate if $\eta_{t,kv}$ and x_{t,a_d} have opposite sign.

To illustrate, if central bankers talk about price stability, a speaker with e.g. an ideal point $x_a > 0$ will more often use the term *money market* if the η value of *money market* is greater than zero for the topic price stability. If the η value is smaller than zero it will be less often used, compared to the 'neutral speaker', which corresponds to a speaker with ideal point $x_a = 0$.

To specify the model completely in a Bayesian way we have to assign priors on the parameters $\{\boldsymbol{\theta}_t, \boldsymbol{\beta}_t, \boldsymbol{\eta}_t, \boldsymbol{x}_t\}$. Here we follow Vafa et al. (2020), Hofmarcher et al. (2022) and use Gamma distributions for the topic prevalences $\theta_{t,ik}$ and term rates $\beta_{t,kv}$.

On the other side, the parameters $\eta_{t,kv}$ and the ideal points $x_{t,a}$ can take on arbitrary values. Thus standard normal priors are assumed for these parameters.

Following the lines of Vafa et al. (2020), estimation of this model is done, using mean field variational inference. Instead of Markov Chain Monte Carlo methods, the posterior is approximated by a class of variational distributions using Kullback-Leibler divergence and parameters of those distributions are optimized to get as close as possible to the the true unknown posterior. For estimating the TV-TBIP model a mean-field variational family is used. Hereby, let $q_{\boldsymbol{\phi}_t}(\boldsymbol{\theta}_t, \boldsymbol{\beta}_t, \boldsymbol{\eta}_t, \boldsymbol{x}_t)$ be the variational family with parameters denoted by $\boldsymbol{\phi}_t$. The complete set of variational parameters is thus given by
$\boldsymbol{\phi}_t = \{\{\mu_{\theta_{t,i}}\}_i, \{\sigma^2_{\theta_{t,i}}\}_i, \{\mu_{\beta_{t,k}}\}_k, \{\sigma^2_{\beta_{t,k}}\}_k, \{\mu_{\eta_{t,k}}\}_k, \{\sigma^2_{\eta_{t,k}}\}_k, \{\mu_{x_{t,s}}\}_s, \{\sigma^2_{x_{t,s}}\}_s\}$. Minimizing the Kullback-Leibler divergence is equivalent to maximizing the Evidence Lower Bound (ELBO):

$$\mathbf{E}_{q_{\boldsymbol{\phi}_t}}[\log p(\boldsymbol{\theta}_t, \boldsymbol{\beta}_t, \boldsymbol{\eta}_t, \boldsymbol{x}_t) + \log p(\boldsymbol{c}_t|\boldsymbol{\theta}_t, \boldsymbol{\beta}_t, \boldsymbol{\eta}_t, \boldsymbol{x}_t) - \log q_{\boldsymbol{\phi}_t}(\boldsymbol{\theta}_t, \boldsymbol{\beta}_t, \boldsymbol{\eta}_t, \boldsymbol{x}_t)],$$

with $\boldsymbol{c}_t$ denoting the document-term matrix for year t.

In a mean-field variational approach, this implies that the variational family factorizes over the latent variables, i.e.,

$$q_{\boldsymbol{\phi}_t}(\boldsymbol{\theta}_t, \boldsymbol{\beta}_t, \boldsymbol{\eta}_t, \boldsymbol{x}_t) = \prod_i q(\boldsymbol{\theta}_{t,i}) \prod_k q(\boldsymbol{\beta}_{t,k}) \prod_k q(\boldsymbol{\eta}_{t,k}) \prod_s q(\boldsymbol{x}_{t,s}),$$

whereby i denotes speeches, k topics, and s indexes authors. Time is denoted with t.

To complete this variational approach, we use log-normal distributions for the positive variables and Gaussian distributions for the real variables. This means

$$\begin{aligned}
\boldsymbol{\theta}_{t,i} &\sim \text{LogNormal}_K(\boldsymbol{\mu}_{\boldsymbol{\theta}_{t,i}}, I_K\sigma^2_{\boldsymbol{\theta}_{t,i}}), & \boldsymbol{\beta}_{t,k} &\sim \text{LogNormal}_V(\boldsymbol{\mu}_{\beta_{t,k}}, I_V\sigma^2_{\beta_{t,k}}),\\
\boldsymbol{\eta}_{t,k} &\sim \text{Normal}_V(\boldsymbol{\mu}_{\eta_{t,k}}, I_V\sigma^2_{\eta_{t,k}}), & x_{t,s} &\sim \text{Normal}(\mu_{x_{t,s}}, \sigma^2_{x_{t,s}}),
\end{aligned}$$

with I_K respectively I_V denoting the K resp. V dimensional identity matrix. These parameters are determined by maximizing the ELBO.

So far, the model does not link the parameters across time. In order to obtain the time-varying TV-TBIP we follow Hofmarcher et al. (2022) and stepwise initialize the variational parameters of the topic-term $\mu_{\beta_{t,k}}$ and polarity-term distributions $\mu_{\eta_{t,k}}$ across years whereby the parameter estimates obtained for the previous year are used to initialize the parameters of the next year. Given this new initialization, new parameters are estimated for the next year. This implies that for the first year in sample, i.e.,2000, the standard initialization of the optimizer as proposed in Vafa et al. (2020) is used to get estimates for the parameters ϕ_1 For the subsequent year the obtained parameters of the per topic word distribution $\mu_{\beta_{1,k}}$ and the associated polarity per term values $\mu_{\eta_{1,k}}$ are used to initialize the optimizer to obtain parameters ϕ_2.

This trivial forward initialization has two main advantages: First, it allows to detect the timely evolution of topics, i.e. how topics change over time in terms of term-importance and secondly, the initialization of the polarity scores $\mu_{\eta_{1,k}}$ avoids label switching for the ideal points x_s which allows for a coherent interpretation of the ideal points over time. For a more detailed discussion, we refer readers to Hofmarcher et al. (2022).

5 Empirical results

In this section, we investigate the content of euro area central bankers' speeches over time. This is accomplished in two steps. First, we characterize the identified topics. Second, we compute overall, central bank-specific ideal points that allow us to gauge how central banks differ in talking about these topics.

5.1 Identification of topics

We start by using the methodology described in section 4 to automatically cluster words in coherent topics. For the ease of interpretation, we allow for a maximum number of two topics.[11] In a robustness exercise, we show that results do not change qualitatively if we re-estimate the model with three topics or if we include only speeches delivered by governors (see Figures 13 and 14 in the appendix).

[11] In Feldkircher et al. (2021) and based in part on word clouds, a focus on 5 topics proved satisfactory. Considering a larger number of topics would not, in any case, change the conclusions below about the degree of cacophony in central bank communication.

The topics can be identified by looking at the neutral terms (β) that are associated with each of the two topics. Since these might change over time, we display the topic-specific neutral terms in Fig. 2 using a heat map. The more frequently a term appears in speeches associated with a topic, the darker the shading. For the sake of illustration, we have fixed the maximum number of terms to 40 in each plot. These are listed on the vertical axis.

Fig. 2: Top neutral terms per topic over time

Notes: The plot shows the top neutral terms (βs) per topic. Terms "monetary policy", "central bank", "european central" and "vice president" have been excluded. "MP" refers to monetary policy, "FS" to financial stability.

We see that topic 1 is to a large extent defined by the term "price stability", which appears consistently over the entire sample period as seen from the relatively dark areas for each year of the sample. Other frequently used words relate to the time horizon of monetary policy measures ("medium term" and "short term") or the governing body where these policies are implemented ("governing council"). We also see that the neutral terms vary over time. For example, at the beginning of the sample period, terms such as monetary union, structural reforms and economic growth were more prominent, than in the latter part of the sample. Private sector (finances) and public finances appeared most frequently in speeches during and after the global financial crisis, where excessive household and government debt have been two topics that appeared frequently on the agenda. In light of these results, we label the first topic simply as "monetary policy".

Topic 2 clearly differs from monetary policy related topics. The areas with the darkest shading include terms such as 'financial stability", "financial markets", "financial system", and other terms related to the banking sector. These terms remain pretty stable over time. By contrast, it is worth highlighting that "banking union", "macro

prudential", and "capital markets" appear more frequently at the height of the ESDC. It is also interesting that "climate change" begins to emerge at the end of the sample (i.e., in 2019-20) at a time when central banks begin to make links between this phenomenon and the potential threat to financial stability. Therefore, it is natural to label topic 2 "financial stability".

Next, we investigate whether a particular central bank dominates a topic. This is measured by the topic proportions, θ shown in Fig. 3 for the ECB and selected central banks.

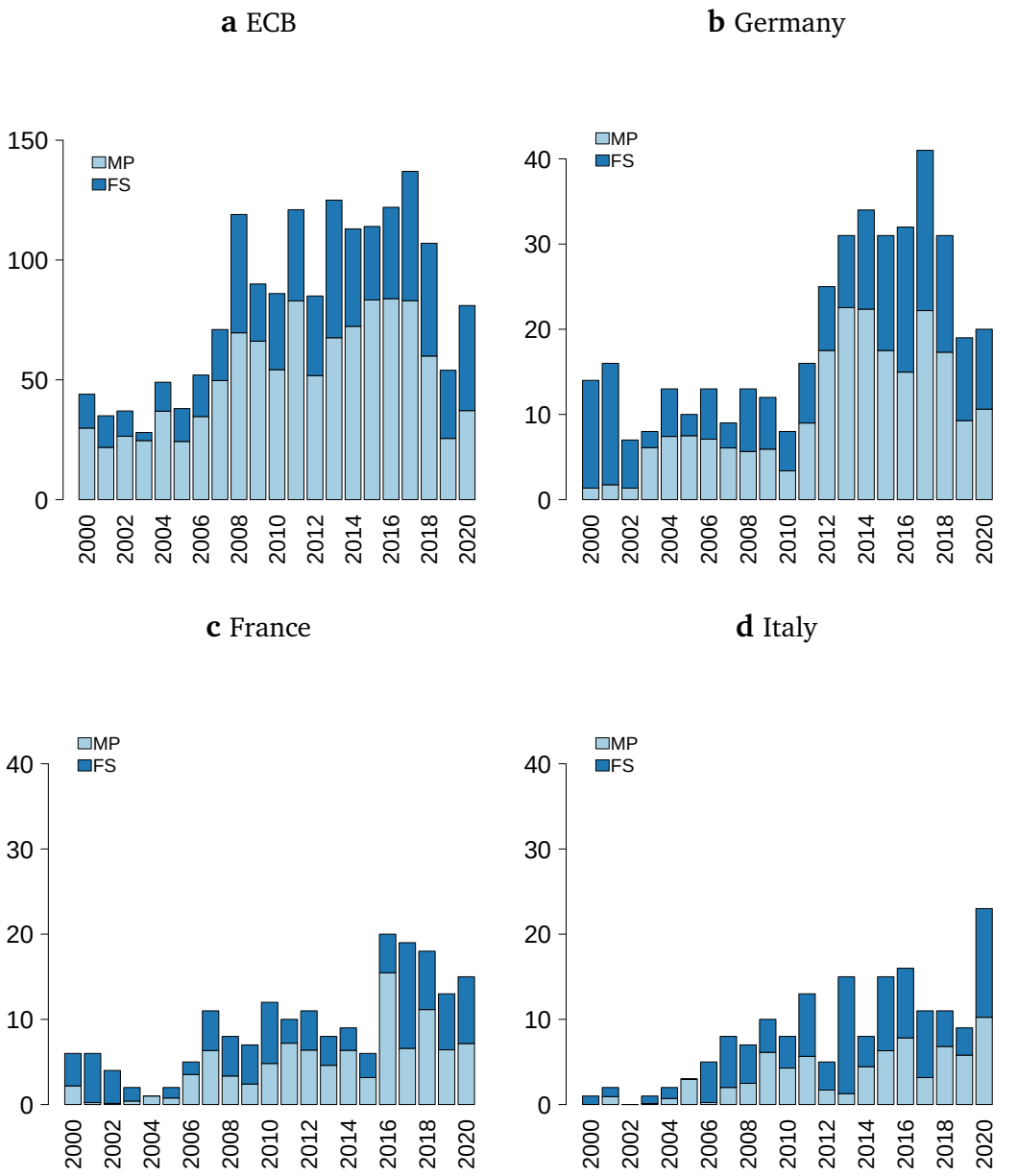
The plot demonstrates that monetary policy objectives play a consistently important role in speeches given by ECB officials. While there is an increase in emphasis on this topic beginning when inflation begins to fall in 2013, and remains well below the target of below but close to 2% until 2017, this topic begins to fade in importance thereafter. Inflation rises and although it remains below the ECB's objective the gap narrows considerably after 2017.[12] There is a clear shift, starting in 2008, in emphasis on financial stability issues (topic 3) and this remains effectively as important as any of the other topics in the content of ECB speeches until the end of the sample in 2020. Interestingly, except in 2019, the role of monetary policy (topic 2) is the most prominent of all, particularly after the GFC and the ESDC. The top right and the bottom panel of Fig. 3 show the topic proportions for Germany, France and Italy. This shows that while topic proportions for each central bank vary over time, there is no central bank that focuses solely on one single topic. This implies that we do not see central banks "specializing" in a particular topic. Rather they devote resources to both identified topics but with varying intensity over time.

We are also able to infer the polarity scores of the single terms. We scale these by the βs, which implies that we look at polarity times the frequency with which the term appears in the data. The multiplicative polarity scores are then sub-divided into positive and negative versions and help us determine whether the context in which the terms appear is a positive or a negative one. Polarity scores then provide an indication of the strength of the sentiment associated with the words used. They are depicted in Fig. 4. Negative polarity scores are pre-multiplied by -1 so that the same scale is used for both positive and negative terms.

Starting with topic 1, authors with a negative polarity score (top left) have a stronger focus on public finances and more general aspects of monetary policy. The block of words comprising "monetary policy", "public finances", "fiscal policy", "economic policy", "exchange rate" and the "current account" is pretty stable over time. Other words, such as "sovereign debt" appear more frequently during and in the aftermath of the ESDC. The same goes for "banking union", a polarity term that was very popular in the aftermath of the GFC. The top right hand panel of Fig. 4 provides the polarity scores for the positive elements the monetary policy topic. On the positive scale, the terms that stand out and are used to cover the price stability mandate

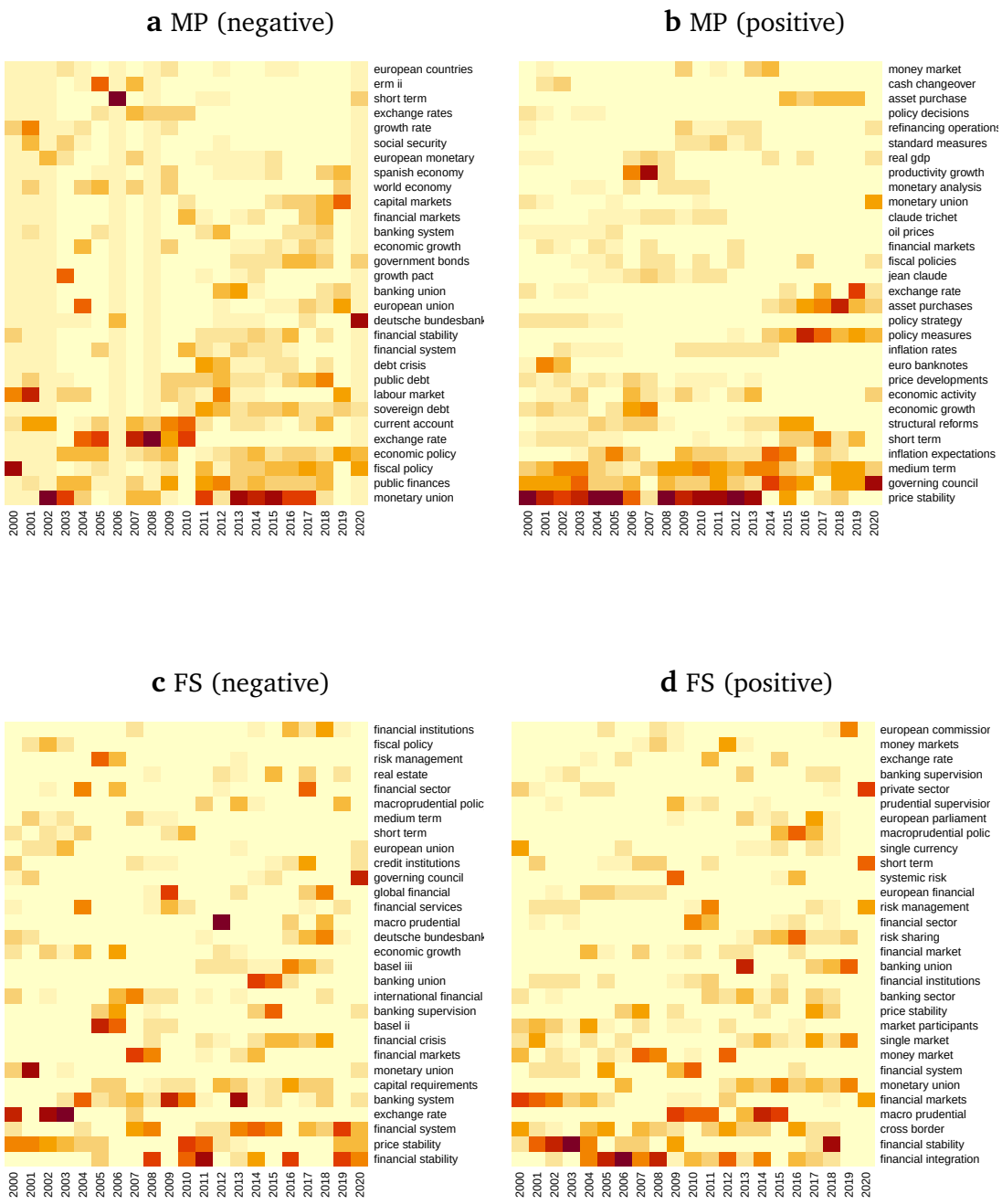
[12] Based on developments in HICP inflation data. See https://www.ecb.europa.eu/stats/macroeconomic_and_sectoral/hicp/html/index.en.html.

Fig. 3: Topic proportions for selected central banks over time



Notes: The plot shows the topic proportions over time. "MP" refers to monetary policy, "FS" to financial stability.

Fig. 4: Top multiplicative polarity terms over time



Notes: The plot shows the top 30 polarity terms, scaled by their frequency (i.e, $\beta \times \eta$). Terms "monetary policy", "central bank", "european central" and "vice president" have been excluded. "MP" refers to monetary policy, "FS" to financial stability.

of the central banks. More specifically, words such as ”price stability”, ”governing council”, ”inflation expectations” and the policy horizons ”short term” and ”medium term” receive high positive polarity scores. We also see that asset purchases and policy measures appear in the years from 2014 on, where the ECB initiated its first asset purchase program. This implies that monetary policy in Europe is either discussed from a rather broad perspective (negative polarity scores) or a narrow angle that focuses on price stability (positive polarity).

The bottom panel of Fig. 4 displays polarity scores for the financial stability topic. Negative terms comprise words such as ”financial stability”, ”price stability” and ”financial system”. These terms appear relatively stable over time. Other negative polarity scores appear strongly only over certain time periods. For example, ”Financial system” appeared frequently during the GFC and the ESDC. Other words, appear rather isolated. For example, terms related to regulation such as ”basel”, ”banking supervision”, ”macroprudential policies” have been discussed in the run-up and during crisis events. On the positive side, we observe a less stable pattern. ”Financial integration”, ”cross-border” and ”financial system” are the terms that appear most frequently. The polarity scores for the financial stability topic reveal a distinction between authors whose speeches focus on regulatory topics and those who focus on financial integration. For the sake of completeness, we also show the same analysis with multiplicative polarity scores summed over the whole sample period as well as the raw polarity scores (not scaled by their frequency) in Figures 8 and 9 in the appendix.

Summing up, our analysis shows that euro area central bankers' speeches are mostly dealing with either a broad monetary policy topic (topic 1) or issues related to financial stability (topic 2). This finding is in line with the recent study of Carboni et al. (2020), who used topic modeling to analyze speeches of the ECB and the US Fed. Central banks are not exclusively focusing on one of these topics; rather they devote attention to these topics with varying intensity over time. The polarity terms form the basis to assess how central banks address the same topics in a different tone. This analysis shows that some central banks talk about monetary policy in a broader sense (negative polarity) whereas others focus on a narrow definition of monetary policy determined to a large extent by price stability (positive polarity). Topic 2, financial stability, on the other hand is either addressed with a focus narrow focus on regulation and domestic financial stability (negative polarity) or from a more encompassing focus looking at cross-border financial stability and financial integration (positive polarity).

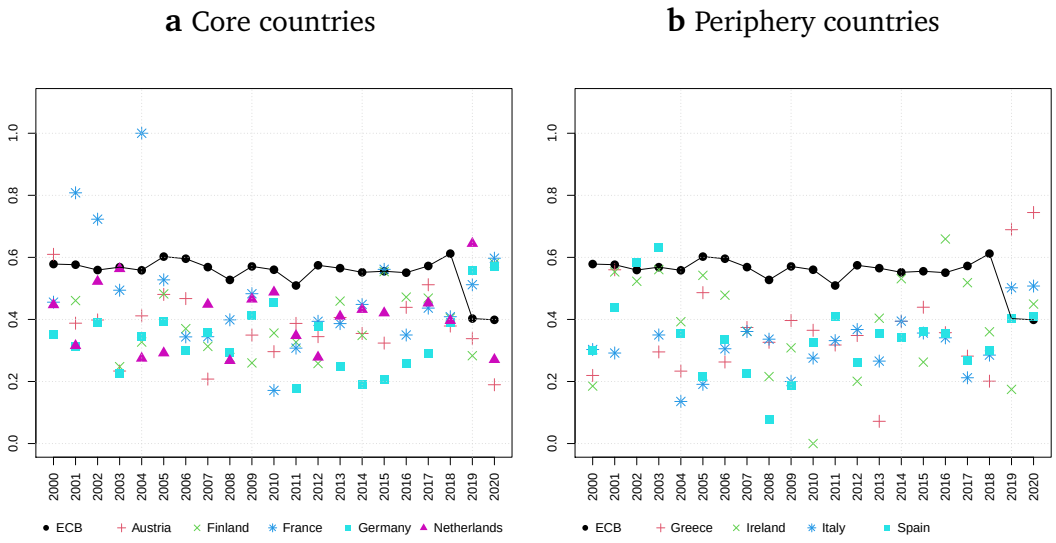
5.2 Ideal point analysis

In this section, we assess the evolution of the ideal points at the ECB and national central banks. These are independent of the topic but will vary over time as they reflect their preference for topics mentioned in speeches.

5.2.1 Ideological positions in the euro area

To be consistent, we focus in this section on the sub-sample of central banks that contributed on a regular basis throughout the sample period. These are: the national central banks that were members of the euro area since its inception, namely Austria, Germany, Finland, France and the Netherlands. For convenience we refer to these as the core central banks. Next, we consider national central banks at the periphery central banks, namely Greece, Ireland, Italy and Spain. Ideal points for the remaining euro area national banks, such as those who joined the EA later, are displayed in Table 2 in the appendix. Last, we normalize the ideal points to range between 0 and 1. The ideal points are displayed in Fig. 5.

Fig. 5: Ideal points in the euro area



Ideal points of the ECB are plotted as the solid dotted line while the ideal points for individual national central banks are depicted by symbols. We can then, visually, compare the gaps in ideal points between the ECB and the member country central banks. According to our definition, the wider the gap, the greater the dispersion in ideological positions and, hence, the more likely this will contribute to cacophony in central bank communication in the EA. As noted in the introduction, cacophony reflects the diversity of topics that can explain the content of speeches by the central bankers in our sample.

First, we notice that the ECB's ideal points tend to lie above the ideal points of the individual national banks. This implies that, when talking about monetary policy, the ECB focuses more on explanations of inflation dynamics, the institutional framework and - in the case of financial stability - on issues related to financial integration. National central banks, by contrast, are more concerned with the effects of monetary policy tools, policies fostering economic recovery, as well as the regulatory framework

in the case of the financial stability topic. Notice that this gap is more visible for central banks at the periphery vis-a-vis the ECB than for their counterparts in the core countries. Nevertheless, we also observe a narrowing of the gap which starts around the outbreak of the ESDC. Hence, national central banks display a tendency in choosing their wordings more in line with that of the ECB. Indeed, by 2019, many even cross the ECB's ideal point. This behaviour changes, at the end of the sample, where we see a clear divergence of ideal points from large central banks and the ECB. In case this "wedge" turns out to be persistent, this could imply more tension regarding the implementation of monetary policy in the euro area.

Examining the ideal points of individual national central banks there is no obvious rank ordering that emerges in terms of their ideological positions over time. At the beginning of the sample period, the ideal points for France show a strong positive deviation from the ECB. In Fig. 3 we see that this might be driven first by a relatively low number of speeches over the period from 2002 to 2004 and second by a significant switch from nearly solely focusing on monetary to nearly exclusively focusing on financial stability in 2004. In general, we also observe considerably more variation in ideal points at the national level than at the level of the ECB. This implies hence that the ideological position of the ECB does not represent the average position of EA national banks.

Second, and with the exception of the last two years of the sample (2019-2020), the ECB shows a certain degree of overall ideological stability as reflected in their speeches. It is striking that between 2012 and 2015, arguably the most critical years of the ESDC, ideal points of the ECB hardly moved. This is reminiscent of the ECB speaking with one voice. This suggests that, in a crisis, central bank communication aims and has succeeded in speaking with one voice. If we exclude the last two years of the sample, there is only a noticeable shift in the ideal point, namely in 2016 and likely influenced by Brexit. This implies that the ECB – and to some extent also the national central banks – are respectively sticking to their knitting. However, unless the public is aware of their assigned responsibilities, the result may instead be interpreted, as Blinder (2018, p. 57) put it, as one that *"...speaks with too many voices..."* but ends up sounding like a community of central banks that *"...have no voice at all"*. We can also zoom in to assess which speakers are driving the ideological position of the ECB. For that purpose, Table 3 in the appendix, lists the number of speeches given by each ECB representative per year. The table indicates certain "regimes" that always consist of one dominant speaker (the ECB president) and three to four other ECB members who are also active but to a lesser extent. At the beginning of the sample period, the speakers group was very narrow with most contributions by Willem Duisenberg and Christian Noyer. From 2004 to 2011, the group consisted of Jean-Claude Trichet as the most frequent author, followed by José Gonzalez-Paramo, Jürgen Stark, Lorenzo Bini Smaghi and Lucas Papademos. From 2012 to 2018, Mario Draghi was the most active ECB speaker, followed by Peter Praet, Vitor Constancio and to a lesser extent Yves Mersch. In 2020, we again see a somewhat smaller group

of ECB speakers consisting of the current president Christine Lagarde, followed by Isabel Schnabel.

A first exercise consists in asking whether we can relate the ideal points to some key macroeconomic fundamentals. More specifically, we conduct a country-fixed effects panel estimation with the core and periphery countries as well as the ECB. The macroeconomic variables we consider comprise the average yearly change in the real effective exchange rate (REER), the inflation rate, the ECB's measure of country specific financial stress (CISS), gross government net lending / borrowing and the real GDP growth rate. These variables should capture the fundamentals that could drive the tone in addressing either monetary policy or financial stability. To account for the persistence in the ideal points, we also include a lag of the dependent variable. The results are depicted in Table 1.

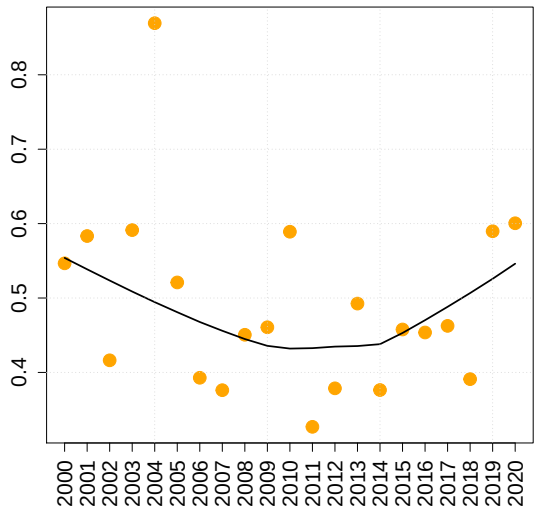
Table 1: Determinants of Ideal Points: 2001-2020

	Dependent variable:						
	Ideal point						
			panel linear				*panel GMM*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ip_{t-1}	0.314***	0.320***	0.300***	0.256***	0.249***	0.258***	0.204***
	(0.073)	(0.074)	(0.075)	(0.076)	(0.076)	(0.075)	(0.078)
Inflation		−0.006	−0.009	−0.007	−0.009	−0.004	−0.005
		(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)
REER change			4.856	3.171	3.131	−0.301	0.378
			(3.452)	(3.473)	(3.462)	(3.634)	(3.788)
CISS				−0.120**	−0.091*	−0.145**	−0.169**
				(0.049)	(0.053)	(0.056)	(0.068)
Gov. net lending/borrowing					0.004	0.007**	0.005
					(0.003)	(0.003)	(0.003)
Real GDP growth						−0.009***	−0.008**
						(0.003)	(0.003)
Observations	190	190	190	190	190	190	
R^2	0.093	0.097	0.107	0.136	0.146	0.180	
Adjusted R^2	0.042	0.041	0.046	0.072	0.078	0.110	
F Statistic	18.303***	9.519***	7.040***	6.925***	6.001***	6.383***	
Note:							*p<0.1; **p<0.05; ***p<0.01

The results show a significant degree of persistence in the ideal points. From Fig. 5 we note that the dispersion of individual national banks' ideal points is larger than that of the ECB. However, the panel estimates only capture the average behavior in our sample. We further include inflation and a measure of external competitiveness (changes in the REER). Both variables turn out not to explain differences in ideal points. This is surprising since a common classification of central bankers is by looking at their inflation tolerance. By contrast, we find that an increase in financial stress negatively impacts the ideal point. Taken at face value this implies that countries facing financial stress focus more on domestic, financial topics than financial integration. We also see that countries with a budget surplus tend to have higher ideal points, whereas strong real GDP growth seems to decrease the ideal point. Hence, the results imply that higher real GDP growth changes the focus of the bank away from price stability. Our results remain qualitatively unchanged if we use a panel GMM estimator with lags of the dependent variable as the instrument (see most right column).

We can further investigate whether a convergence of ideal points emerges over time by calculating the cross-sectional standard deviation of the ideal points for the ten EA countries and the ECB. The results are shown in Fig. 6. The solid line reflects the fit of a locally-weighted polynomial regression.

Fig. 6: Variation in ideal points over time



The figure reveals three different trends over the sample period. In the first half of the sample period, we observe a negative trend in the standard deviations of ideal points until 2014. Taken at face value, this implies a degree of convergence of ideological standpoints in the euro area over that time period. This downward trend is followed by a period of less variations in ideal points. More specifically, during the periods of the GFC and the ESDC, standard deviations of ideal points have been

rather constant. In the last period of the sample, we see an upward trend, driven by the latest two observations stemming from 2019 and 2020. The uptick in ideological variety in these last two years could be driven by publications within the ECB's strategy review, which include new aspects of monetary policy, such as digital innovation and climate change. Of course, the emergence of the covid-19 pandemic might also trigger a divergence of ideal points, with the ECB focusing on the issues related to EA monetary policy implementation while the national central banks on country-specific effects. Finally, changes in the variability of ideal points could also be driven by the switch from the in the ECB's presidency from Mario Draghi to Christine Lagarde.

5.2.2 Ideological Positions and Expectations

Central bankers use speeches, among other communications devices, to also shape expectations. Accordingly, we now consider a VAR setup to explore the interaction between the TV-TBIP and conventional macroeconomic aggregates, including expectations. Since the ECB is solely responsible for carrying out monetary policy actions we consider only the link between TV-TBIP and euro area wide variables.

For that purpose, we have re-estimated the ideal points for the ECB on a quarterly basis, while still estimating yearly ideal points for the national central banks. [13] The quarterly ideal points of the ECB are displayed in Fig. 10 and show a very similar pattern as ideal points estimated annually: they are very stable, tend to lie above ideal points of the remaining central banks and hover around a value of 0.6.

With quarterly ideal points at our disposal, we estimate a vector autoregressive model to investigate how much variation in macroeconomic expectations can be explained by the ECB's ideological standpoint. To measure expectations, we collect data on forecasts for real GDP growth, inflation and the unemployment rate from the ECB's survey of professional forecasters (SPF).

We use a standard Bayesian VAR with a hierarchical Minnesota prior as proposed in Giannone et al. (2015) and implemented in Kuschnig and Vashold (2021). More specifically, we denote by $\{\boldsymbol{y}_t\}_{t=1}^{T}$ an M-dimensional time series process that contains the ECB's ideal point (ip), inflation expectations for the current year and one year ahead ($Dp_{t,t+0}, Dp_{t,t+12}$), real GDP growth ($y_{t,t+0}, y_{t,t+12}$) and unemployment ($y_{t,t+0}, y_{t,t+12}$), $\boldsymbol{y}_t = (ip_t, Dp_{t,t+0}, Dp_{t,t+12}, y_{t,t+0}, y_{t,t+12}, y_{t,t+0}, y_{t,t+12})'$.

The VAR with $p = 4$ lags is then written as

$$\boldsymbol{y}_t = \boldsymbol{c} + \sum_{j=1}^{p} \boldsymbol{A}_j \boldsymbol{y}_{t-j} + \boldsymbol{u}_t, \quad \boldsymbol{u}_t \sim \mathcal{N}_M(\boldsymbol{0}, \boldsymbol{\Sigma}), \tag{5.1}$$

with $\boldsymbol{c}$ being a $M \times 1$ intercept vector, $\boldsymbol{A}_j$ denoting the $M \times M$ coefficient matrix of the jth lag and a Gaussian distributed reduced-form error $\boldsymbol{u}_t$ with full variance-covariance matrix $\boldsymbol{\Sigma}$. Based on the VAR, we calculate a forecast variance decomposition (FEVD)

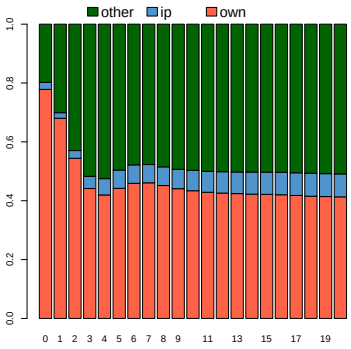
[13] Technically, for each year t, we estimated for each quarter an individual, independent ideal point for the ECB.

that allows us to gauge how much variation of the forecast error is explained by a shock to the ideal point relative to shocks to the remaining variables. The shocks are orthogonalized using a recursive ordering in the VAR. As a robustness check, we also carry out a generalized forecast error variance decomposition akin to Lanne and Nyberg (2016), depicted in Fig. 11, which is independent of the ordering of the variables in the underlying VAR.

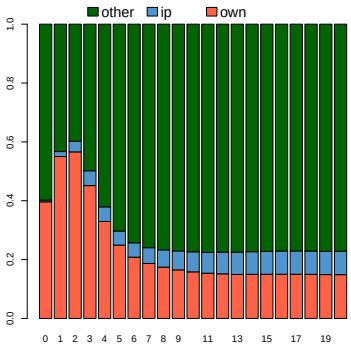
The results are depicted in Fig. 7.

Fig. 7: Forecast error variance decomposition of macroeconomic expectations

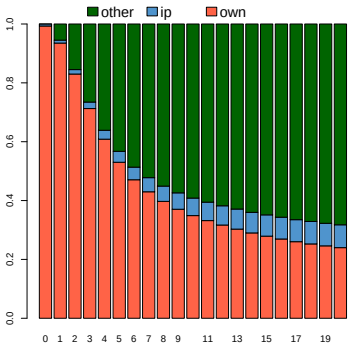
a Real GDP growth, current year



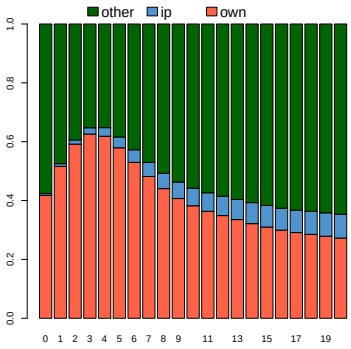
b Real GDP growth, one year ahead



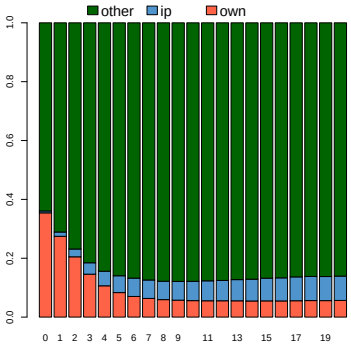
c Inflation, current year



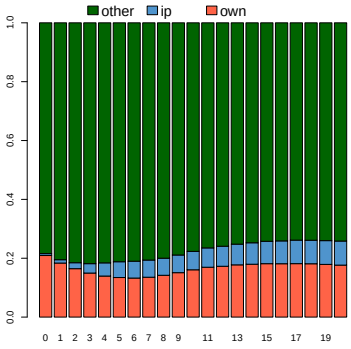
d Inflation, one year ahead



e Unemployment, current year



f Unemployment, one year ahead



Notes: The plot shows a forecast error variance decomposition for expectations of real GDP growth, inflation and unemployment. Variation explained by shocks to the variable under consideration are in red (”own”), the ECB ideal point in blue (”ip”) and the remaining variables in green (”other”).

Unsurprisingly, for most of the variables, the contribution of own shocks (in red) tend to dominate especially so at the shorter forecast time horizon. An exception to this are unemployment expectations for which shocks to the remaining variables (in green) explain most of forecast error variance. Looking at shocks to the ECB's ideal point (in blue), we see that for all expectations data horizon, shocks to the ideological standpoint are far from negligible in explaining the forecast error variance. This is particularly so at the longer term horizon. In this sense we find evidence that the information conveyed in the ECBs speeches do shape longer-run expectations of key macroeconomic variables (i.e., more than 10 quarters in the future). In the appendix section, we also provide impulse response functions for the recursive VAR (see Fig. 12. These show that an increase in the ECB's ideal point triggers a significant decrease in GDP growth expectations as well as an increase in unemployment expectations. This holds true for both forecast horizons. There are no significant effects on inflation expectations. Of course, it must be kept in mind that inflation rates were fairly low for a considerable portion of the sample. Additionally, the ECB may well have used speeches to allay public fears that it was an 'inflation nutter' by conveying the ideological position that its mandate to keep prices stable was not at the expense of real economic performance.

Summing up, we find that the ECB's ideal points tend to lie above that of other euro area national banks. The ECB's ideological standpoint is hence not an average of the ideal points of individual euro area central banks. Also, the ECB's ideal points are fairly stable over time, which reflects a consistent communication strategy of the ECB with the public also during crisis periods and more generally – ideal points of euro area individual central banks tend to converge. These findings are qualitatively unchanged if we increase the number of topics or consider only speeches from governors (see Fig. 15 in the appendix). We also investigated potential macroeconomic drivers of the ideal points, which revealed that differences in financial stability as well as real GDP growth are important explanatory factors. Last, we assessed whether ideal points can also influence the economy. We did this by looking at a forecast error variance decomposition of expectations data and found that the ideal point can explain significant shares of variation in inflation, real GDP growth and unemployment forecasts, especially so in the longer-term.

6 Conclusion

In this paper, we have used speeches from euro area central banks and the ECB to identify monetary policy topics as well as how differently central banks "talk" about these topics. For that purpose, we relied on a newly developed version of text-based ideal point modeling that allows to evaluate changes in the ideological stand points of speeches over time. Our results show that the bulk of speeches given by central bankers can be boild down into two topics, namely monetary policy, and financial stability. Each topic is addressed with varying intensity by the ECB and euro area

national banks over our sample period. This implies that central banks change their focus from time to time and that there is no persistent or "regional" specialization of topics discussed within the euro area. Zooming in, we look at polarity scores that allow us to assess how central banks address the same topics in a different tone. These also form the basis for the ideal point which serves as a summary measure for the ideological standpoint of the central banks. Our analysis reveals outstanding ideal points for the ECB that persistently, and positively, depart from all euro area central banks considered. With respect to the identified topics this implies that the ECB has a very narrow focus on price stability when talking about monetary policy and a cross-border, financial integration perspective when addressing financial stability. By contrast, other euro area national banks talk more broadly about monetary policy and focus on regulation and domestic issues when discussing the topic financial stability.

Taken at face value, the clear position of the ECB implies that its ideological standpoint is not formed as the average of its member states. This could be interpreted as the national central banks having only a minor influence on the tone of the ECB's communication which, in turn, might also be reminiscent of its overall monetary policy strategy. As a further striking result, our estimations demonstrate that the ECB's ideal point barely moves during crisis periods. This finding reveals a focus on consistent and unified communication during these periods. Finally and taking a broader perspective, we find a convergence of ideal points of euro area national banks and and therefore of ideological positions during the period 2000 to 2018. In general, a high level of financial stress or strong economic growth, decreases the ideal point, whereas a budget deficit increases the ideal point. This trend reversed in 2019 and 2020, where we witness a sharp drop in the ECB's ideal point, which is reminiscent of a broader approach to monetary policy. This sharp drop could be associated with the ECB focusing on new topics, the emergence of the coronavirus crisis, or the new ECB presidency of Christine Lagarde. Regardless of its source, it implies considerable diversity of opinions exists within the euro area system. This should be seen as positive even if some observers wish the ECB and national central banks spoke with one voice. The downside, of course, as noted in the opening quote, is the risk of cacophony but only if the diversity of opinions is interpreted as noise.

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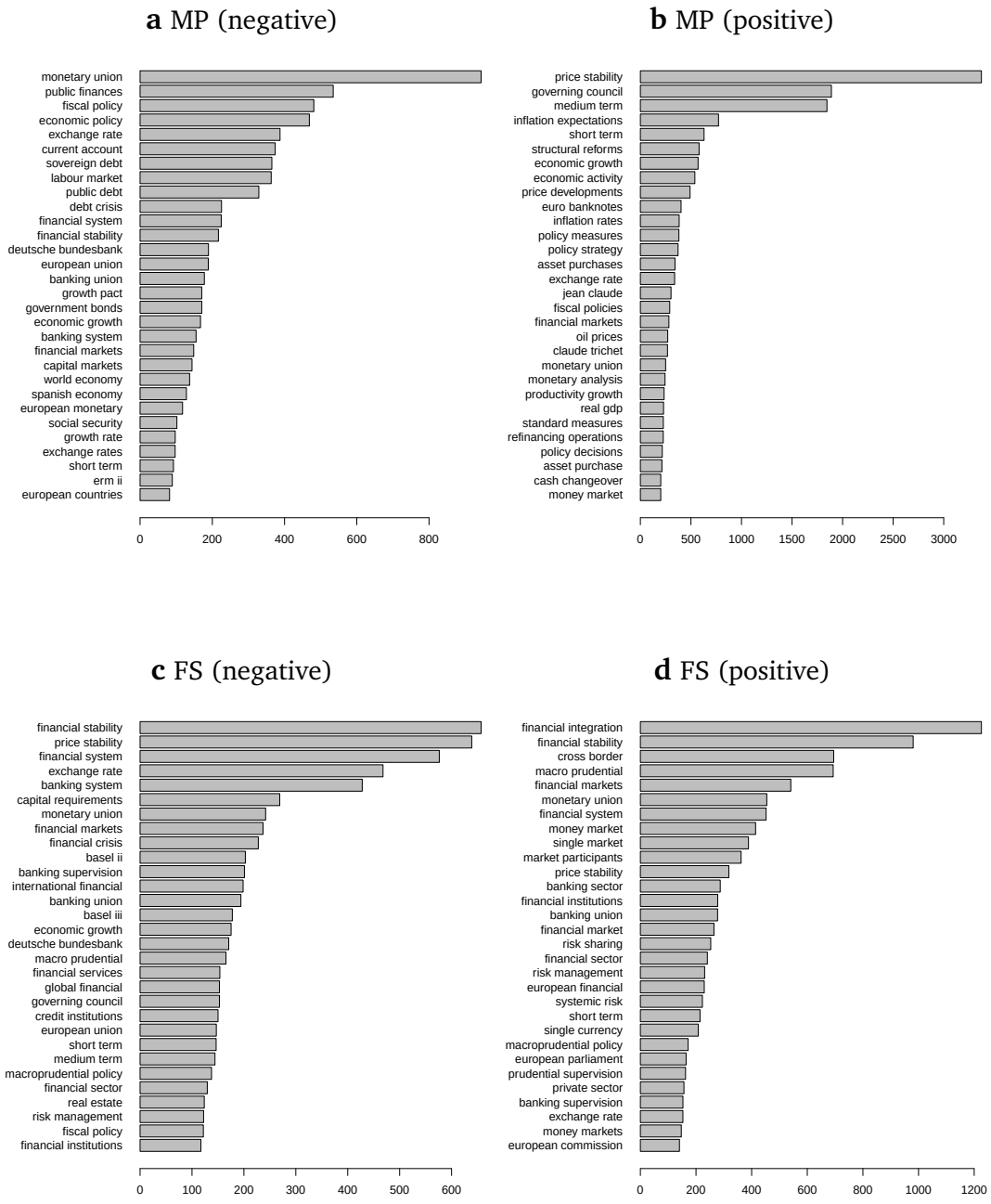
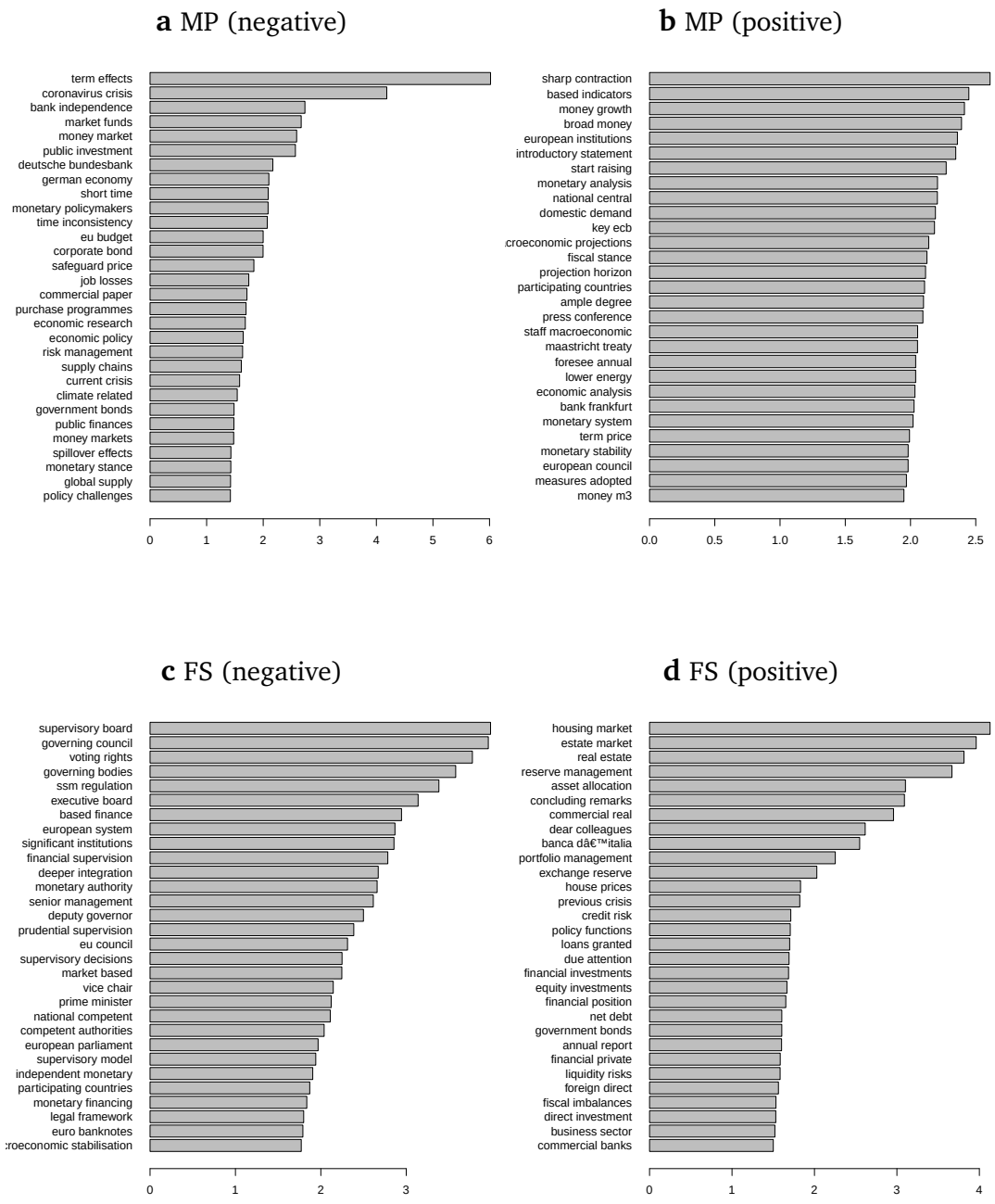
Appendix A Additional results

Fig. 8: Top multiplicative terms summed over the full sample period



Notes: The plot shows the top polarity terms, weighted by their relative frequency. Terms ”monetary policy”, ”central bank”, ”european central” and ”vice president” have been excluded.”MP” refers to monetary policy, ”FS” to financial stability.

Fig. 9: Top polarity terms summed over the full sample period



Notes: The plot shows the top neutral β terms. Terms "monetary policy", "central bank", "european central" and "vice president" have been excluded. "MP" refers to monetary policy, "FS" to financial stability.

Table 2: Ideal points

	AT	BE	ECB	EE	FI	FR	DE	GR	IE	IT	LV	LT	LU	MT	NL	PT	SK	SI	ES
2000	0.61	0.80	0.58			0.46	0.35	0.22	0.19	0.30	0.42				0.45				0.30
2001	0.39	0.58	0.58	0.64	0.46	0.81	0.31	0.56	0.55	0.29	0.49			0.25	0.32				0.44
2002	0.40	0.41	0.56	0.24		0.72	0.39		0.52		0.16		0.29	0.13	0.52				0.58
2003	0.23	0.21	0.57		0.25	0.49	0.23	0.30	0.56	0.35	0.34		0.58	0.33	0.56	0.56	0.26		0.63
2004	0.41	0.36	0.56	0.18	0.33	1.00	0.34	0.23	0.39	0.14			0.82	0.35	0.27				0.36
2005	0.48	0.43	0.60		0.48	0.53	0.39	0.49	0.54	0.19			0.33	0.28	0.29				0.22
2006	0.47	0.25	0.60	0.51	0.37	0.34	0.30	0.26	0.48	0.31			0.31	0.48		0.14			0.34
2007	0.21	0.36	0.57	0.34	0.31	0.34	0.36	0.37	0.36	0.36			0.47	0.32	0.45				0.22
2008		0.54	0.53		0.28	0.40	0.29	0.33	0.22	0.34			0.37	0.30	0.27				0.08
2009	0.35	0.52	0.57	0.28	0.26	0.48	0.41	0.40	0.31	0.20			0.40	0.30	0.47				0.19
2010	0.30		0.56		0.36	0.17	0.45	0.37	0.00	0.28			0.37	0.42	0.49	0.44			0.32
2011	0.39	0.56	0.51	0.57	0.33	0.31	0.18	0.32		0.33				0.35	0.35	0.34			0.41
2012	0.34		0.57	0.47	0.26	0.39	0.38	0.35	0.20	0.37				0.39	0.28	0.35			0.26
2013	0.41		0.57	0.42	0.46	0.39	0.25	0.07	0.40	0.27				0.42	0.41	0.30			0.35
2014	0.35		0.55	0.33	0.35	0.45	0.19	0.39	0.53	0.39				0.45	0.43	0.38		0.50	0.34
2015	0.32		0.56	0.36	0.55	0.56	0.21	0.44	0.26	0.36	0.49		0.44	0.45	0.42	0.30			0.36
2016	0.44		0.55		0.47	0.35	0.26	0.36	0.66	0.34				0.45		0.41		0.37	0.36
2017	0.51		0.57		0.47	0.44	0.29	0.28	0.52	0.21		0.38		0.41	0.45	0.49			0.27
2018	0.38	0.50	0.61		0.40	0.41	0.39	0.20	0.36	0.29	0.49			0.40	0.40	0.25			0.30
2019	0.34		0.40		0.28	0.51	0.56	0.69	0.17	0.50		0.21		0.22	0.64	0.28			0.40
2020	0.19		0.40		0.58	0.60	0.57	0.74	0.45	0.51		0.38			0.27	0.41			0.41

Notes: The table shows the estimated ideal points per national bank over time. No ideal point is available in case speeches are missing for a particular year. Ideal points normalized to lie in the range from 0 to 1.

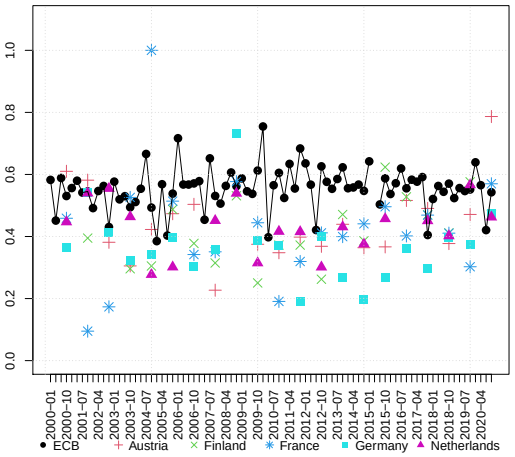
Table 3: ECB speakers in the period from 2000 to 2020

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Coure	0	0	0	0	0	0	0	0	0	0	0	0	21	30	28	23	31	31	25	8	0
Noyer	14	15	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagarde*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	30
Tumpel-Gugerell	0	0	0	0	0	0	0	2	10	8	6	4	0	0	0	0	0	0	0	0	0
Schnabel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Trichet*	0	0	0	6	39	28	40	43	48	30	46	48	0	0	0	0	0	0	0	0	0
Asmussen	0	0	0	0	0	0	0	0	0	0	0	0	6	17	0	0	0	0	0	0	0
Gonzalez-Param	0	0	0	0	0	0	0	2	11	9	7	13	4	0	0	0	0	0	0	0	0
Stark	0	0	0	0	0	0	0	4	16	9	8	10	0	0	0	0	0	0	0	0	0
Bini Smaghi	0	0	0	0	0	1	0	2	12	15	11	18	0	0	0	0	0	0	0	0	0
Papademos	0	0	6	9	7	9	9	18	22	19	3	0	0	0	0	0	0	0	0	0	0
de Guindos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	14	13
Draghi*	0	0	0	0	0	0	0	0	0	0	0	6	37	39	38	35	31	30	22	9	0
Issing	2	4	3	2	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Praet	0	0	0	0	0	0	0	0	0	0	0	3	10	13	12	20	23	32	16	0	0
Lane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	11
Lautenschlaeger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	5	7	7	8	1	0
Padoa-Schioppa	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Constancio	0	0	0	0	0	0	0	0	0	0	5	11	7	10	15	18	14	17	7	0	0
Duisenberg*	28	15	20	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mersch	0	0	0	0	0	0	0	0	0	0	0	8	0	16	12	13	16	20	18	4	7

Notes: The table shows the speakers associated with the ECB per year. An asterisk indicates that the speaker has served as the president of the ECB.

Fig. 10: Ideal points in the euro area - ECB quarterly

a Core countries



b Periphery countries

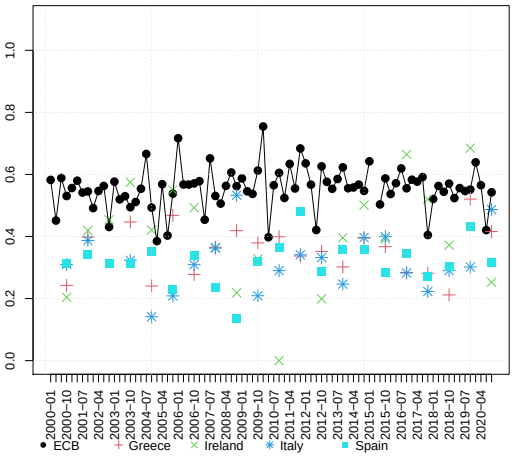
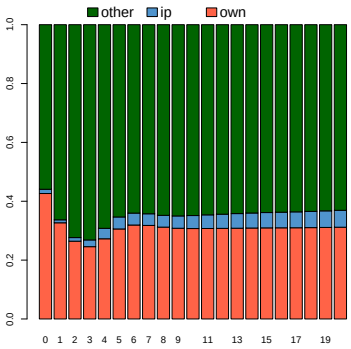
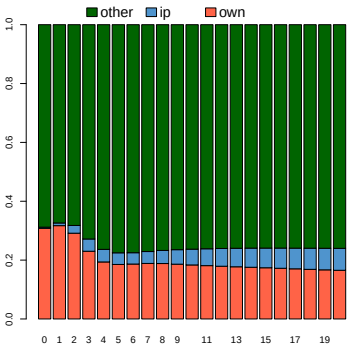


Fig. 11: Generalized forecast error variance decomposition of macroeconomic expectations

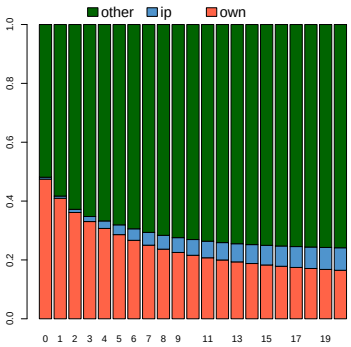
a Real GDP growth, current year



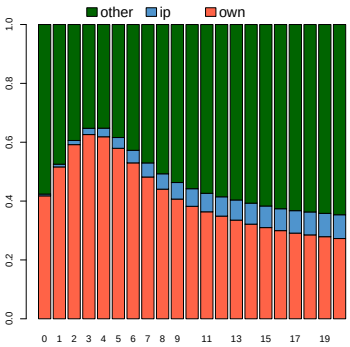
b Real GDP growth, one year ahead



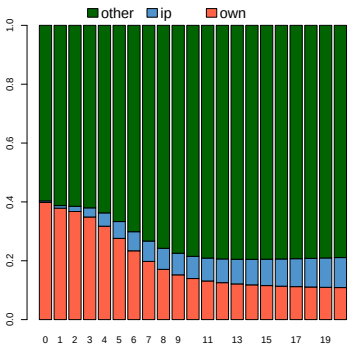
c Inflation, current year



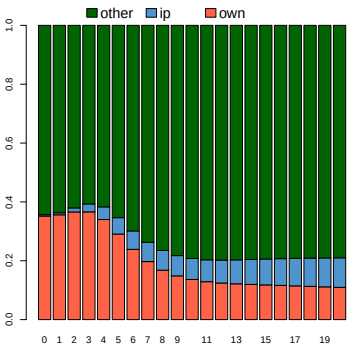
d Inflation, one year ahead



e Unemployment, current year

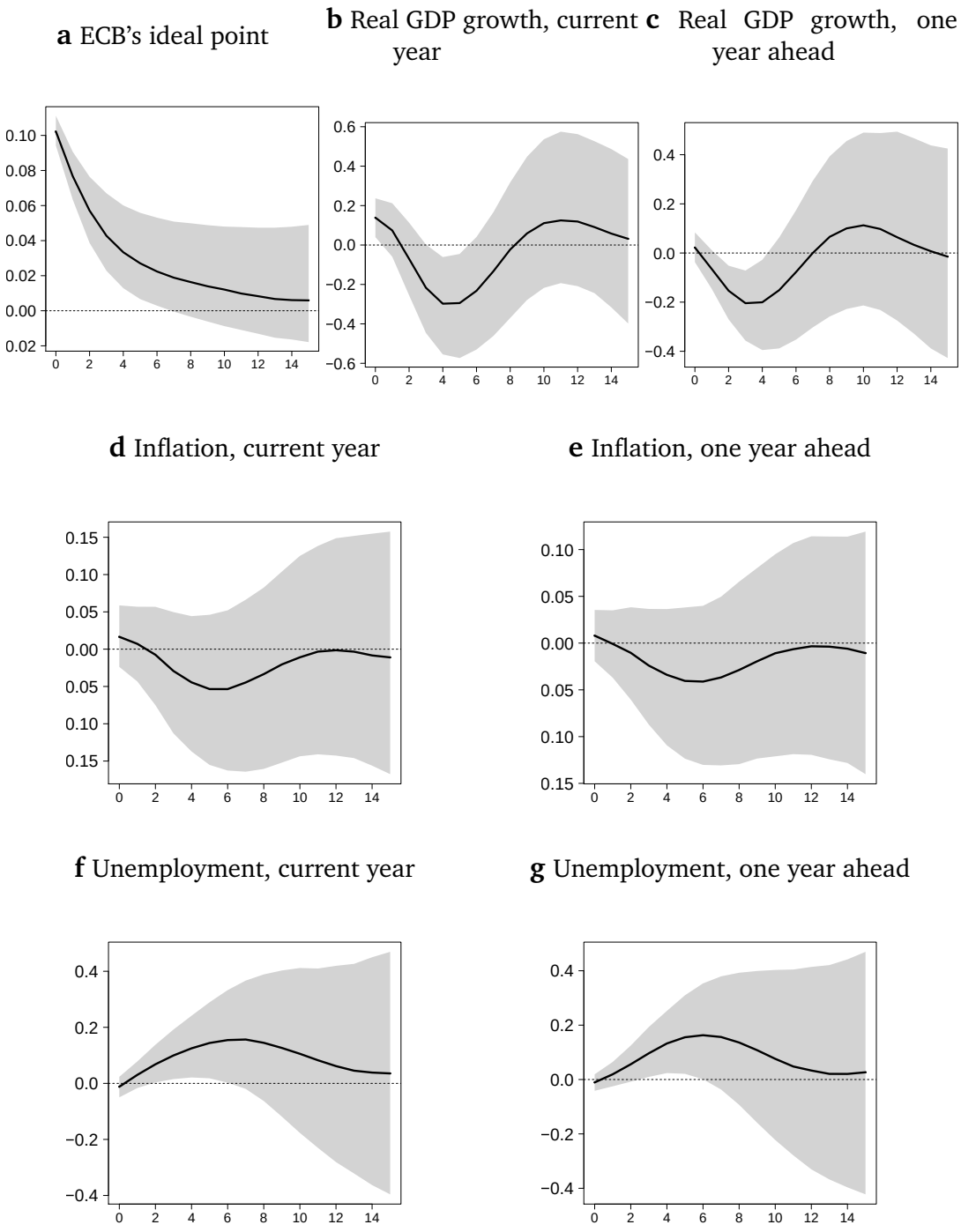


f Unemployment, one year ahead



Notes: The plot shows a generalized forecast error variance decomposition for expectations of real GDP growth, inflation and unemployment. Variation explained by shocks to the variable under consideration are in red ("own"), the ECB ideal point in blue ("ip") and the remaining variables in green ("other").

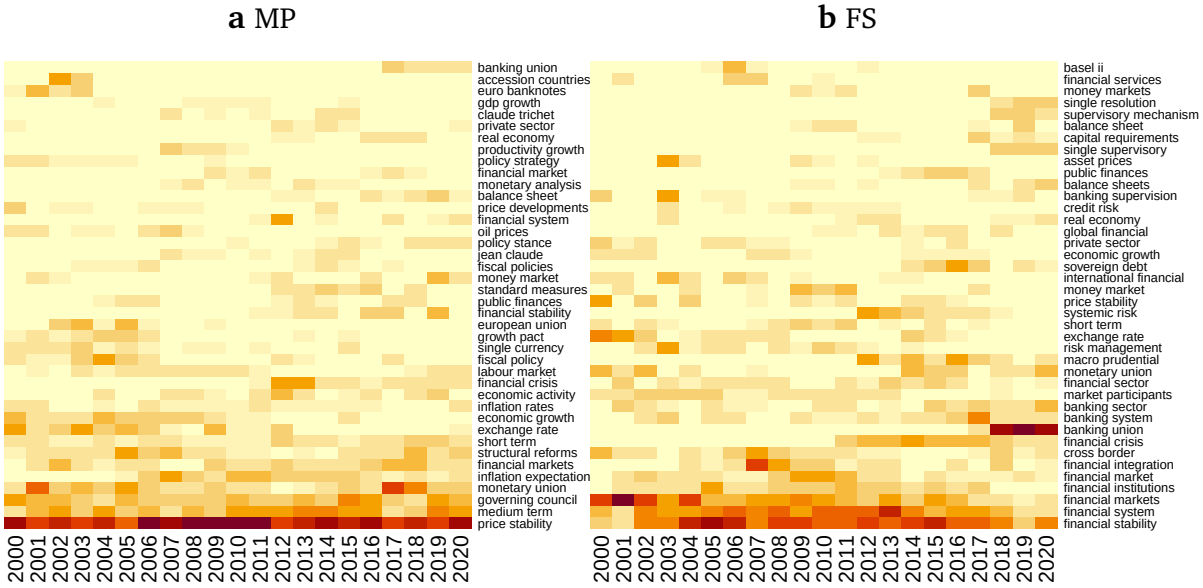
Fig. 12: Impulse response analysis: Shock to the ECB's ideal point



Notes: The plot shows impulse responses to a positive, one standard deviation shock to the ECB's ideal point based on a Cholesky decomposition. Posterior median along with 68% credible intervals shown.

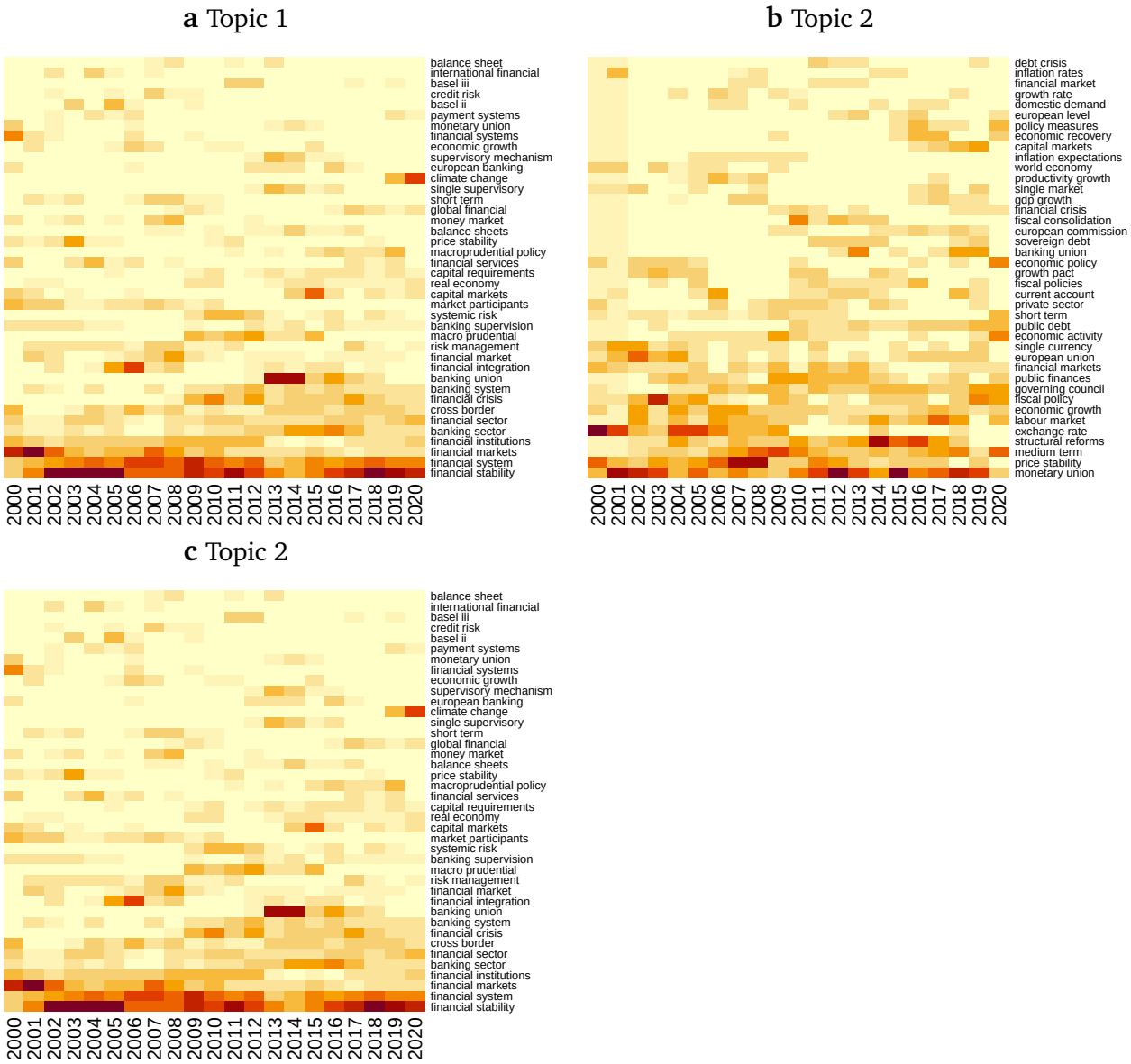
Appendix B Robustness analysis

Fig. 13: Top neutral terms per topic over time – only governors



Notes: The plot shows the top neutral terms (βs) per topic. Terms "monetary policy", "central bank", "european central" and "vice president" have been excluded. "MP" refers to monetary policy, "FS" to financial stability.

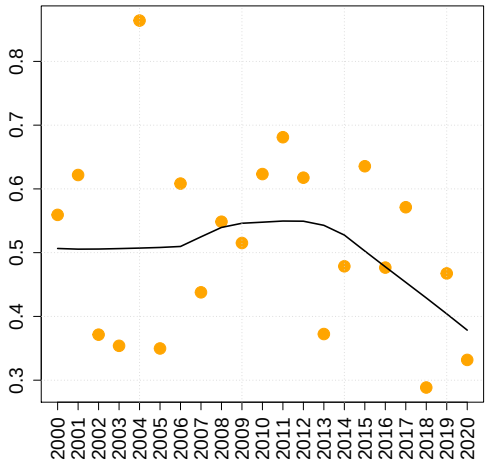
Fig. 14: Top neutral terms per topic over time – three topics



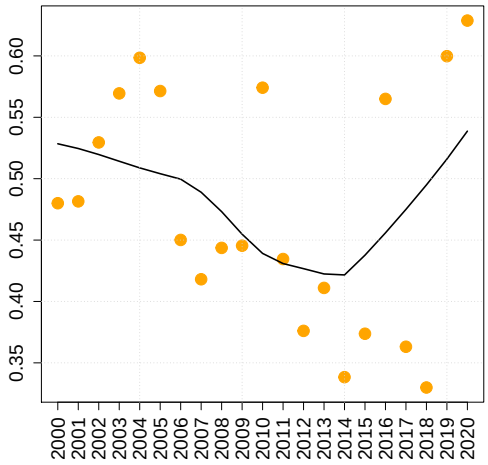
Notes: The plot shows the top neutral terms (βs) per topic. Terms "monetary policy", "central bank", "european central" and "vice president" have been excluded. "MP" refers to monetary policy, "FS" to financial stability.

Fig. 15: Variation in ideal points over time

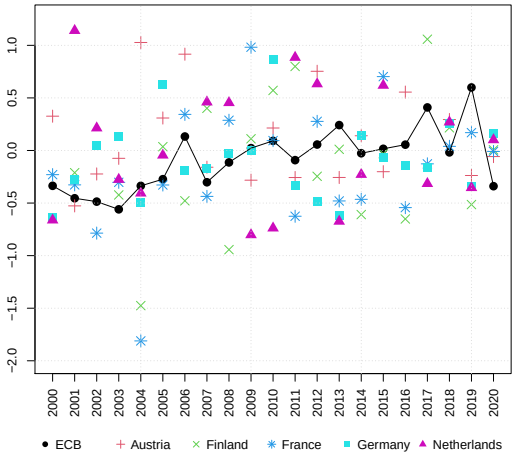
a SD of ideal points (only governors)



b SD of ideal points (3 topics)

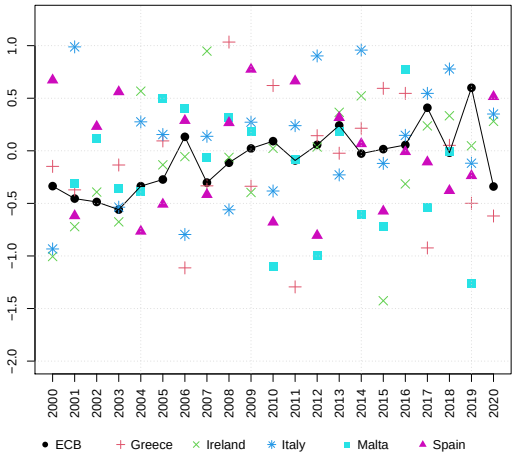


c Core countries (only governors)



d Core countries (3 topics)

e Periphery countries (only governors)



f Periphery countries (3 topics)