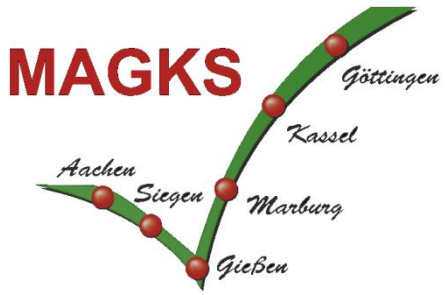

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Coordination: Bernd Hayo • Philipps-University Marburg
School of Business and Economics • Universitätsstraße 24, D-35032 Marburg
Tel: +49-6421-2823091, Fax: +49-6421-2823088, e-mail: hayo@wiwi.uni-marburg.de

Not all ECB meetings are created equal*

Sinem Kandemir† Peter Tillmann‡

May 15, 2023

Abstract

Most meetings of the Governing Council of the ECB take place *intra muros* at the ECB's premises in Frankfurt. Some meetings, however, are held *extra muros*, i.e. outside Frankfurt, hosted by one of the national central banks. This paper uses high-frequency surprises from meeting days to show that the standard deviation of surprises is higher when the ECB meets *intra muros*. This difference is mostly due to larger timing, forward guidance and QE surprises when meeting in Frankfurt. We show that the transmission of policy surprises to longer-term interest rates is significantly weaker when meeting *extra muros*. In addition, when the meeting takes place *extra muros*, the wording of the ECB communication during the press conference is significantly more similar to the preceding meeting. The results suggest that the important decisions are taken in Frankfurt and that the ECB avoids large changes to the policy path when meeting *extra muros*. The difference across meeting types has consequences for the macroeconomic impact of monetary policy.

Keywords: monetary policy, expectations, central bank communication, monetary policy committee, text analysis

***JEL* classification:** E58, E43

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†Justus-Liebig-University Giessen, Email: sinem.kandemir@wirtschaft.uni-giessen.de

‡Justus-Liebig-University Giessen, Email: peter.tillmann@wirtschaft.uni-giessen.de

1 Introduction

Decisions by the Governing Council, the policy-making body of the European Central Bank (ECB), drive financial markets. The literature typically studies market reactions in a tight window around policy decisions, which can be interpreted as reflecting surprise changes of the expected policy path.

This paper analyzes the properties of these surprises on ECB meeting days. Our contribution is a distinction between meetings taking place at the ECB's premises in Frankfurt, which we label *intra muros*, and meetings outside Frankfurt labeled *extra muros*. In normal years without a major crisis or a pandemic, six of the Governing Council's eight regular meetings take place in Frankfurt and two take place outside Frankfurt.[1] There is no other important central bank with a comparable meeting schedule.

Our key contribution is to show that not all ECB meetings are created equal. We find significant differences in the magnitude, the nature and the impact of policy surprises between *intra muros* and *extra muros* meetings. This difference has not yet been studied in the literature. It it consistent with the notion that the ECB avoids important decisions when meeting off-site.

We proceed as follows: First, we use high-frequency surprises provided by Altavilla et al. (2019) and show that the standard deviation of surprises is higher for meetings *intra muros* than meetings *extra muros*. This holds for almost all surprises covered by Altavilla et al. (2019), i.e. changes in Overnight Index Swap (OIS) rates and German Bund yields of different maturities as well as sovereign bond yields and exchange rates. The difference between meetings in Frankfurt and outside Frankfurt stems from surprises during the post-meeting press conference of the ECB president, not from a tight window around the release of the policy decision. Hence, it is information revealed during the press conference that moves markets more strongly when the meeting takes place in Frankfurt.[2] We also account for a second distinction between meetings of the Governing Council: meetings with and without new ECB/Eurosystem staff projections. The absolute surprises at longer

[1] In 2003, Vitor Constâncio, then Governor of the Bank of Portugal, explained the rationale for the meetings outside Frankfurt as follows: "We meet twice a year outside Frankfurt and this constitutes an important expression of the decentralized nature of the Eurosystem. It also underlines the accountability of the ECB to all national constituencies and the importance we attach to the need that our activity should be understood and supported by public opinion in all member states" (https://www.bis.org/review/r031112e.pdf).

[2] The literature does not yet differentiate between meetings in different locations and, hence, with differently sized surprises. Only Berger et al. (2011), who measure of the favorableness of newspaper reporting about the ECB, control for meetings held outside Frankfurt. They show that meetings outside Frankfurt receive a more favorable coverage in the media of the host country.

maturities remain larger at *intra muros* meetings even if we control for the release of macroeconomic projections.

Second, we use the factors estimated by Altavilla et al. (2019), which summarize the information content of high-frequency market reactions into target, timing, forward guidance and Quantitative Easing (QE) surprise to show that the difference across meeting locations stems from policy decisions that affect long-term interest rates, i.e. timing, forward guidance and QE surprises. Furthermore, regressions of daily yield changes on the Altavilla et al. (2019) factors show that surprises about the future policy path as reflected in the forward guidance and the QE factors are significantly more effective in shaping the yield curve when the meeting is held *intra muros*.

Third, we find that a one percentage point surprise during the press conference has a somewhat larger impact on changes of longer-term interest rate relative to the trading day before the meeting when the meeting takes place in Frankfurt. However, this difference is not statistically significant. When taking the different magnitudes of policy surprises across meeting locations into account, we find that a one standard deviation surprise has a significantly larger impact on long-term OIS rates when the meeting takes place *intra muros*.

Fourth, we follow the literature and look at the correlation of two-year yield changes and stock market responses in the window around the ECB decision. A negative correlation, i.e. a policy tightening depresses equity prices, is consistent with monetary policy shocks. A positive correlation, however, would indicate that the effect of the policy tightening is dominated by the information revealed through the ECB action reflecting that the state of the economy is better than expected. The literature refers to information shocks (e.g. Nakamura and Steinsson, 2018; Cieslak and Schrimpf, 2019; Jarocinski and Karadi, 2020). Our results suggest that pure monetary policy (information) shocks play a larger (smaller) role when the meeting is held *intra (extra) muros*.

Fifth, we apply textual analysis to the transcripts of the post-meeting press conferences. The results show that the communication at meeting days *extra muros* are semantically more similar to the previous meeting, which took place in Frankfurt. A more similar communication is consistent with smaller policy changes.

Finally, we estimate the macroeconomic consequences of policy surprises depending on the meeting type at which the surprises emerge. Our evidence suggests that restrictive target, timing and QE surprises reduce consumer prices when the policy decision is taken in Frankfurt, but leave prices unaffected when the meeting takes place outside Frankfurt. Hence, the meeting type matter not just for the impact of policy on financial markets, but also for the ability of the ECB to stabilize prices.

For the responses of industrial production, the results are less clear.
Our results are consistent with the notion that the ECB chooses the timing of major policy steps such that important decisions outside Frankfurt are avoided. Potential reasons for such a timing strategy could be that only a skeleton staff travels with the Governing Council to the meeting locations outside Frankfurt, i.e. to Riga, Venice or Madrid. Furthermore, when meeting *extra muros*, members of the Governing Council have a tighter schedule, thus leaving less time for policy discussions. The media coverage should be comparable across meetings types as the press conference is live-streamed.
Observers of the ECB seem to recognize differences across meeting types. For example, in 2013 *Reuters* writes that

> "The ECB's Governing Council meets in Bratislava next Thursday - one of two annual policy meetings outside Frankfurt. The 23-man body rarely moves rates when it meets off-base, but the bleak economic picture strengthens the case for action."[3]

Thus, the market seems to expect less from a meeting outside Frankfurt. Note, however, that our analysis is based on surprises, i.e. the difference between the realized policy decision and the market expectation. If the market anticipates less and the ECB indeed delivers less, surprises should not be affected by the nature of the meeting. Instead, we find that surprises are significantly smaller at *extra muros* meeting days. Our findings suggest that the ECB could manage expectations more effectively when using the full set of eight regularly scheduled meetings per year in order to implement policy. Avoiding decisions at the two meetings outside Frankfurt appears as a constraint on the efficient design of policy.
The remainder of this paper is organized as follows: Section 2 introduces the stylized fact based on the raw surprise data, while section 3 studies the properties of identified factors that summarize different policy dimensions reflected in the raw data. In section 4, we estimate the response of daily yields to the identified factors across meeting types. Section 5 sheds light on monetary versus information shocks and section 6 analyzes the textual properties of policy communication during the ECB press conferences. Section 7 evaluates the macroeconomic impact of policy surprises across meeting types, while section 8 introduces an illustrative model to rationalize our findings. Section 9 concludes.

[3]See https://www.reuters.com/link.

2 Meetings *intra muros* and *extra muros*: a new stylized fact

We use the information provided by Sanger and Warin (2018) and complement it with information provided on the ECB's website to classify 210 meetings for the Governing Council between 07 March 2002 and 16 December 2021. Table (4) lists all meeting dates and provides information of the location of the meeting. While most meetings took place *intra muros*, 30 meetings took place *extra muros*, i.e. in Vienna, Riga, Brussels or other locations hosted by one of the national central banks of the euro area. After the outbreak of the pandemic, some members of the Governing Council joined the meeting remotely. We classify these meetings as *intra muros* since the ECB president chaired the meeting from the ECB's premises. We do not include the non-scheduled meetings on 08.10.2008 and 18.03.2020. At 206 of these 210 meeting days, the ECB president held a press conference.[4]

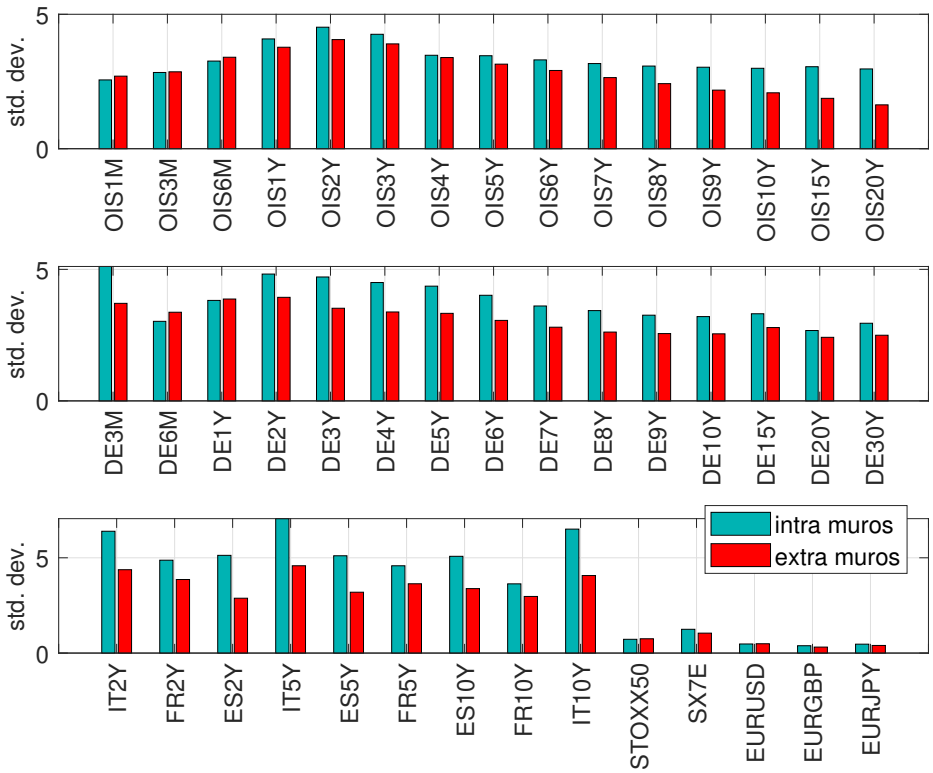
For each meeting, we collect high-frequency surprises from the database of Altavilla et al. (2019). These authors provide the change in interest rates of different types and maturities as well as the percentage change in exchange rates and stock prices during meetings of the Governing Council. The change in the tight window around policy decisions can be interpreted as reflecting the new information emanating from the meeting only.

Overall, the database contains surprises of 44 different financial assets. Moreover, the database offers the change in each asset price between 13:25 and 14:10 CET, i.e. around the press release published at 13:45 CET. We refer to this window as the press release window. The second window stretches from 14:15 to 15:50 CET and covers the press conference during which the ECB president reads out the Introductory Statement and answers questions from journalists. This window is the press conference window. Finally, Altavilla et al. (2019) calculate the change in asset prices between 13:25 and 15:50 CET, i.e. covering both the press release and the press conference. This window is the monetary event window.

For each asset price, we calculate the standard deviation of surprises separately for meetings in Frankfurt and outside Frankfurt. Figure (1) shows the standard deviations of the surprises during the wide monetary event window. We clearly see that surprises are higher when the ECB meets *intra muros* compared to meetings *extra muros*. This observation holds for almost all asset prices. Is this difference due to larger surprises in the press release window or in the press conference window?

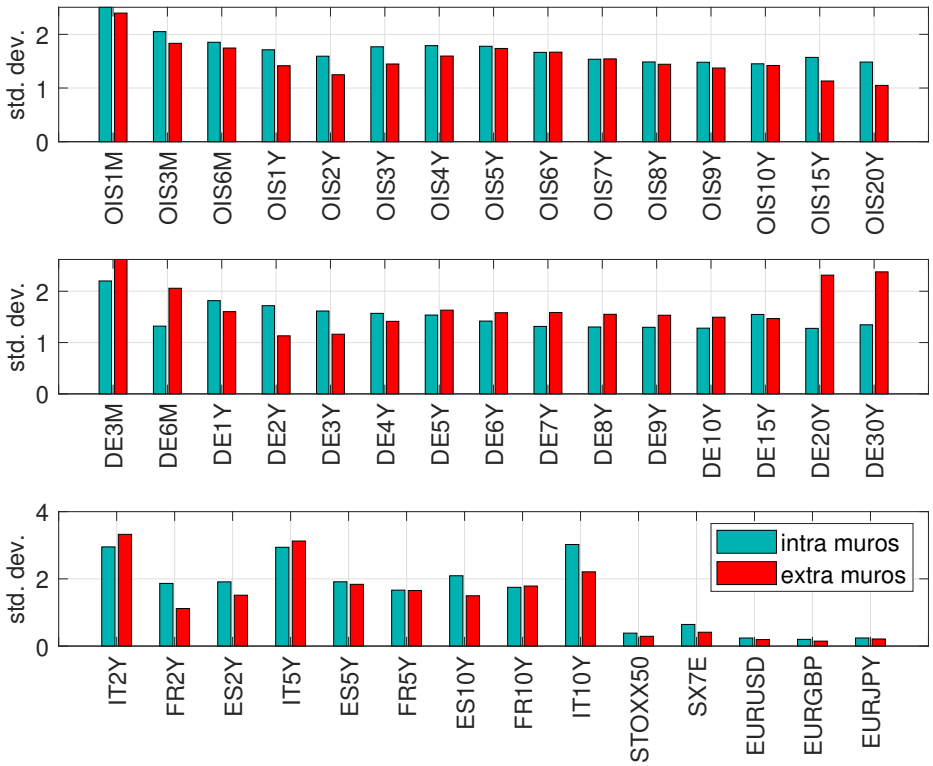
[4]There was no post-meeting press conference on 01.08.2002, 31.07.2003, 05.08.2004 and 04.08.2005.

Figure 1: Standard deviation of surprises in monetary event window



Notes: The figure shows the standard deviation of the surprises between 13:25 and 15:50 CET on ECB meting days. The figure differentiates between meetings *intra muros*, i.e. at the ECB's premises in Frankfurt, and meetings *extra muros*, i.e. outside Frankfurt. The data is taken from Altavilla et al. (2019).

Figure 2: Standard deviation of surprises in press release window



Notes: The figure shows the standard deviation of the surprises between 13:25 and 14:10 CET on ECB meting days. The figure differentiates between meetings *intra muros*, i.e. at the ECB's premises in Frankfurt, and meetings *extra muros*, i.e. outside Frankfurt. The data is taken from Altavilla et al. (2019).

Figure 3: Standard deviation of surprises in press conference window

Notes: The figure shows the standard deviation of the surprises between 14:15 and 15:50 CET on ECB meting days. The figure differentiates between meetings *intra muros*, i.e. at the ECB's premises in Frankfurt, and meetings *extra muros*, i.e. outside Frankfurt. The data is taken from Altavilla et al. (2019).

The results shown in Figure (2) suggest that the meeting location does not make a difference for the market reaction during the release window. Figure (3) reveals that the difference between meetings *intra* and *extra muros* is driven by surprises in the press conference window.

We now address two potential shortcomings of the comparison of standard deviations across meetings. First, we cannot say whether the difference between meeting types is statistically significant. Second, there is an alternative differentiation between meetings that we need to take into account - the distinction between meetings with and without ECB/Eurosystem staff macroeconomic projections. At the meeting in March, June, September and December, the ECB releases a set of macroeconomic projections. These are prepared by the ECB staff or the staff of the national central banks. It is plausible that the ECB chooses larger policy surprises based on a new set of projections.[5]

We address both concerns by estimating a regression of the series of absolute surprises in each alternative observation window on a constant, a dummy that is one for a meeting held *extra muros* and zero for other meetings (model 1) and an additional dummy that is one if macroeconomic projections are released at the meeting and zero otherwise (model 2). The coefficient on the first dummy tells us whether surprises are larger or smaller when the meeting is held outside Frankfurt. The positive coefficient on the second dummy would imply that surprises are larger on meetings days with a release of new projections.

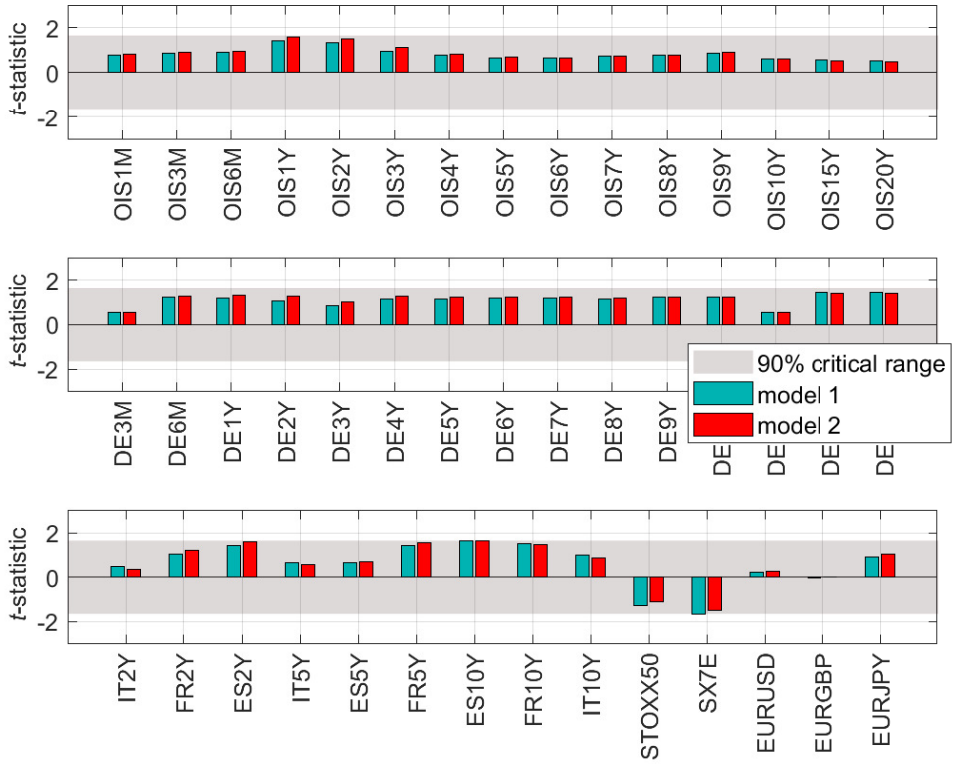
Figure (4) shows the results for the press release window. For each interest rate and asset price, respectively, the graph shows the t-statistic of the coefficient on the *extra muros* dummy for the two alternative models. The results are unambiguous: none of the t-statistics is larger than the 90% critical value. Hence, the surprises are not statistically different when the meeting is held off-site. Including a dummy to highlight meeting with projections does not make a difference.

For the press conference window, see Figure (5), the surprises are indeed significantly smaller when the meeting is *extra muros*. For most long-term interest rate, the t-statistics is below -1.65, thus implying smaller market reactions. Allowing for the additional projections-dummy, i.e. model 2, results is a somewhat smaller effect of the meeting location, but does not fundamentally change our findings.

Result 1: Across a wide range of assets, market responses are systematically smaller when the ECB meets *extra muros*. This difference is driven by surprises in the press

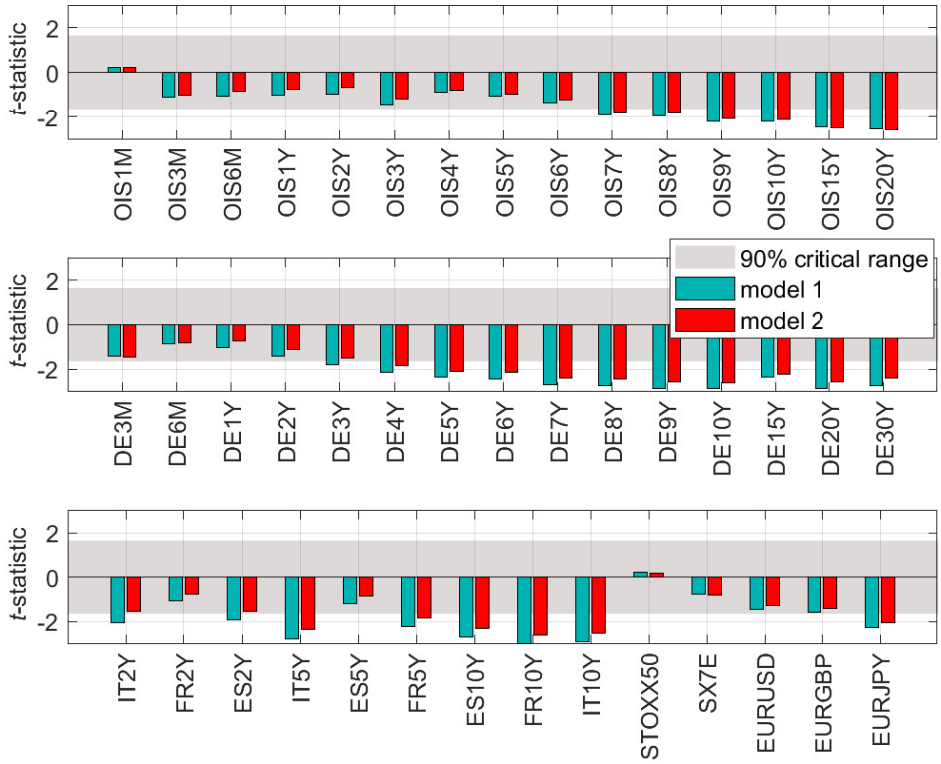
[5]See Hubert (2015) and Kontogeorgos and Lambrias (2019) for studies on the information content of the ECB/Eurosystem staff projections. Tillmann (2021) shows that dissent in the Governing Council occurs more often in meetings with new projections.

Figure 4: Absolute surprises in press release window



Notes: The figure shows the t-statistic of a regression of the absolute surprises in the press release window on ECB meting days on a constant and an *extra muros*-dummy (model 1) and, in addition, a dummy for the release of projections (model 2).

Figure 5: Absolute surprises in press conference window



Notes: The figure shows the t-statistic of a regression of the absolute surprises in the press conference window on ECB meting days on a constant and an *extra muros*-dummy (model 1) and, in addition, a dummy for the release of projections (model 2).

conference window.

How to interpret this finding? The smaller surprises during meetings outside Frankfurt are consistent with the notion that the ECB optimizes the timing of major policy decisions. When meeting in, say, Riga rather than Frankfurt, only a skeleton staff travels with the Governing Council. Hence, drawing on the vast number of experts from within the ECB is more difficult relative to meetings in Frankfurt, which should call for smaller policy steps. In addition, the schedule of meeting days outside Frankfurt is packed with an intense social program for members of the Governing Council including meetings with representatives of national governments, thus leaving less time for policy discussions and decisions.

3 Decomposing surprises

Monetary policy surprises are multidimensional. At a given meeting, the ECB provides information on conventional interest rate policy as well as unconventional policies such as forward guidance of Quantitative Easing (QE). Gürkaynak et al. (2005, 2007), Brand et al. (2019) and Swanson (2021) use factor models in order to identify three orthogonal dimensions of the policy of the U.S. Federal Reserve based on the responses of the entire term structure of interest rates to monetary surprises. Altavilla et al. (2019) use the data from their Euro Area Monetary Policy Database (EA-MPD), which we introduced in the previous sections, in order to decompose the market responses to ECB decisions. They find that one factor is sufficient to describe the responses in the press release window. For the press conference window, they find two factors until the adoption of Quantitative Easing and four factors thereafter. After a suitable rotation of these factors, the authors refer to the "target", "timing", "forward guidance" and "QE" factors.

The target factor has the highest loading on the one-months OIS rate during the press release window. The timing factors impacts market expectations in the near future and has the highest loading on one-year OIS rates in the press conference window. Importantly, it has only a small impact on longer maturities. The forward guidance factors mostly drives OIS rates between maturities of two and five years. It is important to stress that the forward guidance factor reflects changing beliefs about the future policy path that are orthogonal to current surprises. Hence, it is present in data even before the ECB formally endorsed forward guidance as a policy instrument at the zero lower bound. Finally, the QE factor has the highest loading on the long-end of the yield curve. This factor captures surprises in changes

in asset-purchase programs known as Quantitative Easing (QE).
Altavilla et al. (2019) normalize these factors such that the target factor has unit impact of one-months OIS surprises in the press release window. The timing factor has an impact of one on six-month OIS surprises in the press conference window, while the forward guidance factor are normalized to have an impact of one on two-year surprises. The QE factor is reformulated to have a unit effect on 10-year surprise.

Table 1: Standard deviations of identified factors from Altavilla et al. (2019)

factor	standard deviation	
	intra muros	extra muros
(a) press release window		
target	2.23	2.38
(b) press conference window		
timing	2.22	1.97
Forward Guidance	3.52	2.64
QE	2.70	1.70
# obs.	180	30

Notes: The table shows the standard deviation of the estimated factors from Altavilla et al. (2019) on ECB meeting days.

We use the estimated factors from Altavilla et al. (2019) and compute the standard deviations of each factor for *intra muros* and *extra muros* meetings, respectively.[6] Table (1) shows the findings. We spot a clear pattern: the standard deviation of the target factor is roughly similar across meeting types. However, the timing, the forward guidance and the QE factors are much more volatile when the meeting of the Governing Council takes place in Frankfurt. For the forward guidance and QE factors, this difference is particularly visible. This finding supports the notion that the key decision on the future path of monetary policy are taken *intra muros*.[7]

[6]The updated series of factor from Altavilla et al. (2019) are available at https://gragusa.org/factors/.

[7]We obtain similar results if we use the factors estimated by Baumgärtner (2020), Baumgärtner and Klose (2021) and Miranda-Agrippino and Nenova (2022).

Result 2: On *extra muros* meeting days, timing, forward guidance and QE surprises are significantly smaller.

4 The responses of daily interest rates

We now estimate the impact of the high-frequency factors on meeting day t estimated by Altavilla et al. (2019) on interest rates at a daily frequency. For an OIS rate of maturity n, we regress the first difference, $\Delta y_t^{(n)}$, on a constant and the respective factor j, where $j \in$ (target, timing, forward guidance, QE). The first difference in OIS rates is the change between the meeting day and the previous trading day. Importantly, we distinguish between the surprise during meetings *intra muros* (superscript *in*) and meetings *extra muros* (superscript *ex*). Hence, the regression reads

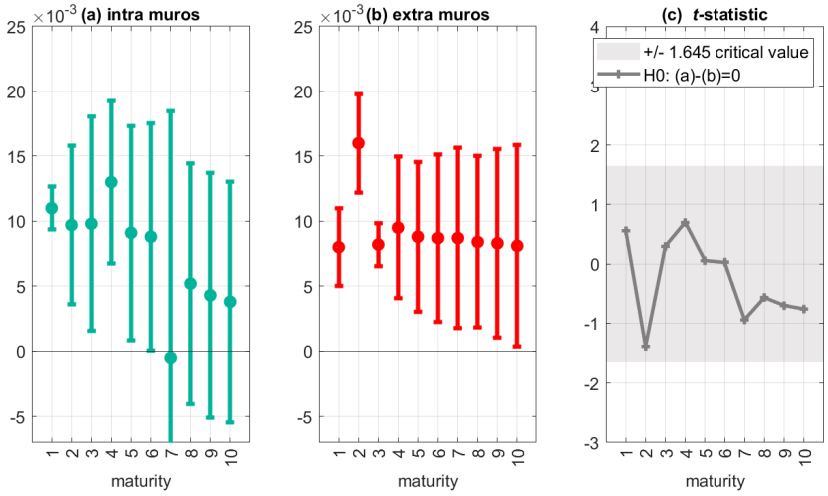
$$\Delta y_t^{(n)} = c + \beta_1 \varepsilon_{t,j}^{in} + \beta_2 \varepsilon_{t,j}^{ex} + e_t, \tag{1}$$

where β_1 and β_2 are our coefficients of interest and $\varepsilon_{t,j}$ is the factor of type j. If the high-frequency surprises are positive, i.e. if policy tightened unexpectedly, y_t should increase. Hence, we expect the respective slope coefficient to be positive. Note that all factors, including the forward guidance factors, are normalized such that an increase reflects a policy tightening. The dependent variables in this estimation are euro area OIS rates for maturities from $n = 1$ to $n = 10$ years.

It is important to keep in mind that the previous section showed that $\varepsilon_{t,j}^{in}$ has a larger standard deviation than $\varepsilon_{t,j}^{ex}$. Without accounting for this difference, a comparison of the estimated slope coefficients would be biased. A one percentage point surprise *extra muros* might be more effective, while a surprise of such magnitude is much rarer compared to meetings *intra muros*. If we want to compare the effectiveness of a "usual" surprise, we need to divide both $\varepsilon_{t,j}^{in}$ and $\varepsilon_{t,j}^{in}$ by their sample standard deviation before estimating equation (1).

Figure (6) depicts the estimated regression coefficients for the target factor. The vertical bars reflect a 90% confidence band with HAC standard errors. Panel (a) of the figure depicts the effect on *intra muros* meeting days. Panel (b) depicts the effect on *extra muros* meeting days. In panel (c), we show the series of $t-$statistics for the null hypothesis of equal effects across meeting types and the corresponding 90% critical values. We find that shorter maturities respond significantly to target surprises. Importantly, we do not find a significant difference in the responses on intra muros and extra muros meeting days. Figure (7) shows the responses to the timing factor. In contrast to the results for the target factor, the slope coefficients

Figure 6: Response of daily OIS rates to target factor



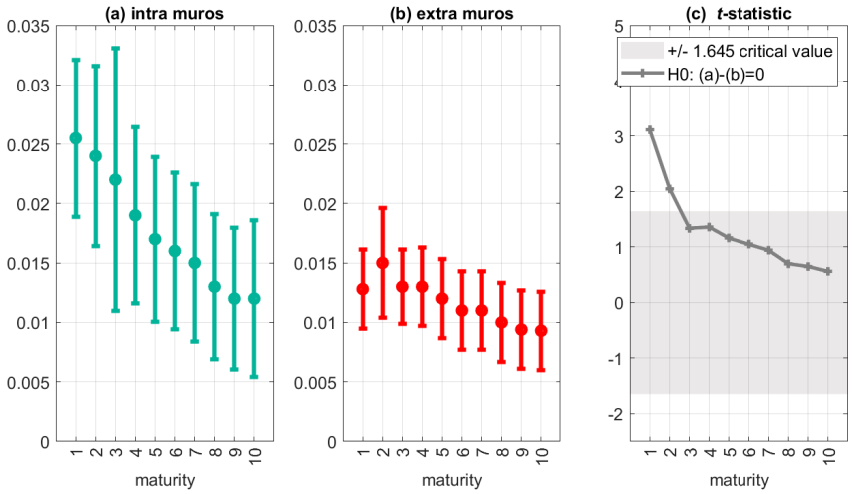
Notes: The figure shows the response of daily changes in OIS rates of different maturities to a target surprise in the press release window. The vertical bars reflect a 90% confidence band with HAC standard errors. Panel (a) depicts the effect on *intra muros* meeting days. Panel (b) depicts the effect on *extra muros* meeting days. In panel (c), we show the series of $t-$statistics for the null hypothesis of equal effects and the corresponding 90% critical values.

for each maturity are positive and statistically significant. Hence, OIS rates of all maturities increase following a policy tightening. As expected, the increase is strongest for shorter maturities of one and two years. Importantly, the series of t-statistics suggests that for both of these maturities the impact during meetings *intra muros* is significantly higher than during meetings *extra muros*.

Forward guidance surprises, see Figure (8), increase yields for each maturity with the impact being strongest for four-year OIS rates. For one-year to six-year maturities, the response following the policy tightening is significantly stronger on *intra muros* meeting days. The clearest difference between meeting types can be observed for QE surprises, see Figure (9). Responses of OIS rates for maturities between three and ten years are significantly higher if the meeting takes place in Frankfurt. For ten-year rates, the response is more than three times stronger. Hence, surprises about the future policy path as reflected in the forward guidance and the QE factors are significantly more effective in shaping the yield curve when the meeting is held *intra muros*.

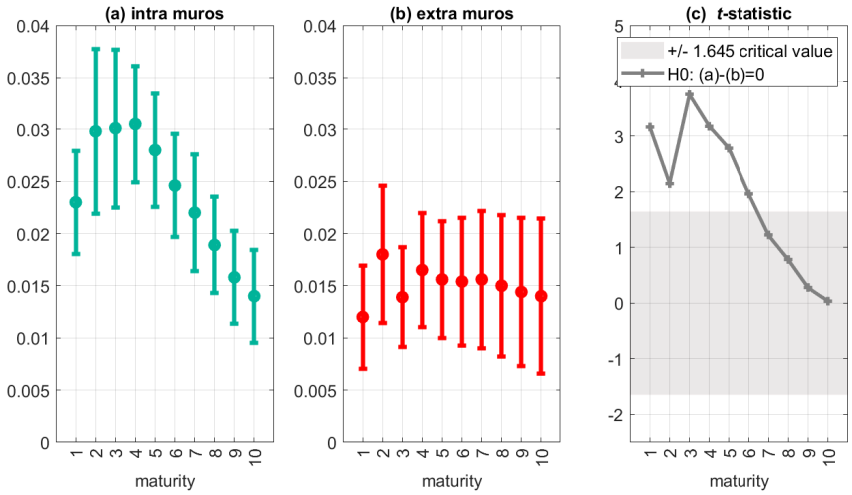
As mentioned before, a second distinction between meeting types applies to meetings with and without ECB/Eurosystem staff projections. We also run a regression of daily interest rates on the four surprise factors and separate surprises on meeting days with new projections from meetings without new projections. When standard-

Figure 7: Response of daily OIS rates to timing factor



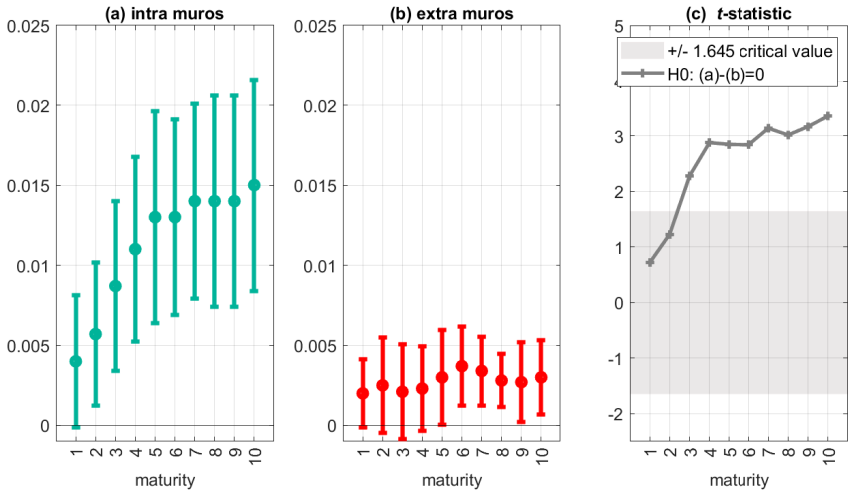
Notes: The figure shows the response of daily changes in OIS rates of different maturities to a timing surprise in the press conference window. The vertical bars reflect a 90% confidence band with HAC standard errors. Panel (a) depicts the effect on *intra muros* meeting days. Panel (b) depicts the effect on *extra muros* meeting days. In panel (c), we show the series of $t-$statistics for the null hypothesis of equal effects and the corresponding 90% critical values.

Figure 8: Response of daily OIS rates to forward guidance factor



Notes: The figure shows the response of daily changes in OIS rates of different maturities to a forward guidance surprise in the press conference window. The vertical bars reflect a 90% confidence band with HAC standard errors. Panel (a) depicts the effect on *intra muros* meeting days. Panel (b) depicts the effect on *extra muros* meeting days. In panel (c), we show the series of $t-$statistics for the null hypothesis of equal effects and the corresponding 90% critical values.

Figure 9: Response of daily OIS rates to QE factor



Notes: The figure shows the response of daily changes in OIS rates of different maturities to a QE surprise in the press conference window. The vertical bars reflect a 90% confidence band with HAC standard errors. Panel (a) depicts the effect on *intra muros* meeting days. Panel (b) depicts the effect on *extra muros* meeting days. In panel (c), we show the series of $t-$statistics for the null hypothesis of equal effects and the corresponding 90% critical values.

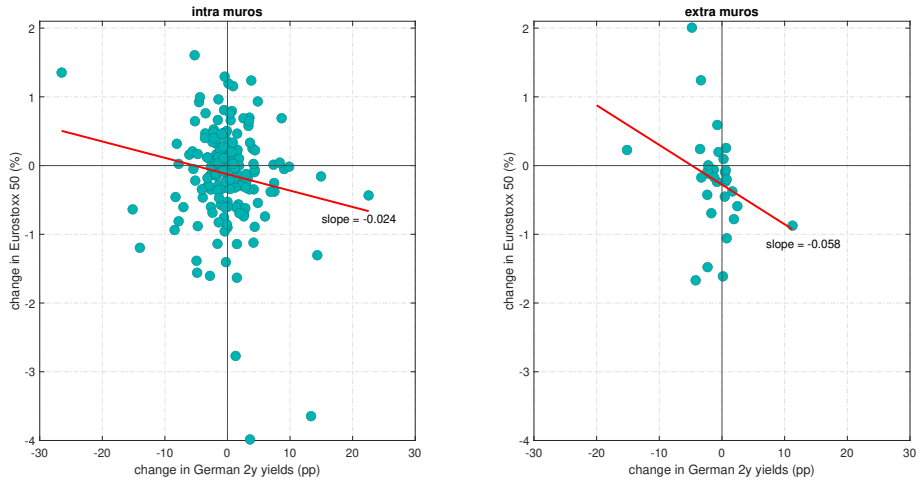
izing the surprises to control for differences in standard deviations, we do not find significant differences in the estimated coefficients across meeting types.

Result 3: When the ECB meets *intra muros*, surprises about the future policy path are more effective in driving long-term rates compared to a meeting *extra muros*.

5 Monetary versus information surprises

An unexpected monetary tightening should depress real economic activity. Stock prices should fall upon information about tighter monetary conditions, i.e. when bond yields increase. Hence, we should observe a negative correlation of stock and bond yield changes on ECB decision days. Jarocinski and Karadi (2020), among others, have shown that for several meeting days this correlation has the wrong sign: stock prices actually increase when policy tightens. The explanation of this positive correlation rests on the assumption of an information advantage of the central bank: if market participants know that the ECB is better informed and observe a monetary tightening, they update their assessment of the state of the economy. As a results, stock prices increase. The literature (Nakamura and Steinsson, 2018; Cieslak and Schrimpf, 2019; Jarocinski and Karadi, 2020) refers to information effects

Figure 10: Correlation between yield changes and stock prices changes on ECB meeting days



Notes: The graph shows the correlation of changes in German two-year yields and the percentage change in the Eurostoxx 50 stock price index on *intra muros* and *extra muros* meeting days. The data is taken from the EA-MPD of Altavilla et al. (2019).

or information surprises, respectively.[8]

In order to study the role of monetary and information surprises for our findings, Figure (10) depicts all changes in German two-year yields and the Eurostoxx 50 in our sample distinguished between meeting types. Again, the data is taken from Altavilla (2019). We find that the OLS slope of the fitting line between yield changes and stock price changes is -0.02 for meetings *intra muros*, but -0.06 for meetings held *extra muros*. This is consistent with information shocks being more important for meetings in Frankfurt, thus weakening the correlation between stock prices and yield changes.

[8]This interpretation of the counterintuitive responses of stock and bond markets is not undisputed, see Bauer and Swanson (2023).

Table 2: Policy surprises vs information surprises

surprise	standard deviation	
	intra muros	extra muros
pure policy	1.01	0.98
information	1.03	0.77
# obs.	180	30

Notes: The table shows the standard deviation of high-frequency surprises on ECB meeting days. The data is taken from Kerssenfischer (2022).

Jarocinski and Karadi (2020), Andrade and Ferroni (2021) and Kerssenfischer (2022) identify information surprises for the euro area imposing sign restrictions on changes of German two-year bond yields and changes in the Eurostoxx 50 stock price index. Here, we use the identified surprises from Kerssenfischer (2022). He splits the high-frequency change in German two-year yields into "pure policy surprises" and "information surprises". Both of these have a mean of zero and unit variance. Table (2) shows the standard deviation of these two types of surprises on ECB meeting days. While the standard deviation of pure policy surprises is almost equal for meeting *intra muros* and *extra muros*, the standard deviation of information surprises is lower when the meeting takes place outside Frankfurt. This finding is in line with the correlation between stock price and interest rate changes shown before: information shocks are more prevalent when the meeting takes place at the ECB's premises.

Result 4: Information shocks play a smaller role when the meeting is held off-site.

6 The content of the press conferences

The previous sections established that policy surprises are different when the ECB meets off-site. This finding is based on market reactions on meeting days of the Governing Council. A key result was that the difference across meeting types mainly stems from the press conference after the policy decision, not from the press release. We now want to provide evidence in support of our main result based on the textual information conveyed during the press conference.[9] The key challenge is that the

[9]For other studies of ECB press conferences using text analytical tools see Paloviita et al. (2020), Klejdysz and Lumsdaine (2022), Parle (2022), Pavelkova (2022) and Baranowski et al. (2023). De

transcripts of the press conferences contain multidimensional information.[10] We focus on two of these dimensions: first, the similarity of the communication during the press conference to the preceding press conference and, second, the complexity of the communication. We will study both dimensions separately for the Introductory Statement, the ECB president's answers in the Q&A part of the press conference as well as both parts jointly.[11]

6.1 Similarity

To shed light on the semantic structure and the similarity between two press conferences, we calculate the cosine similarity between their word frequency vectors (Manning, et al., 2008; Acosta and Meade, 2015; Ehrmann and Talmi, 2020). For this, we define the cosine similarity as

$$S_{A,B} = \frac{\sum_{w=1}^{W} A_w B_w}{\sqrt{\sum_{w=1}^{W} A_w^2}\sqrt{\sum_{w=1}^{W} B_w^2}}, \tag{2}$$

where W is the total number of unique words in the entire corpus of press conferences and vectors A_w and B_w measure the frequency with which a specific word w appears in press conferences A and B, respectively. Note that, while the numerator refers to the dot product of vectors A and B, the denominator represents the Euclidean lengths, respectively. As a result, press conferences that share the same wording and identical word frequency proportions will have a cosine similarity close to unity ($S_{A,B} = 1$), whereas press conferences that are mostly unrelated (or orthogonal) to each other, will result in a cosine similarity close or equal to zero ($S_{A,B} = 0$), indicating only little to no semantic similarity.

Next, in order to focus on the textual component only, we follow common preprocessing steps and prepare the text data as follows. First, we take into account the unique character sequence within a document and segment each document into smaller units (*tokens*), namely sentences and words. Second, we convert the text to lower case letters and remove all non-alphanumeric characters, punctuation, whitespace and stopwords.[12] Third, we lemmatize the text and reduce words to their base

Pooter (2021) and Narain and Sangani (2023) offer an analysis of the press conferences held by Federal Reserve chairs. The latter study also looks at the market impact of communication as a very high frequency.

[10] Recently, research by Gorodnichenko et al. (2023) focuses on the impact of emotions during press conference of the Federal Reserve chair. Kanelis and Siklos (2022) adopt a similar approach for the press conferences of the ECB.

[11] We use the data set of Sanger and Warin (2018), which we update until December 2021.

[12] Note that unstructured text data usually contain uninformative sequences of short functional

or root meaning. As a result, the respective lemma represents the base form of all its inflectional forms. Forth, to emphasize the importance of words and expressions that are most prevalent, a common practice is to weight raw term frequencies by using the term frequency-inverse document frequency (*tf-idf*).

For our set of 206 ECB meeting days with a press conference, we obtain a 206×206 matrix with the bilateral similarities of the Introductory Statements, the ECB's answers or the full press conferences for each possible pair of meetings. Figure (11) plots this information for the full press conference as a heatmap. Not surprisingly, we see that meeting pairs closer to the main diagonal become more similar. In addition, the graph shows a higher similarity among the meetings from the beginning of the sample to around meeting number 110. Meetings thereafter have less in common with the first 100 meetings. This break reflects the adoption of unconventional monetary policies after the euro area reached the zero lower bound of nominal interest rates. The new set of policy programs changed the language of the press conference. Around meeting number 190, the heatmap shows again a change in color to a darker blue, thus indicating another break point. This coincides with the COVID-19 pandemic in 2020, which again changed the wording of the press conference.

From this matrix of bilateral similarities, we now select the similarity of consecutive meetings only. The time series of meeting-to-meeting similarity is depicted in Figure (12) for the Introductory Statements, the ECB's answers in the Q&A part and the full press conference. The times series suggest that the Introductory Statements of two consecutive meeting days are semantically more similar than the subsequent Q&A parts of the press conferences. Furthermore, we spot an upward trend in similarity over the first sample years suggesting that both the ECB and the media gradually adjusted their wording until a level was reached at which the wording remains very similar across meetings.

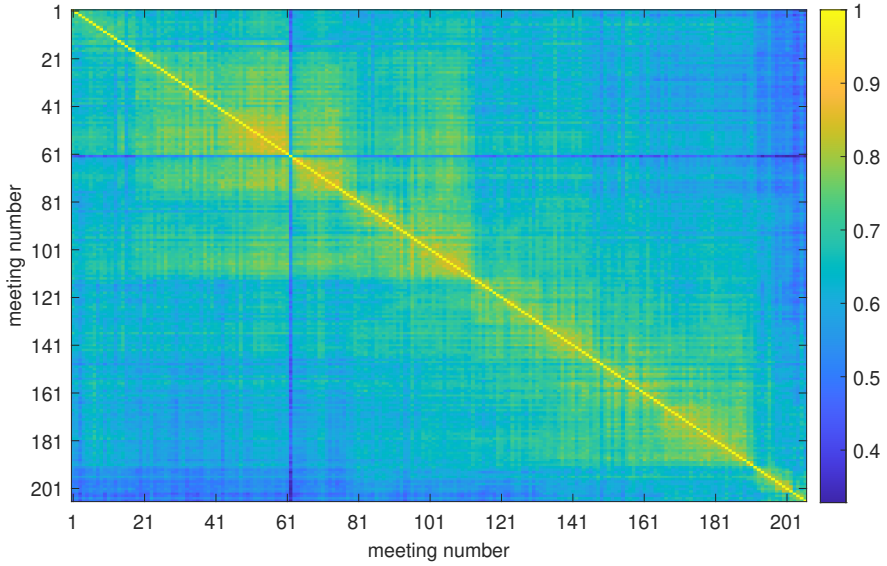
We estimate a straightforward regression of the semantic similarity with respect to the previous meeting on a constant, a time trend, a dummy that is one for meetings with new ECB/Eurosystem staff projections and zero otherwise and an index that is one if the meeting in t is held *extra muros*. The time trend captures the increase in similarity over time. A positive coefficient on the extra muros dummy would indicate that the ECB keeps its communication more closely aligned to that of the previous meeting if the meeting is held outside Frankfurt.[13]

Panel (a) of Table (3) shows the estimated coefficients. For the Introductory State-

words that appear frequently but are considered to convey little to no informative value. Hence, to highlight significant words that are specific to the text, we use the predefined stop word list from the `Natural Language Toolkit (NLTK)` for Python 3.11.

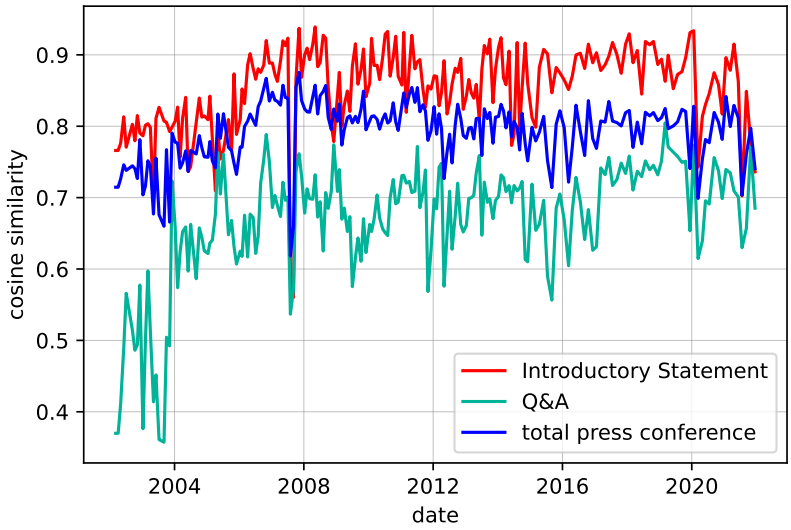
[13]Remember that there are no cases with two consecutive meetings held *extra muros*.

Figure 11: Semantic similarity of press conferences



Notes: The figure shows the pairwise cosine similarity of the wording used in all ECB press conferences.

Figure 12: Semantic similarity of consecutive press conferences



Notes: The figure shows the pairwise cosine similarity of consecutive Introductory Statements, ECB's answers in the Q&A part and full press conferences.

ment and the full press conference, the similarity is significantly smaller if the meeting coincides with the release of new projections. This is consistent with the notion that policy changes are more likely to be announced in meetings with new projections. Furthermore, we obtain a positive and significant coefficient on the *extra muros* dummy. The ECB's answers in the Q&A part of the press conference and the full press conferences are semantically more similar to the previous meeting if the meeting is held *extra muros*. This is consistent with the ECB avoiding large policy changes when the meeting is outside Frankfurt. The results remain unchanged if we exclude the meetings from March 2020 onwards, when the COVID-19 pandemic disrupted the meeting calendar and forced the ECB to hold all meetings online or in Frankfurt, respectively. Besides, the coefficient on the time trend is significantly positive for each dependent variable. Thus, the semantic similarity of communication increases over time.

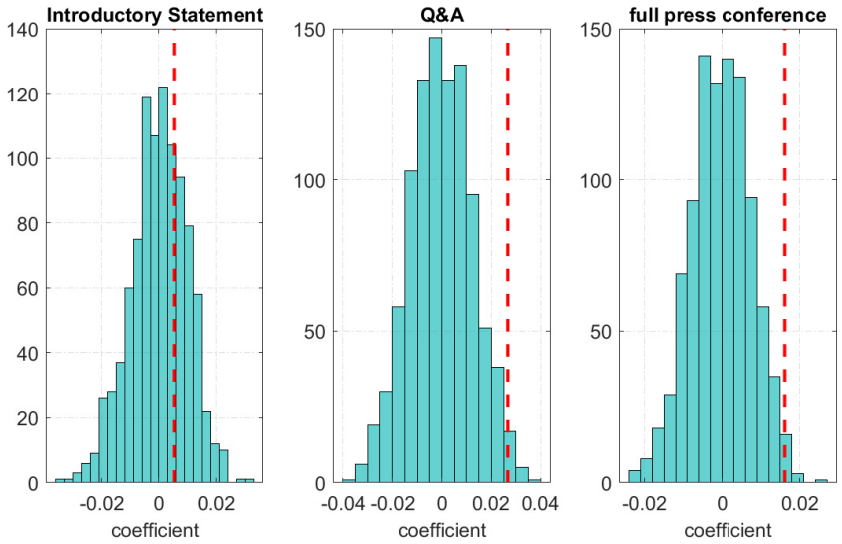
Table 3: Semantic similarity and complexity of press conferences

	Introductory Statement	Q&A	total press conference
	(a) dep. variable: cosine similarity		
extra muros	0.0053	0.0267	0.0161
	(0.0079)	(0.0109**)	(0.0059***)
projections	−0.0237	−0.0050	−0.0091
	(0.0050***)	(0.0063)	(0.0038**)
time trend (×10)	0.0037	0.0078	0.0019
	(0.0009***)	(0.0018***)	(0.0008**)
	(b) dep. variable: complexity (Flesch-Kincaid)		
extra muros	−0.0348	0.3481	0.2718
	(0.1448)	(0.1509**)	(0.1234**)
projections	−0.8954	0.0664	−0.1905
	(0.1047***)	(0.1408)	(0.1044*)
time trend (×10)	−0.0299	−0.0299	−0.0461
	(0.0195)	(0.0022)	(0.0211**)
	(c) dep. variable: complexity (Gunning Fog)		
extra muros	−0.1062	0.3451	0.2538
	(0.1528)	(0.1658**)	(0.1311*)
projections	−0.8833	0.0986	−0.1654
	(0.1117***)	(0.1508)	(0.110)
time trend (×10)	−0.0123	−0.0294	−0.0421
	(0.0205)	(0.024)	(0.0224*)
	(d) dep. variable: complexity (SMOG)		
extra muros	−0.0701	0.2274	0.1725
	(0.1082)	(0.1171*)	(0.0900*)
projections	−0.6446	0.0729	−0.0993
	(0.0794***)	(0.0962)	(0.0742)
time trend (×10)	−0.0091	−0.0178	−0.0288
	(0.0148)	(0.0156)	(0.0153*)
	(e) dep. variable: readability (Flesch Reading Ease)		
extra muros	0.3256	−1.4101	−1.1096
	(0.5978)	(0.6455**)	(0.4986**)
projections	3.2453	−0.3413	0.3889
	(0.3930****)	(0.4774)	(0.3753)
time trend (×10)	0.0674	0.0790	0.1812
	(0.0748)	(0.0784)	(0.0081**)

Notes: The table shows the estimated coefficients from a regression of semantic similarity and complexity, respectively, on a constant, the *extra muros*-dummy, a dummy highlighting ECB/Eurosystem staff projections and a time trend. Robust standard errors in parentheses. A significance level of 1%, 5% and 10% is denoted by ***, ** and *.

In order to support this finding further, we run a placebo experiment. In the previous regression, we included a dummy variable with 30 entries of one reflecting meetings *extra muros* and the remaining entries equal to zero. We now create n random times

Figure 13: Estimates from placebo experiment



Notes: The figure shows the distribution of the estimated coefficients from regressions of the semantic similarity of consecutive meetings on 1000 randomly generated placebo location dummies. The red, dashed line corresponds to the estimated coefficient on the true location dummy that is one for *extra muros* meetings and zero otherwise.

series of zeros and ones, each 206 observations in length, with random permutations of the 30 entries of one. Hence, we randomly select 30 meeting days. To match the properties of the actual *extra muros*-dummy, we make sure that none of the placebo series has two consecutive entries of one. We estimate the regression model n times for each placebo series and store the coefficient on the placebo. Figure (13) plots the distribution of the estimated coefficients for $n = 1000$. In addition, the figure also shows the estimated coefficient on the true meeting dummy. We find that for the Q&A part and the full press conference, more than 99% of all placebo results are below the point estimate on the true meeting dummy. This supports the interpretation that the higher similarity indeed reflects the location of the meeting rather than other omitted factors. For the Introductory Statements, the result is somewhat weaker with only 69% of all placebo estimates being below the estimate on the true meeting dummy.

6.2 Complexity

In order to assess the linguistic complexity of the Introductory Statements, the Q&A parts and the full press conferences, respectively, we further introduce two readability metrics: the Gunning Fog Index (1952) and the Flesch Kincaid Grade Level (1975). Note that, compared to other readability tests, such as the Flesch Read-

ing Ease (1948) and McLaughlin's SMOG index (1969), the Gunning Fog (FOG) formula convinces with its simplicity Taking into account the sentence length and the percentage of complex words, namely words that consist of three syllables and more, the index is calculated as follows

$$FOG = 0.4 \left[\left(\frac{words}{sentences} \right) + 100 \left(\frac{complex\ words}{words} \right) \right]. \tag{3}$$

The FOG formula gives the years of formal education needed to understand the content on a first reading. It is measured by grades according to the US school grading system, such that the reading level ranges from six (sixth grade) to seventeen (college graduate). In other words, any score less than or equal to six will be denoted as 6, whereas results over seventeen are usually reported as 17 and, thus, are considered as post-graduate level. Figure (14) shows the evolution of the FOG Index for each press conference in our sample. We find that, with an average score of 17.28, the Introductory Statements seem to contain a more complex language compared to the corresponding Q&A parts and the full press conferences, respectively. These findings are line with Coenen et al. (2017) and, thus, imply a high level of linguistic complexity in communication. However, considering that the opening statements usually adopt a more technical format than the following Q&A parts, these results are no surprise.

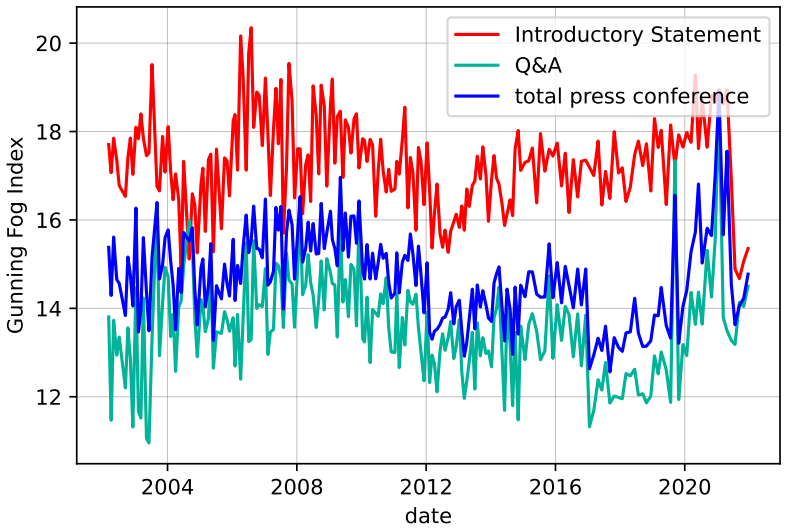
To further investigate these findings, we introduce the Flesch Kincaid Grade Level (FK) as an alternative readability measure. Taking into account the average sentence length and the average number of syllables in each word, the measure is calculated as follows

$$FK = 0.39 \left(\frac{total\ words}{total\ sentences} \right) + 11.8 \left(\frac{total\ syllables}{total\ words} \right) - 15.59. \tag{4}$$

Despite the differences in index construction, the Flesch Kincaid Grade Level also aligns with the US school grading system and measures the years of formal education needed to understand the textual content. Again, higher (lower) values imply a greater (lower) degree of complexity. Figure (15) shows a similar result for our sample. With an average score of 13.32 for the Introductory Statements and an average score of 9.95 for the Q&A parts, the variation in patterns align with high levels of linguistic complexity measured using the FOG.

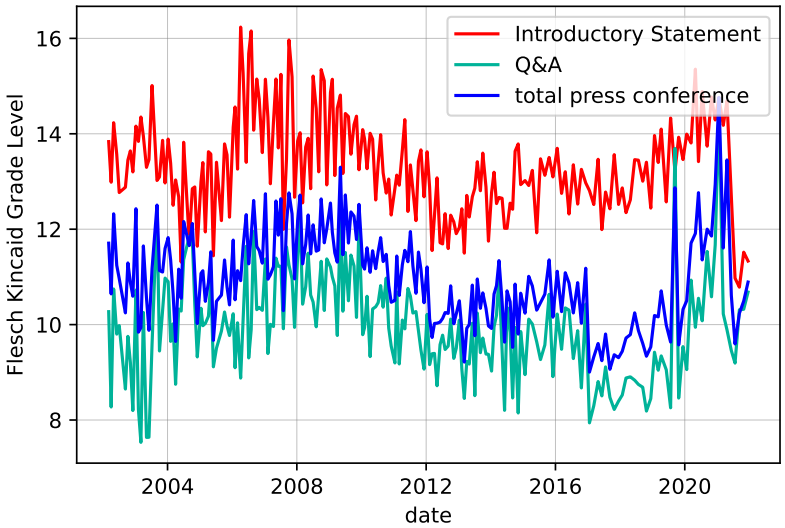
The estimated regression is analogous to the model from the previous subsection. We regress the alternative measures of semantic complexity on a constant, a time trend, the projections dummy and the *extra muros* dummy. The coefficient on the

Figure 14: Readability of press conferences



Notes: The figure shows the Gunning Fog Index as a degree of linguistic complexity used in ECB press conferences. The readability metric measures the years of formal education needed to understand the textual content. Higher (lower) values imply a greater (lower) degree of complexity in ECB communication.

Figure 15: Readability of press conferences



Notes: The figure shows the Flesch-Kincaid Grade Level as a degree of linguistic complexity used in ECB press conferences. The readability metric measures the years of formal education needed to understand the textual content. Higher (lower) values imply a greater (lower) degree of complexity in ECB communication.

latter dummy tells us whether the communication is more or less complex when the meeting is held off-site.

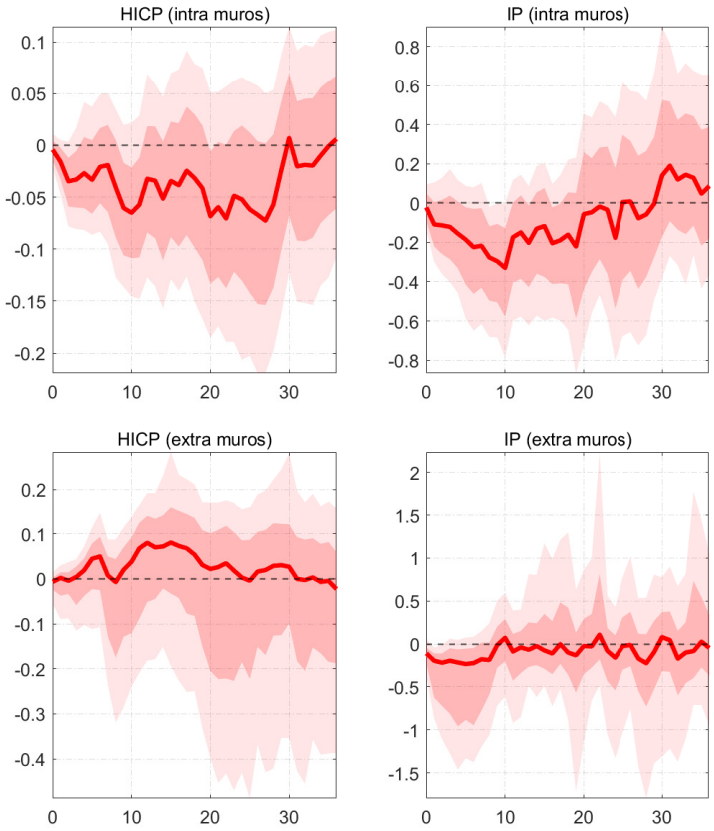
Panels (b) to (e) of Table (3) summarize the regression results. The complexity of the Introductory Statement is smaller on meeting days with new macroeconomic projections. The location dummy, however, does not enter significantly. In terms of complexity, Introductory Statements after *extra muros* meetings are indistinguishable to meetings held in Frankfurt. We now turn to the ECB's answers during the Q&A part of the press conference. For each measure of complexity, the meeting dummy enters with a coefficient that is significant at the 10% level only. The estimated coefficients suggest that the communication during the Q&A becomes more complex or less readable in terms of the Flesch Reading Ease measure, respectively. These results are difficult to reconcile with the notion that the ECB avoids important decisions, which would suggest that the communication is less rather than more complex, when meeting outside Frankfurt. The results imply that the effects stems from the Q&A part of the press conferences, not from the Introductory Statements. One potential reason for the inconsistency could be that the composition of the media asking questions is more heterogeneous outside Frankfurt with a small tilt towards smaller and more regional media outlets that do not continuously cover ECB decisions. When responding, the ECB presidents might need longer sentences and, hence, more complex language, compared to responses to questions from e.g. *Bloomberg* or *The Financial Times*.

Result 5: The communication of the ECB at meetings held outside Frankfurt is semantically more similar to the previous meeting compared to meetings in Frankfurt.

7 Does it matter for the macroeconomic impact of monetary policy?

In the last step of the analysis, we ask whether monetary policy impulses emanating from the two alternative meeting types differ in their macroeconomic impact. We estimate local projections (Jordà, 2005) in order to quantify the response of a dependent variable at time $t + h$, e.g. y_{t+h}, to the factors from Altavilla et al. (2019) introduced before. The dependent variable is either the (log) Harmonized Index of Consumer Prices or the (log) index of industrial production. The vector containing the four factors is ε_t^j. Importantly, we differentiate between shocks emanating from

Figure 16: Response to target factor



Notes: The figure shows the response of the Harmonized Index of Consumer Prices (HICP) and the index of industrial production (IP) h periods after a shock on an *intra muros* or *extra muros* meeting day. The shaded areas are 68% and 90% bootstrapped probability bands.

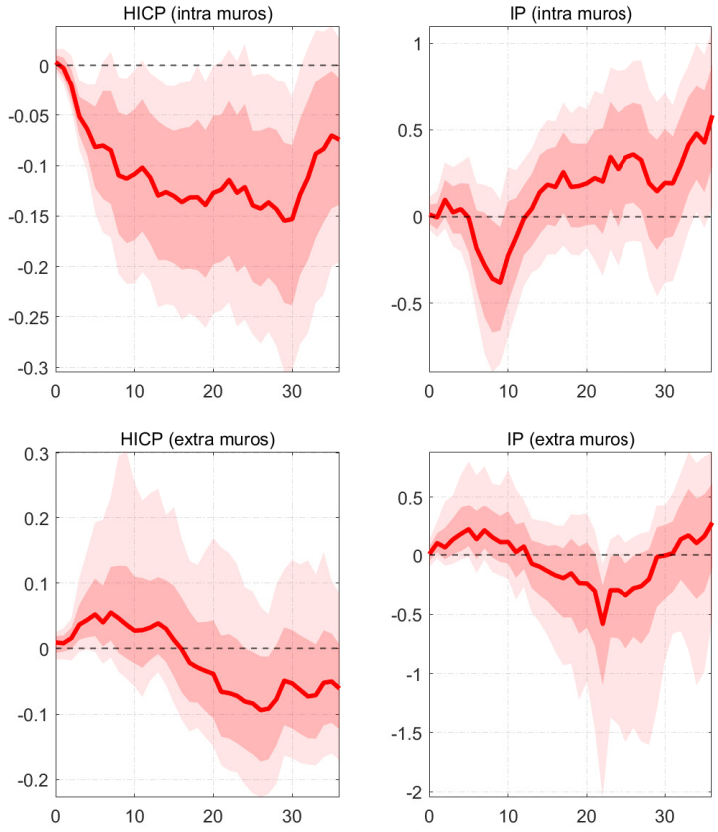
a meeting held *intra muros* and a meeting held *extra muros*, i.e. $j = in, ex$,

$$y_{t+h} = \alpha_h + \beta_h^{in}\varepsilon_t^{in} + \beta_h^{ex}\varepsilon_t^{ex} + \Gamma_h' \sum_{s=1}^{q} \mathbf{x}_{t-s} + u_{t+h}, \tag{5}$$

where α_h is a constant and $\mathbf{x_t}$ contains a set of q lags of control variables. Plotting β_h^{in} and β_h^{ex} as a function of $h = 0, ..., H$ provides us with impulse response functions to the two types of policy impulses. Since we saw earlier that the standard deviations of surprises are different across meeting types, we normalize each factor to have a standard deviation of one. The vector of control variables includes four lags of the two dependent variables as well as four lags of the dollar exchange rate, the (log) oil price and the Wu and Xia (2016) shadow short-rate.

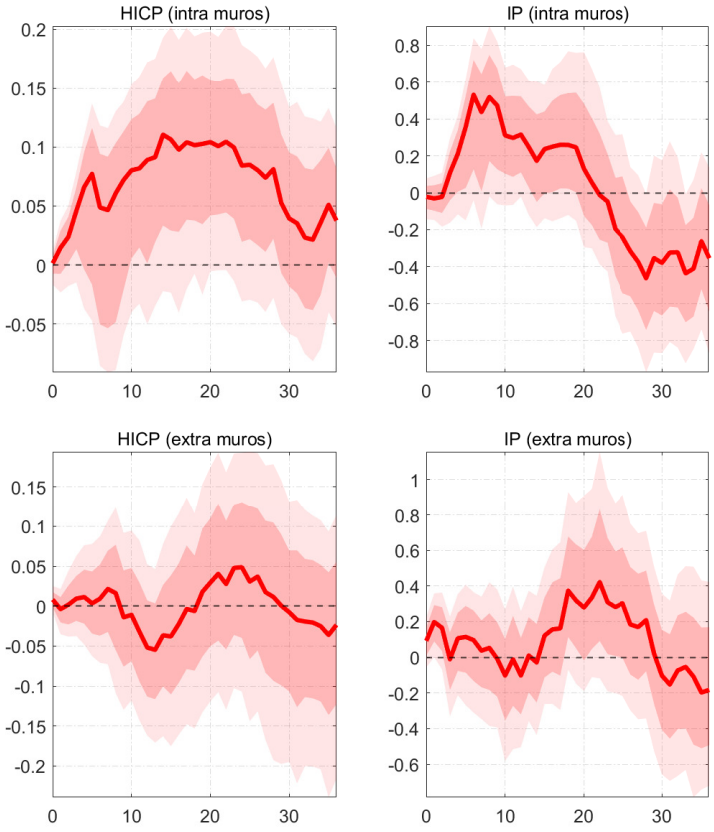
Figure (16) shows the responses of prices and activity to the target factor. For *intra muros* shocks, consumer prices and industrial production fall. Hence, a monetary

Figure 17: Response to timing factor



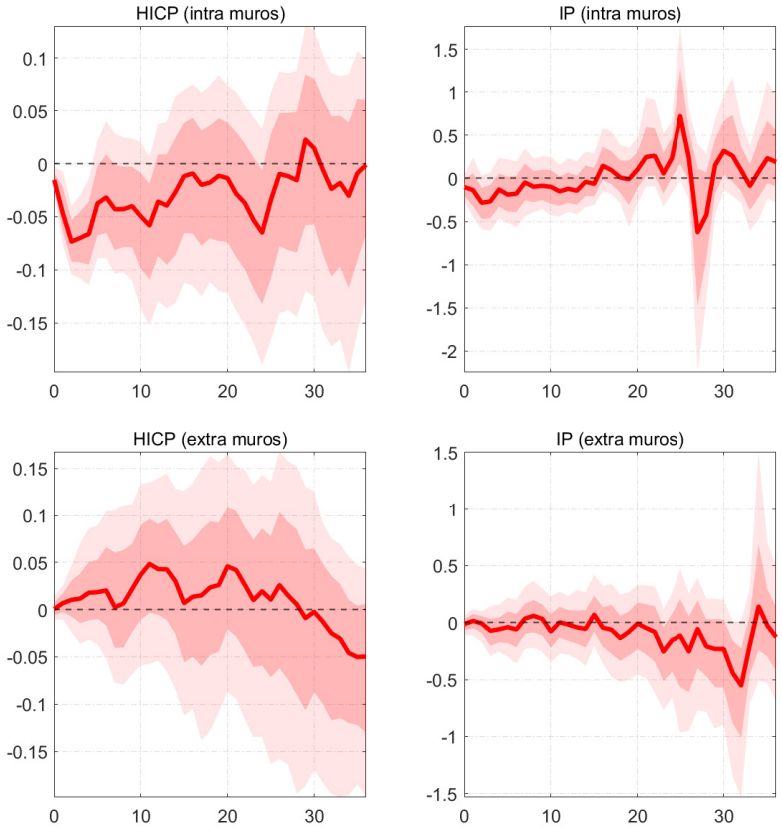
Notes: The figure shows the response of the Harmonized Index of Consumer Prices (HICP) and the index of industrial production (IP) h periods after a shock on an *intra muros* or *extra muros* meeting day. The shaded areas are 68% and 90% bootstrapped probability bands.

Figure 18: Response to forward guidance factor



Notes: The figure shows the response of the Harmonized Index of Consumer Prices (HICP) and the index of industrial production (IP) h periods after a shock on an *intra muros* or *extra muros* meeting day. The shaded areas are 68% and 90% bootstrapped probability bands.

Figure 19: Response to QE factor



Notes: The figure shows the response of the Harmonized Index of Consumer Prices (HICP) and the index of industrial production (IP) h periods after a shock on an *intra muros* or *extra muros* meeting day. The shaded areas are 68% and 90% bootstrapped probability bands.

tightening that is reflected in an increase in the target factor puts downward pressure on prices and contains real economic activity. For *extra muros* shocks, in contrast, we do not find a response of consumer prices. Industrial production tends to fall, but the decline is smaller than for *intra muros* surprises. Following a timing surprise at a Frankfurt-based meeting, consumer prices fall and need three years to return to the mean, see Figure (17). For a surprise coming out of an ECB meeting held outside Frankfurt, consumer prices do not respond in a clear pattern. Most of the response is statistically indistinguishable from zero. The response of industrial production remains inconclusive for both meeting types.

The responses to forward guidance surprises, see Figure (18), are counterintuitive, yet consistent with the differences across meetings. We find that a tightening surprise raises consumer prices when the meeting is held in Frankfurt, but has no effect when the meeting is outside Frankfurt. The counterintuitive sign of the response is probably due to strong information effects analyzed before. The responses of industrial production remain inconclusive in either case. A restrictive QE surprise *intra muros*, see Figure (19), leads to a fall in consumer prices. The corresponding tightening at a meeting *extra muros*, in contrast, has no effect on consumer prices. Likewise, industrial production falls relatively quickly in the former case but not the latter.

To summarize, we find that the macroeconomic impact of policy impulses differ across meeting types. Target, timing and QE surprises reduce consumer prices when the policy decision is taken in Frankfurt, but leave prices unaffected when the meeting takes place outside Frankfurt. This supports the notion that ECB meetings are not created equal as the Governing Council takes the important decisions at home in Frankfurt.

Result 6: The response of consumer prices to target, timing and QE surprises is weaker when the meeting takes place outside Frankfurt.

8 An illustrative model

We now use a simple New-Keynesian model in order to rationalize our main finding. The model shows that interest rate *surprises* are indeed smaller compared to the previous meeting when it is perfectly known that the central bank responds less to inflation. Compared to the standard three-equation model, we add two modifications. First, aggregate demand depends on the two-period interest rate rather than the one-period rate and, second, the central bank's interest rate response to inflation

varies over time. All other ingredients are taken from the textbook model.
The supply-side of the economy is described by the New-Keynesian Phillips Curve,

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t + e_t, \tag{6}$$

where π_t is inflation and x_t is the output gap. The discount factor is $0 < \beta < 1$ and the slope of the Phillips curve is $\kappa > 0$, which is inversely related to the extent of price rigidity. The supply shock e_t follows an AR(1) process is

$$e_t = \rho e_{t-1} + \varepsilon_t, \tag{7}$$

with $\rho < 1$ and $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$. The New-Keynesian IS curve describes the demand-side of the economy,

$$x_t = E_t x_{t+1} - \sigma^{-1}(R_t - E_t \pi_{t+1}), \tag{8}$$

where σ is the inverse of the intertemporal elasticity of substitution.
The first modification of the standard model is that demand is driven by the two-period real interest rate, not the one-period rate. Hence, R_t is the two-period nominal interest rate, which is linked to the one-period rate through the expectations hypothesis

$$R_t = \frac{1}{2}(r_t + E_t r_{t+1}). \tag{9}$$

Hence, the two-period rate is the average of the current and expected future one-period rate controlled by the central bank. To close the model, we introduce a monetary policy rule. The central bank sets the one-period rate as a response to inflation,

$$r_t = \phi_t \pi_t, \tag{10}$$

where $\phi_t > 1$ reflects the strength of the interest rate response to inflation. The second modification of the standard framework is that ϕ_t is not a constant, but changes over time. A constraint on the central bank's willingness to adjust rates at the next meeting is equivalent to a lower ϕ_{t+1}. It is important to stress that the change in ϕ_t is deterministic. Thus, agents know that $\phi_{t+1} < \phi_t$.
The solution for inflation, the output gap and the one-period interest rate is

$$\pi_t = \frac{1-\rho}{\Omega_t} e_t \tag{11}$$

$$x_t = -\frac{\frac{1}{2}\phi_t - \rho\left(1 - \frac{1}{2}\phi_{t+1}\right)}{\Omega_t} \sigma^{-1} e_t \tag{12}$$

$$r_t = \frac{1-\rho}{\Omega_t} \phi_t e_t, \tag{13}$$

where $\Omega_t = (1-\beta\rho)(1-\rho) + \kappa\sigma^{-1}\left[\frac{1}{2}(\phi_t + \rho\phi_{t+1}) - \rho\right]$. Under our assumptions, $\Omega_t > 0$. A lower ϕ_{t+1}, i.e. a meeting tomorrow in which the central bank responds less aggressively to inflation, makes inflation, output and the interest rate responses today larger. The intuition is as follows: the shock is persistent such that a positive shock in t raises inflation not just in t, but also in $t+1$. A less aggressive central bank response at the next meeting translates into a lower R_t, such that the supply shock is stabilized less. As a result, inflation and output are more volatile.
We now study the magnitude of interest rate *surprises* on meeting days t and $t+1$. Our empirical results discussed in the previous sections imply that the interest rate surprise is smaller on meeting days *extra muros*. Our interpretation is that the ECB responds less to incoming information when the meeting is held *extra muros*.
Consider the following sequence of meetings:

1. In t, the ECB meets in Frankfurt. The response coefficient is ϕ_t.
2. In $t+1$, the ECB meets outside Frankfurt. The response coefficient is $\phi_{t+1} < \phi_t$. This is known in t.
3. In $t+2$, the ECB meets again in Frankfurt. The response coefficient is ϕ_t.

The surprise change in policy rate in $t+1$, i.e. the difference between the realized and the expected one-period rate, is

$$\begin{aligned} r_{t+1} - E_t r_{t+1} &= \phi_{t+1}\pi_{t+1} - \phi_{t+1}E_t\pi_{t+1} \\ &= \frac{(1-\rho)\,\phi_{t+1}}{\Omega_{t+1}}\varepsilon_{t+1}. \end{aligned} \tag{14}$$

The surprise change in the one-period rate on meeting day t is

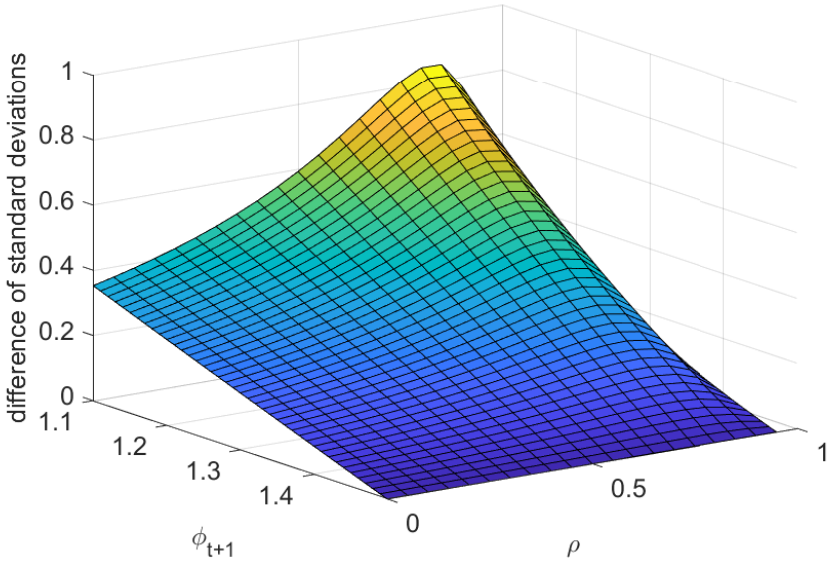
$$\begin{aligned} r_t - E_{t-1} r_t &= \phi_t\pi_t - \phi_t E_{t-1}\pi_t \\ &= \frac{(1-\rho)\,\phi_t}{\Omega_t}\varepsilon_t. \end{aligned} \tag{15}$$

In Figure (20), we plot the difference between the standard deviation of surprises in t and in $t+1$, i.e.

$$std\left(r_t - E_{t-1}r_t\right) - std\left(r_{t+1} - E_t r_{t+1}\right). \tag{16}$$

We calibrate the model for $\beta = 0.99$, $\kappa = 0.1$, $\sigma = 1$, $\phi_t = 1.5$ and $\sigma_\varepsilon^2 = 1$.
We see the key result: knowing that $\phi_{t+1} < \phi_t$, i.e. $\phi_{t+1} < 1.5$, implies that the standard deviation of surprises in $t+1$ is smaller than the standard deviation of surprises in t. Hence, if markets anticipate that the central bank responds less to

Figure 20: Difference in standard deviations of interest rate surprises between meetings



Notes: The figure shows the difference between the standard deviation of interest rate surprise in t, i.e. with ϕ_t, and the standard deviation of interest rate surprises in $t+1$, i.e. with ϕ_{t+1}.

inflation when meeting off-site, the standard deviation of surprise changes in the policy rate is smaller. This difference becomes larger for a higher ρ, i.e. if the shock is more persistent. As a matter of fact, the model is illustrative only. It takes the response coefficient in the central bank's policy rule as given.

9 Conclusions

This paper showed that market surprises during ECB meetings are smaller when the meeting takes place outside Frankfurt compared to meetings at the ECB's premises. This difference is particularly pronounced for timing, forward guidance and QE surprises, i.e. policies that shift the future path of interest rates. We also showed that the transmission of high-frequency policy surprises to daily long-term interest rate is significantly weaker when the meeting is held *extra muros*.

Apparently, the Governing Council chooses the timing of decisions such that major decisions outside Frankfurt are avoided. The implicit cost of adjusting the policy path seems to be higher when meeting outside Frankfurt. While the Governing Council has eight regular policy meetings per year, not all of them are created equal. Only the meetings *intra muros* are used to initiate new policies and make

substantial changes to existing policies. This is supported by the textual similarity of each press conference to the preceding press conference. When the meeting takes place outside Frankfurt, the textual similarity to the previous meeting is significantly higher.

Avoiding important decisions at the meetings outside Frankfurt appears as a constraint on the design of policy, which is not yet incorporated into the theoretical literature on optimal discrete policy steps and the optimal frequency of policy decisions (Guthrie and Wright, 2004; Gerlach-Kristen, 2005; Gerlach-Kristen, 2008). In addition, the Governing Council's reluctance to adjust policy outside Frankfurt in light of incoming data, or to adjust it only if the circumstances make it absolutely necessary, should matter for the design of the optimal interest rate path. Our findings suggest that the ECB could manage expectations more efficiently when using the full set of eight regularly scheduled meetings per year in order to implement policy without the implicit constraint of external meetings.

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Table 4: Meetings of the Governing Council in our sample

date	location	date	location	date	location	date	location	date	location
07.03.2002	Frankfurt	03.11.2005	Frankfurt	04.06.2009	Frankfurt	10.01.2013	Frankfurt	08.06.2017	Tallinn
04.04.2002	Frankfurt	01.12.2005	Frankfurt	02.07.2009	Luxembourg	07.02.2013	Frankfurt	20.07.2017	Frankfurt
02.05.2002	Frankfurt	12.01.2006	Frankfurt	06.08.2009	Frankfurt	07.03.2013	Frankfurt	07.09.2017	Frankfurt
06.06.2002	Frankfurt	02.02.2006	Frankfurt	03.09.2009	Frankfurt	04.04.2013	Frankfurt	26.10.2017	Frankfurt
04.07.2002	Luxembourg	02.03.2006	Frankfurt	08.10.2009	Venice	02.05.2013	Bratislava	14.12.2017	Frankfurt
01.08.2002	Frankfurt	06.04.2006	Frankfurt	05.11.2009	Frankfurt	06.06.2013	Frankfurt	25.01.2018	Frankfurt
12.09.2002	Frankfurt	04.05.2006	Frankfurt	03.12.2009	Frankfurt	04.07.2013	Frankfurt	08.03.2018	Frankfurt
10.10.2002	Frankfurt	08.06.2006	Madrid	14.01.2010	Frankfurt	01.08.2013	Frankfurt	26.04.2018	Frankfurt
07.11.2002	Frankfurt	06.07.2006	Frankfurt	04.02.2010	Frankfurt	05.09.2013	Frankfurt	14.06.2018	Riga
05.12.2002	Frankfurt	03.08.2006	Frankfurt	04.03.2010	Frankfurt	02.10.2013	Paris	26.07.2018	Frankfurt
09.01.2003	Frankfurt	31.08.2006	Frankfurt	08.04.2010	Frankfurt	07.11.2013	Frankfurt	13.09.2018	Frankfurt
06.02.2003	Frankfurt	05.10.2006	Paris	06.05.2010	Lisbon	05.12.2013	Frankfurt	25.10.2018	Frankfurt
03.04.2003	Rome	02.11.2006	Frankfurt	10.06.2010	Frankfurt	09.01.2014	Frankfurt	13.12.2018	Frankfurt
08.05.2003	Frankfurt	07.12.2006	Frankfurt	08.07.2010	Frankfurt	06.02.2014	Frankfurt	24.01.2019	Frankfurt
05.06.2003	Frankfurt	11.01.2007	Frankfurt	05.08.2010	Frankfurt	06.03.2014	Frankfurt	07.03.2019	Frankfurt
10.07.2003	Frankfurt	08.02.2007	Frankfurt	02.09.2010	Frankfurt	03.04.2014	Frankfurt	10.04.2019	Frankfurt
31.07.2003	Frankfurt	08.03.2007	Frankfurt	07.10.2010	Frankfurt	08.05.2014	Brussels	06.06.2019	Vilnius
04.09.2003	Frankfurt	12.04.2007	Frankfurt	04.11.2010	Frankfurt	05.06.2014	Frankfurt	25.07.2019	Frankfurt
02.10.2003	Lisbon	10.05.2007	Dublin	02.12.2010	Frankfurt	03.07.2014	Frankfurt	12.09.2019	Frankfurt
06.11.2003	Frankfurt	06.06.2007	Frankfurt	13.01.2011	Frankfurt	07.08.2014	Frankfurt	24.10.2019	Frankfurt
04.12.2003	Frankfurt	05.07.2007	Frankfurt	03.02.2011	Frankfurt	04.09.2014	Frankfurt	12.12.2019	Frankfurt
08.01.2004	Frankfurt	02.08.2007	Frankfurt	03.03.2011	Frankfurt	02.10.2014	Naples	23.01.2020	Frankfurt
05.02.2004	Frankfurt	06.09.2007	Frankfurt	07.04.2011	Frankfurt	06.11.2014	Frankfurt	12.03.2020	Frankfurt
04.03.2004	Frankfurt	04.10.2007	Vienna	05.05.2011	Helsinki	04.12.2014	Frankfurt	30.04.2020	Frankfurt
01.04.2004	Frankfurt	08.11.2007	Frankfurt	09.06.2011	Frankfurt	22.01.2015	Frankfurt	04.06.2020	Frankfurt
06.05.2004	Helsinki	06.12.2007	Frankfurt	07.07.2011	Frankfurt	05.03.2015	Nicosia	16.07.2020	Frankfurt
03.06.2004	Frankfurt	10.01.2008	Frankfurt	04.08.2011	Frankfurt	15.04.2015	Frankfurt	10.09.2020	Frankfurt
01.07.2004	Frankfurt	07.02.2008	Frankfurt	08.09.2011	Frankfurt	03.06.2015	Frankfurt	29.10.2020	Frankfurt
05.08.2004	Frankfurt	06.03.2008	Frankfurt	06.10.2011	Berlin	16.07.2015	Frankfurt	10.12.2020	Frankfurt
02.09.2004	Frankfurt	10.04.2008	Frankfurt	03.11.2011	Frankfurt	03.09.2015	Frankfurt	21.01.2021	Frankfurt
07.10.2004	Brussels	08.05.2008	Athens	08.12.2011	Frankfurt	22.10.2015	Malta	11.03.2021	Frankfurt
04.11.2004	Frankfurt	05.06.2008	Frankfurt	12.01.2012	Frankfurt	03.12.2015	Frankfurt	22.04.2021	Frankfurt
02.12.2004	Frankfurt	03.07.2008	Frankfurt	09.02.2012	Frankfurt	21.01.2016	Frankfurt	10.06.2021	Frankfurt
13.01.2005	Frankfurt	07.08.2008	Frankfurt	08.03.2012	Frankfurt	10.03.2016	Frankfurt	22.07.2021	Frankfurt
03.02.2005	Frankfurt	04.09.2008	Frankfurt	04.04.2012	Frankfurt	21.04.2016	Frankfurt	09.09.2021	Frankfurt
03.03.2005	Frankfurt	02.10.2008	Frankfurt	03.05.2012	Barcelona	02.06.2016	Vienna	28.10.2021	Frankfurt
07.04.2005	Frankfurt	06.11.2008	Frankfurt	06.06.2012	Frankfurt	21.07.2016	Frankfurt	16.12.2021	Frankfurt
04.05.2005	Berlin	04.12.2008	Brussels	05.07.2012	Frankfurt	08.09.2016	Frankfurt		
02.06.2005	Frankfurt	15.01.2009	Frankfurt	02.08.2012	Frankfurt	20.10.2016	Frankfurt		
07.07.2005	Frankfurt	05.02.2009	Frankfurt	06.09.2012	Frankfurt	08.12.2016	Frankfurt		
04.08.2005	Frankfurt	05.03.2009	Frankfurt	04.10.2012	Brdo pri Kanju	19.01.2017	Frankfurt		
01.09.2005	Frankfurt	02.04.2009	Frankfurt	08.11.2012	Frankfurt	09.03.2017	Frankfurt		
06.10.2005	Athens	07.05.2009	Frankfurt	06.12.2012	Frankfurt	27.04.2017	Frankfurt		

Notes: The meeting dates and the locations are taken from the ECB's website.