Clarity of Central Bank Communication About Inflation[1]

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ABSTRACT

This paper examines whether the clarity of central bank communication about inflation has changed with the economic environment. We use readability statistics and content analysis to study the clarity of communication on the inflation outlook by seven central banks between 1997 and 2010. Overall, we find no strong indications that central banks were less clear in explaining their policies when faced with higher uncertainty or a less favorable inflation outlook. The global financial crisis, however, did have a negative impact on clarity of central bank communication.

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1. Introduction

This paper studies the clarity of communication by central banks, in particular their communication on the inflation outlook. Communication is an integral element of monetary policy in many developed and emerging economies. Indeed, central banks have made great efforts to increase their transparency and accountability to the public (Eijffinger and Geraats, 2006; Dincer and Eichengreen, 2007). Central banks provide a greater volume of information and communicate through a range of channels – including inflation reports, press releases, and press conferences – and this information tends to be available faster, more frequently, and to wider audiences than ever before. Previous research has identified various benefits of the increase in communication such as higher predictability of interest rate decisions (e.g., Woodford, 2005; Blinder and others, 2008).

Little is known, however, about how clear central banks' communication is, and what factors drive changes in clarity over time. Recent studies suggest that central banks have not always provided a clear message (Bulíř, Šmídková, Kotlán, and Navrátil, 2008; Bulíř, Čihák, and Šmídková, 2008). In these papers, central banks in a sample of developed and emerging market countries were found to be clear on average between 60 percent and 95 percent of the time. But why have some communications been clear while others are not? Can these variations in clarity be explained? So far, this has not been extensively researched.

Communication clarity and changes therein should be relevant for policymakers, as the quality of communication on the inflation outlook affects the degree to which inflation expectations can be managed. Or, as Blinder (2009) puts it:

> "Since clearer communications presumably have higher signal-to-noise ratios, they should in principle convey more information. (…) While the clarity issue has received scant attention in the literature, I find it tantalising that (…) different methodologies come to the same conclusion: that greater clarity enhances the quality of central bank communication. I would love to jump to this conclusion, but it so far rests on a slender evidentiary base. More research on this issue would be welcome."

Our aim is to fill this gap, that is, to explain variations in the clarity of central bank communication. In particular, does the clarity of central bank communication depend on the context? Is clarity sensitive to the inflation outlook or uncertainty therein, or both?

To motivate why uncertainty in the inflation outlook can influence clarity, imagine writing inflation reports in two different scenarios. The first scenario is straightforward: persistent monetization of debt has

resulted in high inflation, and this policy is widely expected to continue. In the second scenario, assume there are many factors, some difficult to measure precisely, and some offsetting each other. On the one hand, there is relatively less to gain from "crafting the message" in the first scenario, because the causes of inflation are obvious and likely to continue; on the other hand, delivering a clear message is relatively easy. In the second economy, the potential gains from a well-crafted message are substantial; however, delivering a clear message is more challenging. In essence, we try to find out whether the communication effort is reflected in additional clarity during complex economic situations.

Our initial hypothesis is that when the inflation outlook is less certain, or less favorable, communication will be more difficult for the central bank, leading to less clarity. More uncertainty is typically associated with more explanatory factors and more challenges when measuring these factors and communicating their impact on the inflation outlook. Admittedly, in situations of greater uncertainty, the clarity of the central bank's message yields a higher return. The central bank may be well aware that, in some cases, clear explanations are expected. If it then invests more heavily in the drafting process, clarity may well remain unchanged, or it may even increase. We are not aware of research that has sought to investigate this issue empirically.[5]

It is important to understand the drivers of communication clarity, for two main reasons. First, as argued by Jansen (2011a), clarity is an important pre-condition for transparency. Even if a central bank communicates frequently, but does so opaquely, it can hardly be called transparent. Second, clarity may carry direct benefits. As noted by Blinder (2009), clearer communication has a higher signal-to-noise ratio and carries more information. So far, there has been little work to investigate this hypothesis empirically, but the evidence at hand does suggest that clarity is beneficial. Fracasso, Genberg and Wyplosz (2003) have found that well-written inflation reports are associated with higher predictability of decisions. Jansen (2011b) finds that greater clarity of the Humphrey-Hawkins testimonies by the Fed chairman has gone hand in hand with lower volatility in financial markets.

Our paper makes several contributions to the literature. First, we use a measure for clarity which is standard in many fields, such as linguistics or psychology, but has not often been used by economists. One benefit of this criterion is its objectivity, as it only uses textual characteristics: the number of words, sentences, and syllables. As an alternative measure of clarity, we also use the length of the reports.

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[5] There is an analogy with a debate in the accounting literature that focuses on analyzing readability of corporations' annual reports. For instance, Courtis (1998) finds some evidence that, rather than present accounting narratives objectively, managers use readability variability to emphasize good news and obfuscate bad news. However, other studies suggest that there is no such temporary variation (Clatworthy and Jones, 2001).

Second, using this measure, we are able to document how clarity of various types of communications by seven central banks has evolved over the last decade. Third, we analyze if and how clarity has been related to the context in which communications were made. In particular, we study how inflation outlook and the uncertainty around the outlook affected clarity.

To preview our findings, we uncover significant and persistent differences in clarity over time and across countries. Readability appears to be country[6] specific and subject to long-term trends. While some countries' inflation reports have become more readable over time (Chile, Sweden, and the United Kingdom), in other countries readability worsened (Thailand).

Regarding our main hypothesis, overall, we find little evidence that central banks were less able to clearly explain their policies when faced with higher uncertainty or a less favorable inflation outlook. Short-term fluctuations in clarity are hard to account for, although the central bank's assessment of inflation and dissent in voting on interest rates explain some of the variation. Finally, we find that the global financial crisis contributed to making central bank communication less clear. This indicates that—while central bank communication has generally been successful in adapting to new contexts—the financial crisis provided a major communication challenge.

The remainder of the paper is organized as follows. Section II outlines the data and estimation approach. Section III presents results for the clarity of inflation reports, press releases and statements, and report length. Section IV concludes.

2. Data and methodology

2.1. Data and content analysis
Our analysis covers the period from 1997 to 2010 and examines two main types of communications: (i) long documents aimed primarily at specialists (inflation reports, monetary policy report, and bulletins) and (ii) short documents aimed primarily at the general public (press releases and executive summaries of the long documents).

Our sample consists of the following seven central banks: Banco Central de Chile, Bank of England (BOE), Bank of Thailand, Czech National Bank (CNB), European Central Bank (ECB), National Bank of

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[6] The term "country", as used in this paper, may include also territorial entities that are not countries, but for which separate economic statistics are produced.

Poland (NBP), and Sveriges Riksbank. Our main selection criterion was that the central banks focus strongly on inflation forecasts in their communications. Therefore, central banks in our sample have either adopted an inflation targeting regime or operate a framework in which the inflation outlook plays a similarly central role. To simplify, our sample does not include central banks operating in different policy regimes (e.g., currency pegs) or those that have other objectives in addition to price stability (e.g., maximum employment or moderate long-term interest rates). In those cases, communication would need to address a broader range of issues, as well as the trade-offs between multiple objectives. Such limitations make us exclude from our sample central banks that either fix their domestic currencies vis-à-vis the dollar and the euro or run "eclectic monetary regimes," such as the U.S. Fed. Additional criteria in the sample selection were balanced coverage in terms of the world's regions (the sample includes central banks from three continents), level of development (our sample includes both developed economies and emerging markets), size (our sample includes both small and large economies), and data availability. Table 1 provides an overview of the central banks as well as their communications.

First, using similar methods as in Guthrie and Wright (2000), Bulíř, Čihák, and Šmídková (2008), and Bulíř and others (2008), we use content analysis to quantify the elements of various central bank communications, such as reports, press releases and statements. In particular, we extract those text fragments containing the central bank's view on various risks to inflation. These risks may be related to either demand, supply, or external shocks.[7] We use a ternary coding scheme to categorize the comments, based on whether the inflation factors are expected to have inflationary (+1), neutral (0) or deflationary (-1) effects. We then compute the central bank's overall assessment of inflationary risks, by summing the individual coded inflation factors. We give each factor an equal weight because the communication usually does not provide explicit guidance on the factors' quantitative importance. We also want to avoid further subjective judgments regarding the aggregation of the individual risk factors. To give an example, if an inflation report highlights three inflationary factors, and two deflationary factors, our overall measure – which we will denote by S – equals one. Larger positive (negative) values for S mean that the central bank is signaling greater concerns regarding inflationary (deflationary) risks. In the empirical analysis, we use the *absolute* value of S, the idea being that both larger positive and negative values warrant more elaborate explanations from the central bank. In addition, we will also use the dispersion of

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[7] The content analysis focuses on statements relating to inflation. This would be too narrow if the central bank had also other key policy objectives, conflicting with its inflation objective. However, since our sample consists of central banks that operate inflation targeting or a similar (inflation-centered) framework, focusing on inflation-related communication is a reasonable simplification.

the individual inflationary factors. For most central banks, the communications data is available on a quarterly frequency. For the ECB, we use the quarterly averages for the individual *Monthly Bulletins*.

While this paper focuses on written communication, it also includes statements intended for verbal delivery. The focus on written communication seems warranted by the general finding that these types of communication usually have a larger impact on financial markets than speeches or testimonies (Blinder and others, 2008). Still, we also include some spoken communication, in particular the Introductory Statements by the ECB president and the Opening Remarks by the Governor of the Bank of England. The introductory statements and opening remarks, of course, draw upon and are related to the underlying reports (monthly bulletin and inflation report, respectively). Nonetheless, including documents intended for verbal delivery provides an opportunity to compare their clarity of communication relative to the clarity of the underlying reports.

2.2 Measuring the clarity of communication

One way to think about clarity of communication is by asking how easy it would be for someone to understand the information contained in the document. This notion of clarity underlies the so-called Flesch-Kincaid (FK) grade level (Kincaid and others, 1975). This statistic can be interpreted as the number of years of education needed to sufficiently comprehend a text. The FK statistic was developed in the mid-1970s and has since been widely applied in various fields (Clatworthy and Jones, 2001; Paasche-Orlow, Taylor and Brancati, 2003). The FK scale is objective to the extent that it only uses textual characteristics of texts, such as the number of words, sentences, and syllables.[8] It is calculated as:

$$0.39*(\text{\# words} / \text{\# sentences}) + 11.8 * (\text{\# syllables} / \text{\# words}) - 15.59 \qquad (1)$$

The intuition is that many words per sentence or many syllables per word decrease readability. If someone has to process a text with long words or sentences, it will be harder to grasp the message. In our sample, the Flesch-Kincaid grade level varies from 10 to 19 years, with differences over time, across countries, and between the various communication channels in the same country.

We find substantial variation in the Flesch-Kincaid grade level over time for each of the seven central banks in our sample (Figure 1). One element of the variation are underlying trends in some countries: the

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[8] Other reasons for choosing the Flesch–Kincaid measure include its convenience (the Flesch–Kincaid system is embedded in Microsoft Word), wide use in studies of readability, repeatability, and excellent comparability with other established readability scales, such as the fog index and the automated readability index. For instance, Kincaid and others (1975) have reported correlation coefficients of about 0.9 vis-à-vis alternative measures.

readability of the central bank documents improved in Chile (requiring about two years less of schooling to comprehend the text in 2010 as compared to 2000), worsened in Thailand (requiring some additional four years of schooling), worsened marginally in Poland, and remained broadly unchanged in the rest of the sample. To check for nonstationarity of the readability scores we use the Kwiatkowski-Phillips-Schmidt-Shin test – which is to be preferred for smaller samples (Kwiatkowski and others, 1992) – and find that they were either stationary or trend stationary.[9] We therefore include a trend term (1998q1 = 1) in the subsequent regressions to account for the country-specific trends.

We also find statistically significant differences between countries (Figure 2); however, much of this most likely reflects the fact that some of the central banks prepare their documents initially in native languages, while we utilize the English versions of these documents.[10] The average Flesch-Kincaid score for an inflation report in any given country is therefore likely to depend on the features of the primary language of the country and on the way the primary language is translated into English. The most easily readable documents are those of United Kingdom and Sweden, requiring on average about 12 years of schooling; followed by the Czech Republic, requiring about 14 years; and, finally, those in the remaining four central banks require about 16 years for inflation reports and a little less for press statements. It would be a stretch, however, to interpret mechanically these cross-country differences of clarity of communication.[11] For our purposes, the *level* of clarity is not directly relevant. Rather, our aim is to relate the fluctuations in clarity to the changing context in which central banks operate. Trends and idiosyncratic shocks to communication aside, the variation in the Flesh-Kincaid grade level should be a good proxy for changes in clarity of communication, certainly relative to other communications from the same central bank.

To provide a somewhat richer picture, we also consider document length as an alternative dimension of communication. However, the relationship between length of central bank documents and clarity is not straightforward. On the one hand, crafting a more precise, more nuanced message in an uncertain environment typically requires a longer communication. On the other hand, such a communication risks burying the message in a long or complex document, and ultimately becoming less clear. Therefore, we treat length as a separate feature of communication, separate from its clarity.

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[9] Results for the KPSS-tests are available upon request.

[10] The front-page footnote in the English-language Chilean reports explicitly states the seniority of the Spanish original: "This is a translation of a document originally written in Spanish. In case of discrepancy or difference in interpretation the Spanish original prevails."

[11] Jansen (2011a) also stresses that readability measures should be carefully interpreted.

2.3 Analyzing variations in clarity

We now turn to a more formal analysis of clarity. We examine whether variations in clarity are related to quantifiable factors that capture the context in which the communications took place. In our analysis, we include five elements warranting some type of explanation to the public, either because the outlook for inflation is less favorable, or because it is less certain. These factors are: (i) the absolute count of inflation factors (based on the content analysis); (ii) its variation; (iii) forward-looking and (iv) contemporaneous inflation gaps (deviations from the inflation target); and (v) voting dissent in monetary policy committees.

We include these five factors in the following reduced-form regression:

$$FK_{it} = \beta_0 + \alpha_i + \beta_T T_{it} +$$

$$\beta_S |S_{it}| + \beta_V V_{it} + \beta_{\pi e} \left| E_{it}(\pi_{i,t+4}) - \pi_{it}^* \right| + \beta_\pi |\pi_{it} - \pi_{it}^*| + \beta_D DIS_{it} + \varepsilon_{it}, \quad (2)$$

where FK_{it} denotes the Flesch-Kincaid grade level of a communication instrument (report, press release, or statement) by a central bank i in quarter t. Higher values of FK_{it} imply less clarity: a reader would need more schooling to sufficiently comprehend the document. As an alternative measure for clarity, we also use the *length* of central bank documents. We use three deterministic variables: β_0 is a constant, α_i captures country-specific effects, and T_{it} is a linear trend.

The first two covariates ($|S_{it}|$ and V_{it}) refer to the central bank's assessment of inflation in their communications. The verbal assessment of inflation, S_{it}, is the sum of the absolute values of signals with respect to aggregate demand (AD_{it}); aggregate supply (AS_{it}); and external factors (FOR_{it}). Respective examples of such signals are fiscal and cyclical demand pressures (AD); labor supply pressures and capacity utilization (AS); and exchange rate shocks (FOR). We use absolute values of S_{it} as it is the count of potentially conflicting inflation factors may warrant more explanation. As noted, higher absolute values of S_{it} indicate a greater number of risks to price stability. The dispersion in S_{it} across the demand-supply-external factors is measured by $V_{it} = |AD - AS| + |AD - FOR| + |AS - FOR|$.

The next two covariates compare inflation to the inflation target. The third covariate is the absolute difference between the official inflation forecast/projection four quarters ahead, $E_{it}(\pi_{i,t+4})$, and the inflation target, π_{it}^*, that is, a forward-looking gap.[12] The fourth covariate is the absolute difference

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[12] The construction of inflation forecasts differs somewhat across central banks. For example, the CNB's forecast is fully endogenous, while BOE and ECB forecasts are, nowadays, conditional on market expectations. So, other things equal, the CNB's *ex ante* inflation gap will likely be smaller than the BOE one: the policy rule will push

between contemporaneous inflation and the target, where inflation is measured as year-on-year inflation in the quarter during which the report was published, i.e., the contemporaneous inflation gap. Central banks frequently discuss both why the inflation target was missed in the recent past and why it may be missed in the future.[13]

The fifth covariate, included for those four central banks in our sample that publish voting records of their monetary policy committees, is the fraction of dissenting votes, DIS_{it}. We use averages for all votes in meetings taking place during the quarter in which the report was published. Across the countries, there are some differences in the extent to which dissent finds its way into the report itself. In some central banks (e.g., the CNB), the staff writes the report with limited input from the monetary policy committee, so dissent is primarily expressed in the share of dissenting votes. In others (e.g., the BOE), the monetary policy committee is involved in designing the scenarios, so dissent may be reflected in the report to a larger extent. In both arrangements, however, the share of dissenting votes in the committee is a reasonable proxy for dissent, considering also that we focus on developments over time rather than cross-country comparisons.

What are reasonable priors for the β coefficients? For all five covariates, higher values thereof imply the central bank has more to explain to the public. Either the outlook for inflation is less positive, or there is less certainty regarding inflationary developments. For example, higher absolute levels of S_{it} indicate the central bank is less comfortable about its outlook for inflation as it identifies a greater number of risks to price stability. Similarly, if there is a greater dispersion in the underlying signals, reflected in a higher value of V_{it}, the central bank may want to explain what drives this dispersion and how it weighs the various and potentially conflicting signals. Particularly puzzling are deviations of inflation projections from the target and the central bank must to explain why it expects future inflation to remain above/below the target, and what are policy implications thereof. A similar story holds for the current level of inflation and its deviation from the target. Although inflation targeting implies a forward-looking policy, the public often pays attention to the difference between current headline inflation and the inflation target. Finally, if

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inflation closer to the target. In our context, however, this is not a major issue. We are not focusing on cross-country comparisons, but rather on comparisons within a country, and the construction of inflation forecasts for our sample countries has been reasonably consistent .

[13] Information on inflation targets and their changes was taken from the central bank documents or websites. For example, in December 2003, the Bank of England's target changed from 2.5 percent retail price index (RPIX) inflation to 2 percent inflation in the Consumer Price Index (CPI). Data on the targeted inflation series, usually headline inflation based on either harmonized index of consumer prices (HICP) or regular index of consumer prices CPI indices, were taken from Haver Analytics.

the views of the monetary policy committee members start to diverge, the public may be less sure of which way the central bank's policy will go.

Under our (null) hypothesis, the clarity of communication is impaired when the central bank is less sure about future developments or when it needs to explain larger deviations from the inflation target. Suppose that current inflation is above the target, but the official inflation projection/forecast is close to the target, even though the reports mention numerous and mutually offsetting inflation factors. It is going to take effort to present these developments in an accessible manner, presumably leading to a higher Flesch-Kincaid score. In other words, under our null hypothesis, one or more of the β coefficients would be positive. However, the central bank very well may be aware that, in some cases, it needs to present a clear message to the public. To enable this, the central bank may decide to devote more resources to the drafting process. If it succeeds, the clarity of its communications may well remain unchanged, or it may even increase.

The correlations matrix in Table 2 suggests that the *FK* grade level is correlated with the number of words, and—as one could expect—there is a strong correlation between the number of words and the number of sentences. Also, the share of dissenting votes in the monetary policy committee is positively correlated with the number of words and sentences in the communication as well as with the FK grade level. The remaining pairwise correlations among the variables of interest are relatively low.

3. Results

We discuss the country-specific results of our clarity analyses in the following order: inflation reports, releases/statements, and document length. The corresponding Tables are numbered 3, 4, and 5, respectively. We have also estimated a pooled regression, combining the data for the seven countries. However, results based on random-coefficient models (available upon request) suggest that none of the variables considered in equation (2) has a statistically significant effect that would be robust across the countries.

3.1 Clarity of inflation reports

The regression results are consistent with the graphical evidence discussed in section II. Readability of inflation reports, as measured by the Flesch-Kincaid grade level, is mostly country-specific and driven by

deterministic variables. The constant terms point to significant differences in clarity (Table 3). Moreover, we also find, in some cases, significant coefficients for the trend. The inflation reports have become clearer over time in Chile, Sweden, and the United Kingdom, improving by almost $1/5$ of a year of schooling per year. In contrast, the euro area Monthly Bulletins and in particular Thai inflation reports have become less clear during the sample period, by about $1/10$ and $2/5$ of a year of schooling per year. For the Czech Republic and Poland, there are no statistically significant trends.

Of the non-deterministic explanatory variables, only a handful appear to affect readability and none of them consistently across the sample. So, overall, it is difficult to relate changes in clarity to the economic context in which communications occurred. First, the number of inflation factors identified by the central bank ($|S|$) is associated with a reduction in FK, but only significant for the Czech Republic. So, mentioning more risk factors coincides with an increase in report clarity, but this variable is not significant for the other countries. Second, uncertainty regarding the inflation signal (V) does not have a significant impact on report clarity. Third, the absolute deviation of the inflation forecast from the target, $\left| E_{it}\left(\pi_{i,t+4} \right) - \pi_{it}^* \right|$, reduces an inflation report's clarity, that is, increases its FK score in three out of seven countries. However, the results are statistically significant only in the United Kingdom. In this case, the expected over/undershooting of the inflation target corresponds to a decline in readability of about ¾ of a year of schooling. Fourth, for most countries, past inflation deviations from the target are associated with lower clarity of an inflation report; however, the results are statistically significant only for the Czech Republic. Finally, a higher fraction of dissenting votes regarding monetary policy decisions is associated with an increased clarity only in the United Kingdom. The greater level of clarity could help to explain why Gerlach-Kristen (2004) finds that dissent is useful information for predicting subsequent rate changes. It is interesting that the results for the BOE and CNB are similar, even though observed through different variables. We find a negative impact of inflation gaps (contemporaneous versus expected), and a positive impact of signal uncertainty (signal count versus voting dissent).

3.2 Clarity of press releases and statements
Readability of press releases (Chile, Poland, Sweden and Thailand) and statements (the euro area and the United Kingdom) follows similar patterns as that of inflation reports (Table 4). The estimates of the constant term and trend are statistically significant and we find that communication has become clearer over time in Chile and Sweden (by about ¼ of a year of schooling per year). In contrast, communication became less clear over time in the euro area, Poland, Thailand, and the United Kingdom. The differences

in the latter group are large – for example, the decline in readability was six times larger in Thailand as compared to the United Kingdom.

None of the non-deterministic explanatory variables play a systematic role and only two variables are statistically significant in some countries. First, the uncertainty regarding the inflation signal (V) reduced communication clarity in Thailand and the United Kingdom. Second, past inflation deviations from the target were associated with increases in communication clarity in Sweden and the United Kingdom.

3.3 Length of inflation reports

The results for document length, measured as the number of words in the executive summary of the inflation report, are also very much country specific (Table 5). The length of the executive summary in individual countries did not vary much. However, in most countries report length trended upward (the euro area, Poland, Thailand, and the United Kingdom). We find that the absolute value of the verbal evaluation on inflation given by the central bank ($|S|$) reduced report length in the Czech Republic. Perhaps somewhat surprisingly, reports with more dispersed inflation factors were significantly shorter (in the euro area, Thailand, and the United Kingdom). A possible explanation could be that these central banks were compensating for the dispersion in inflation factors by trying to communicate more concisely. Past inflation deviations from the target were associated with longer reports in the euro area and the United Kingdom, but with shorter ones in Thailand. Finally, dissent in the board room increases report length in Poland. We have also estimated a pooled regression and the results (available upon request) again suggest that none of the variables considered have a robust effect across all countries.

3.4 Impact of the global financial crisis

The global financial crisis has presented unique challenges for monetary policy, including on the communication front, as policymakers have aimed to simultaneously reassure the public and communicate the potential vulnerabilities. To this end, some central banks tried to explicitly distinguish crisis-related measures and messages from those related to the regular conduct of monetary policy.

To examine the impact of the crisis, we introduce a binary dummy variable. While there is little disagreement that there was a global financial crisis in 2008 and 2009, the exact timing of the crisis is debatable. The onset of the crisis is usually linked to the Lehman Brothers filing for bankruptcy

protection in September 2008. The end of the crisis is less clear, as the financial markets remained in turmoil through 2009. With this in mind, the crisis dummy equals 1 from 2008q4 to 2009q4 and 0 otherwise.

Table 6 reports results for three country-level regressions (Poland, Sweden, and the United Kingdom) where the crisis dummy is statistically significant and positive. For the other countries, it is not significantly different from zero. The coefficient for the crisis dummy suggests that, on average, the financial crisis added about 1-2 additional years of schooling needed to understand the reports. The crisis dummy leaves the earlier estimates from the Table 3 broadly unaffected. In this case, we also ran pooled-regressions. The coefficient for the crisis dummy was around 0.5, but not statistically significant.

3.5 Sensitivity analysis

In addition to the global financial crisis, we also explored the sensitivity of our results along several other dimensions. In particular, we included the number of individual inflation factors, (AD_{it}), (AS_{it}), and (FOR_{it}), as additional regressors and found all variables to be statistically insignificant. We also added lagged values for past inflation deviations,$|\pi_{it} - \pi_{it}^*|$, and voting dissent (in the baseline model only contemporaneous values were used). The motivation was that if the communications were released early in the quarter, probably not all information on inflation or dissent was available to those drafting the inflation reports. Again, the results with the lagged values did not differ materially from the main results.[14] Finally, we also experimented with an automated general-to-specific procedure using the Autometrics-routine in Oxmetrics. The findings were qualitatively not affected and the routine – after identifying country-specific time dummies for the crisis period – generally selected variables identical to those identified in section III.B: the deterministic variables (constant and trend) remained the most relevant for modeling clarity of communication.

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[14] Replacing Flesch–Kincaid measure by an alternative readability index, such as the fog index or the automated readability index, would not significantly impact the results either. As documented in the literature (i.e., Kincaid and others, 1975), the correlation between the FK measure and these alternative measures is quite high (about 0.9).
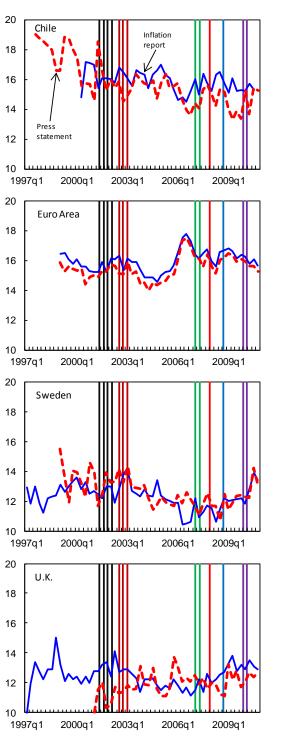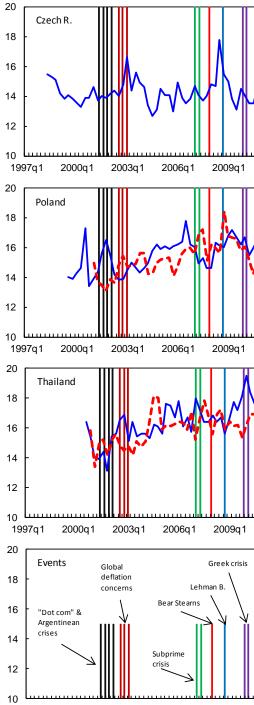
4. Conclusions

We study whether the clarity of central bank communication on inflation has changed with the economic environment. To this end, we combine a standard measure for readability (the Flesch-Kincaid grade level) with content analysis to analyze the clarity of various communication channels (inflation reports, press releases and statements) on the inflation outlook by seven central banks between 1997 and 2010. We find that in our sample readability is country-specific and follows long-term trends.

Overall, we find little evidence that central banks had greater difficulty in explaining their policies when faced with higher uncertainty or a less favorable inflation outlook. At the same time, this means that we have difficulty accounting for short-term fluctuations in clarity: although, the central bank's assessment of inflation and dissent in voting on interest rates explains some of the variation. Finally, the global financial crisis generally is associated with less clarity in central bank communications.

Our paper opens a range of areas for extensions and follow-up research. One avenue is to extend our analysis beyond the sample of the seven banks, and examine the factors influencing the different ways in which central banks adjust their monetary policy communications in response to external developments. Another avenue is to examine whether the changes in central bank communication clarity have impact on other variables, in particular on market (and public) expectations of interest rates and inflation. Finally, it could be of interest to expand our analysis to other forms of central bank communication, such as oral statements by central bank officials and the contents of monetary policy committee minutes (in countries where these are published), as well as communication on topics other than the inflation outlook and, in particular, on financial stability.[15]

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[15] Research on financial stability communication is still scarce. For two recent contributions, see Born and others (2011) and Čihák, Muñoz, Teh Sharifuddin, and Tintchev (2011).

Figure 1. Readability of Inflation Reports and Press Statements, 1997–2010

(Flesch-Kincaid Grade Level; Solid Lines for Reports and Dashed Lines for Statements)

Source: Authors' calculations based on information from the national central banks' websites.

Note: The Flesch-Kincaid grade level can be interpreted as the number of years of education needed to comprehend a text. Missing observations were interpolated. The Czech National Bank does not issue press statements. See also Table 1 for further details.
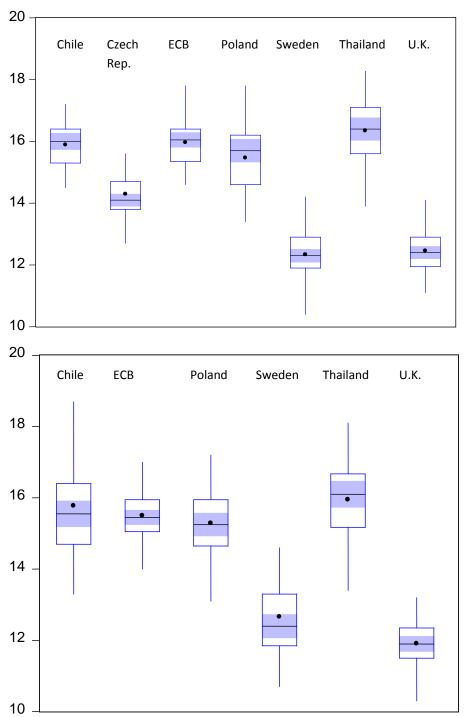
Figure 2. Summary Statistics for Readability of Inflation Reports and Press Statements
(Flesch-Kincaid Grade Level, sample period)

Source: Authors' calculations.

Note: The boxplot denotes the sample mean with a circle; the median and is its 95-percent confidence interval with a line and the shaded area, respectively; the left and right sides of the box indicate the lower and upper quartiles; the whiskers are defined as the first quartile minus 1.5*interquartile range (IQR) and the third quartile plus 1.5*IQR. The Czech National Bank does not issue press statements.

Table 1. Data Overview

Country	Inflation targeting introduced	Reports, frequency and sample	Press release, frequency and sample	Statements, frequency and sample
Chile	1991	Summary of the monetary policy report, three/four times a year, May 2000 – Sep. 2010.	Press release, monthly, Sep. 1997 – Dec. 2010.	
Czech Republic	1998	Introduction of inflation report, four times a year, Apr. 1998 – Oct. 2010.		
Euro area	-	Executive summary of monthly bulletin, Jan. 1999 – Dec. 2010.		Introductory statement, monthly, Jan. 1999 – Dec. 2010.
Poland	1999	Summary of inflation report, three/four times a year, Sep. 1999 – Oct. 2010.	Monetary policy council press release, monthly, Jan. 2001 – Dec. 2010.	
Sweden	1993	Summary of monetary policy report, three/four times a year, Mar. 1997 – Oct. 2010.	Press release of monetary policy decision, six times a year, Mar. 1999 – Dec. 2010.	
Thailand	2000	Overview of inflation report, our times a year, Jul. 2000 – Oct. 2010.	Press release on inflation report, four times a year, Jul. 2000 – Oct. 2010.	
United Kingdom	1992	Summary of inflation report, four times a year, Feb. 1997 – Nov. 2010.		Openings remarks on inflation report, four times a year, Feb. 1997 – Nov. 2010.

Source: Websites of national central banks.

Table 2. Sample Correlations

	$|S|$	V	$|E_t[\pi_{t+4}] - \pi^*|$	$|\pi_t - \pi^*|$	Word count	Sentence count	FK grade level
V	0.19						
$|E_t[\pi_{t+4}] - \pi^*|$	0.05	-0.04					
$|\pi_t - \pi^*|$	0.04	0.12	0.27				
Word count	0.19	0.05	-0.12	0.06			
Sentence count	0.13	0.07	-0.12	0.03	0.93		
FK grade level	0.10	-0.10	0.03	0.14	0.36	0.07	
Dissent	0.18	-0.01	0.03	0.20	0.32	0.16	0.33

Source: authors' calculations. Note: This table shows correlation coefficients between the following variables: the absolute value of the evaluation on inflation given by the central bank ($|S|$), the uncertainty regarding this signal (V), the forward looking and contemporaneous inflation gaps, the number of words and sentences in the executive summary of the inflation report and the Flesch-Kincaid grade level for these summaries. The bottom row shows results for dissent in monetary policy committees for the four countries in our sample which publish voting records. This table describes the sections of text used for FK calculations and not the sections used for content analysis.

Table 3. Explaining Clarity of Inflation Reports

(The dependent variable is the Flesch-Kincaid grade level)

	Chile	Czech Republic	Euro area	Poland	Sweden	Thailand	United Kingdom
$|S|$	-0.07	-0.24**	0.18	0.01	-0.05	-0.13	0.02
	(0.09)	(0.10)	(0.11)	(0.07)	(0.11)	(0.08)	(0.05)
V	0.07	0.04	-0.02	-0.00	-0.06	-0.02	-0.04
	(0.06)	(0.11)	(0.08)	(0.13)	(0.05)	(0.12)	(0.05)
$|E_t[\pi_{t+4}]- \pi^*|$	-0.03	-0.08	-0.17	-0.31	0.39	0.61	0.84*
	(0.45)	(0.63)	(0.73)	(0.24)	(0.44)	(0.74)	(0.46)
$|\pi- \pi^*|$	0.08	0.37**	0.66	0.00	-0.16	0.31	0.17
	(0.08)	(0.16)	(0.41)	(0.32)	(0.33)	(0.56)	(0.15)
Dissent		0.25		0.56	-0.50		-2.77*
		(2.60)		(1.51)	(1.17)		(1.38)
Trend	-0.03*	-0.00	0.03**	0.04	-0.04***	0.11**	-0.02**
	(0.02)	(0.02)	(0.01)	(0.03)	(0.01)	(0.04)	(0.01)
Constant	16.39***	14.09***	14.81***	14.26***	13.88***	13.12***	12.99***
	(0.55)	(0.79)	(0.39)	(1.19)	(0.56)	(1.70)	(0.60)
Obs.	30	26	35	18	31	22	48
Adj. R^2	-0.01	0.23	0.05	-0.03	0.30	0.28	0.23
Sample starts	2000q2	2000q1	1999q2	2003q2	2000q1	2000q3	1998q1
Sample ends	2009q4	2009q3	2007q4	2009q4	2009q4	2005q4	2009q4

Source: authors' calculations.

Note: Results for least-squares regression where the dependent variable is the Flesch-Kincaid grade level for the inflation report. Independent variables are the absolute value of the evaluation on risks to price stability given by the central bank ($|S|$), the uncertainty regarding this signal (V), the forward-looking and contemporaneous inflation gaps. When available, we also include the fraction of dissenting votes regarding monetary policy decisions. Statistical significance of the estimated coefficients: *** $p<0.01$,** $p<0.05$, * $p<0.1$. Robust standard errors in parentheses.

Table 4. Explaining Clarity of Press Releases / Statements

(The dependent variable is the Flesch-Kincaid grade level)

	Chile	Euro area	Poland	Sweden	Thailand	United Kingdom
$|S|$	0.15	0.16	-0.11	0.11	0.01	-0.02
	(0.10)	(0.12)	(0.12)	(0.08)	(0.10)	(0.05)
V	0.00	-0.03	0.15	0.01	0.18*	0.10**
	(0.06)	(0.09)	(0.16)	(0.04)	(0.09)	(0.04)
$|E_t[\pi_{t+4}]- \pi^*|$	0.06	-0.26	0.07	0.10	0.20	-0.10
	(0.34)	(0.73)	(0.39)	(0.51)	(0.93)	(0.46)
$|\pi- \pi^*|$	0.10	0.73*	-0.33	-0.44**	-0.34	-0.57**
	(0.08)	(0.36)	(0.27)	(0.19)	(0.33)	(0.21)
Dissent			1.24	-0.57		0.01
			(1.36)	(1.23)		(1.25)
Trend	-0.07***	0.04***	0.07**	-0.06***	0.12**	0.02*
	(0.02)	(0.01)	(0.02)	(0.01)	(0.05)	(0.01)
Constant	16.80***	14.24***	13.09***	14.16***	12.03***	11.20***
	(0.71)	(0.42)	(0.69)	(0.45)	(1.29)	(0.41)
Obs.	30	35	18	38	20	36
Adj. R^2	0.42	0.10	0.40	0.42	0.32	0.28
Sample starts	2000q2	1999q2	2003q2	2000q1	2000q4	2001q1
Sample ends	2009q4	2007q4	2009q4	2009q4	2005q4	2009q4

Source: authors' calculations.

Note: Results for least-squares regression where the dependent variable is the Flesch-Kincaid grade level for press releases (Chile, Poland, Sweden and Thailand) or statements (euro area and United Kingdom). The independent variables are described in the footnote for Table 3. Statistical significance of the estimated coefficients: *** p<0.01,** p<0.05, * p<0.1. Robust standard errors in parentheses.

Table 5. Explaining the Length of Inflation Reports

(The dependent variable is the word count)

	Chile	Czech Republic	Euro area	Poland	Sweden	Thailand	United Kingdom
$|S|$	-10	-63*	31	31	-10	-5	11
	(90)	(32)	(31)	(53)	(105)	(12)	(7)
V	-5	14	-43***	27	26	-36*	-18***
	(43)	(21)	(15)	(68)	(52)	(18)	(6)
$|E_t[\pi_{t+4}] - \pi^*|$	-124	40	-256	83	178	-188	83
	(264)	(132)	(200)	(147)	(464)	(142)	(78)
$|\pi - \pi^*|$	-59	-22	287**	-73	132	-204**	67**
	(64)	(45)	(127)	(118)	(338)	(86)	(28)
Dissent		1,381		1,575**	-952		-114
		(799)		(657)	(1,620)		(144)
Trend	-7	4	11***	53***	-17	38***	11***
	(13)	(4)	(3)	(9)	(12)	(7)	(1)
Constant	2,918***	985***	1,139***	-667*	1,437**	994***	1,162***
	(535)	(204)	(123)	(337)	(539)	(183)	(63)
Obs.	30	26	35	18	31	22	48
Adj. R^2	-0.10	0.19	0.41	0.64	-0.10	0.68	0.61
Sample starts	2000q2	2000q1	1999q2	2003q2	2000q1	2000q3	1998q1
Sample ends	2009q4	2009q3	2007q4	2009q4	2009q4	2005q4	2009q4

Source: authors' calculations.

Note: Results for least-squares regression where the dependent variable is the number of words in the executive summary of the inflation report. The independent variables are described in the footnote for Table 3. Statistical significance of the estimated coefficients: *** p<0.01,** p<0.05, * p<0.1. Robust standard errors in parentheses.

Table 6. The Global Financial Crisis and Clarity of Inflation Reports

(The dependent variable is the Flesch-Kincaid grade level)

	Poland	Sweden	United Kingdom
$\lvert S \rvert$	0.19**	-0.13	0.00
	(0.08)	(0.10)	(0.05)
V	-0.14	-0.04	-0.03
	(0.10)	(0.05)	(0.05)
$\lvert E_t[\pi_{t+4}] - \pi^* \rvert$	-0.50**	0.33	0.63*
	(0.21)	(0.43)	(0.34)
$\lvert \pi - \pi^* \rvert$	0.02	0.22	0.13
	(0.23)	(0.28)	(0.14)
Dissent	-0.24	0.05	-1.96
	(1.14)	(1.11)	(1.26)
Crisis dummy	1.75**	1.46***	1.15***
	(0.73)	(0.38)	(0.24)
Trend	-0.01	-0.06***	-0.03***
	(0.04)	(0.01)	(0.01)
Constant	16.06***	14.13***	13.14***
	(1.60)	(0.52)	(0.59)
Obs.	18	31	48
Adj. R^2	0.33	0.46	0.36

Source: authors' calculations.

Note: The table present results for least-squares regressions where the dependent variable is the Flesch-Kincaid grade level for the inflation report. The independent variables are described in the footnote for Table 3, and now also include a crisis dummy which is equal to 1 for the period 2008q4 – 2009q4. We only present results for three countries where the crisis dummy was significant. Statistical significance of the estimated coefficients: *** $p<0.01$,** $p<0.05$, * $p<0.1$. Robust standard errors in parentheses.

REFERENCES

Blinder, Alan S., 2009, Talking about Monetary Policy: The Virtues (and Vices?) of Central Bank Communication, BIS Working paper no. 274. (Basel: Bank for International Settlements). Available at: http://www.bis.org/publ/work274.htm.

Blinder, Alan S., Michael Ehrmann, Marcel Fratzscher, Jakob de Haan and David-Jan Jansen, 2008, "Central bank communication and monetary policy: a survey of theory and evidence," *Journal of Economic Literature*, 46(4), pp. 910–945.

Born, Benjamin, Michael Ehrmann and Marcel Fratzcher, 2011, "Central bank communication on financial stability," ECB Working Paper 1332. (Frankfurt: European Central Bank). Available at: http://www.ecb.int/pub/pdf/scpwps/ecbwp1332.pdf.

Bulíř, Aleš, Martin Čihák, and Kateřina Šmídková, 2008, "Writing Clearly: ECB's Monetary Policy Communication," IMF Working Paper 08/252. (Washington, DC: International Monetary Fund). Available at: http://www.imf.org/external/pubs/ft/wp/2008/wp08252.pdf.

Bulíř, Aleš, Kateřina Šmídková, Viktor Kotlán, and David Navrátil, 2008, "Inflation Targeting and Communication: It Pays Off to Read Inflation Reports," IMF Working Paper 08/234. (Washington, DC: International Monetary Fund). Available at: http://www.imf.org/external/pubs/ft/wp/2008/wp08234.pdf.

Čihák, Martin, 2006, "How Do Central Banks Write about Financial Stability?" IMF Working Paper 06/163. (Washington, DC: International Monetary Fund). Available at: http://www.imf.org/external/pubs/ft/wp/2006/wp06163.pdf.

Čihák, Martin, Sònia Muñoz, Shakira Teh Sharifuddin, and Kalin Tintchev, 2011, "Financial Stability Reports: What Are They Good For?" IMF Working Paper, forthcoming. (Washington, DC: International Monetary Fund).

Clatworthy, Mark and Michael Jones, 2001, "The effect of thematic structure on the variability of annual report readability," *Accounting, Auditing & Accountability Journal*, Vol. 14, No. 3, pp. 311–326.

Courtis, John K., 1998, "Annual report readability variability: tests of the obfuscation hypothesis," *Accounting, Auditing & Accountability Journal,* Vol. 11, No. 4, pp. 459–471.

Dincer, N. and B. Eichengreen, 2007, "Central bank transparency: causes, consequences and updates," *National Bureau of Economic Research,* Working Paper No. 14791.

Eijffinger, S. C. W. and P. M. Geraats, 2006, "How transparent are central banks?" *European Journal of Political Economy*, Vol. 22, no. 1, pp. 1–21.

European Central Bank, 2004, "The Monetary Policy of the ECB," Chapter 3, January. Available at: http://www.ecb.int/mopo/strategy/html/index.en.html.

Fracasso, Andrea, Hans Genberg, and Charles Wyplosz, 2003, "How Do Central Banks Write?" Geneva Reports on the World Economy, Special Report 2. (Geneva: The Center for Economic Policy Research). Available at: http://hei.unige.ch/~wyplosz/IR_fgw.pdf.

Gerlach-Kristen, P., 2004, "Is the MPC's voting record informative about future UK monetary policy?" *Scandinavian Journal of Economics*, Vol. 106, no. 3, pp. 299–313.

Jansen, David-Jan, 2011a, "Mumbling with great incoherence: was is really so difficult to understand Alan Greenspan?" *Economics Letters¸* Vol. 113, no. 1: 70–72.

Jansen, David-Jan, 2011b, "Has the clarity of central bank communication affected financial markets? Evidence from Humphrey-Hawkins testimonies," *Contemporary Economic Policy¸* Vol. 29, no. 4, pp. 494–509.

Kincaid J., R. Fishburne, R. Rogers, and B. Chissom, 1975, "Derivation of new readability formulas (Automated Readability Index, Fog Count, and Flesch Reading Ease Formula) for Navy enlisted personnel," Research Branch report 8-75. (Memphis: Naval Air Station.)

Kwiatkowski, D., P. C. B. Phillips, P. Schmidt and Y. Shin, 1992, "Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?" *Journal of Econometrics,* Vol. 54**,** pp. 159–178.

Morris, Stephen and Hyan Song Shin, 2002, "Social Value of Public Information", *American Economic Review*, Vol. 92, no. 5, pp. 1521–1534.

Paasche-Orlow, Michael, Holly Taylor, and Frederick Brancati, 2003, "Readability standards for informed-consent forms as compared with actual readability," *New England Journal of Medicine*, Vol. 348, pp. 721–6.

Svensson, Lars E.O., 2006, "Social Value of Public Information: Morris and Shin (2002) Is Actually Pro-Transparency, Not Con," *American Economic Review,* 96(1), pp. 448–452.

Woodford, Michael, 2005, "Central Bank Communication and Policy Effectiveness," *National Bureau of Economic Research*, Working Paper No. 11898.