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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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Communicating dissent on monetary policy: Evidence from central bank minutes *

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Abstract

We study whether differences in views during monetary policy meetings affect central bank transparency. Using data published by four central banks, we find that dissent among committee members increases the file size of minutes of policy meetings. However, dissent does not affect the readability of these minutes. We conclude that minutes can still be useful in providing accountability when views differ without necessarily impairing transparency.

Keywords: monetary policy, minutes, dissent, transparency, accountability.

JEL classification: E52, E58.

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1 Introduction

This paper studies whether differences in views of policymakers affect communications by monetary policy authorities. In particular, we study whether dissent in voting on policy rates affects the size and clarity of minutes of meetings by monetary policy committees. Publishing such minutes is one important way in which a number of central banks inform the general public on monetary policy. By providing insights on the policy deliberations and the underlying information, central banks can provide accountability of their decisions. Whether or not a central bank publishes minutes, is a standard component of measures for central bank transparency (Eijffinger and Geraats, 2006).

A move to greater central bank independence, and increased powers of central banks in the wake of the global financial crisis, have led to calls for greater accountability, since central bank officials are not democratically elected (Bernanke, 2010). Greater accountability in turn requires greater transparency so that central banks can effectively be evaluated and held to account (Bernanke, 2010; Siklos, 2011; Dincer and Eichengreen, 2014). Another argument in favour of transparency is that it can make monetary policy more effective by affecting private agents expectations (Woodford, 2005). By releasing minutes of policy committee meetings, central banks can guide market expectations on the economic outlook as well as future policy decisions (Blinder, Ehrmann, Fratzscher, De Haan, and Jansen, 2008). Indeed, there is evidence that financial markets react to the information content of central bank minutes (Reeves and Sawicki, 2007; Rosa, 2013).

By studying how dissent affects the information structure of minutes, this paper contributes to the on-going debate on optimal central bank accountability and transparency. Within this literature, an on-going debate is whether there can be too much transparency. For instance, Morris and

Shin (2002) and Svensson (2006) have debated, within a global games setting, whether greater transparency on public policy is necessarily welfare-enhancing. From an empirical study, Van der Cruysen, Eijffinger, and Hoogduin (2010) conclude that there is an optimal intermediate degree of central bank transparency. Bloom (2014) has pointed to trade-offs by asking whether transparency can add to financial market volatility.

The trade-off with respect to transparency that this paper considers, is whether dissent leads to longer minutes – which would mean more information to the general public – that are simultaneously less accessible. Dissent among committee members presumably leads to longer deliberations, which would increase the file size of the minutes. This, in turn, raises the issue of whether the readability of the minutes will also be impaired. We use two statistics to assess these two hypothesis. First, we follow Loughran and McDonald (2014) in using the log of the file size as a measure of information content. Secondly, we use a more traditional readability statistic – the Flesch-Kincaid grade level (Kincaid et al. 1975) – to determine the level of readability of minutes.

While we are, to the best of our knowledge, the first to apply the Loughran and McDonald measure in this context, readability statistics are already increasingly being used to study the clarity of central bank communication. For example, Bulíř, Čihák and Jansen (2013) find that the clarity of communications by a number of monetary authorities decreased during the financial crisis. Hernández-Murillo and Shell (2014) use the Flesch-Kincaid grade level to show how the complexity of FOMC statements has increased in recent years. Jansen (2011) finds that greater clarity of Humphrey-Hawkins testimonies by the Federal Reserve Chair go hand in hand with lower levels of medium-term interest rates. Also, Taborda (2015) uses a range of readability statistics to study the minutes published by a sample of Latin American

central banks.

We apply the Loughran and McDonald (2014) file size measure and the Flesch-Kincaid grade level to the minutes of four monetary policy authorities. We select those institutions that publish both minutes of their monetary policy committee meetings and voting records. Thus, we can include the meeting minutes published by the Bank of Japan, the Monetary Policy Committee (MPC) of the Bank of England, the Executive Board of Sveriges Riksbank, and the Federal Open Market Committee (FOMC) of the Federal Reserve.¹

Using country-by-country regression models, we find evidence that dissent among policymakers increases the file size of the minutes, suggesting that the meetings where more dissent occurs are generally longer and more intense. A second finding is, however, that there is no apparent change in the readability of the minutes. We find no evidence that dissent coincides with lower levels of readability. In the case of the Bank of Japan, in fact, we find that more dissent leads to minutes that are more accessible. Overall, therefore, we conclude that minutes can remain useful for central banks in providing accountability in a situation of diverse views without necessarily impairing transparency.

2 Related literature on minutes and dissent

Previous work has shown the relevance of minutes of policy meetings in various contexts of central bank transparency. Analysing minutes by the Riksbank, Apel and Grimaldi (2012) find that a measure of the degree of hawkishness of the minutes helps in predicting future policy decisions of the Riksbank. Similarly, El-Shagi and Jung (2015) conclude that minutes by the

¹See also Keden and Stuart (2014) or El-Shagi and Jung (2015) for further background on minutes and voting records.

Bank of England's MPC help markets in forming expectations about future policy decisions. Given this evidence, it is not surprising that financial market prices react to the release of minutes. Rosa (2013) finds that the publication of FOMC minutes affects the volatility of U.S. asset prices and their trading volumes. Boukus and Rosenberg (2006) extract themes from FOMC minutes, and find that U.S. Treasury yields react to these themes, the level of monetary policy uncertainty, and the prevailing economic outlook.

Turning to disagreement, we can distinguish between voicing different views on monetary policy outside meetings and registering formal dissent in the voting procedure during meetings.² Concerning differing views outside meetings, Ehrmann and Fratzscher (2005) study the Federal Reserve, Bank of England and ECB, and find that communicating the disagreement between committee members about monetary policy reduces the ability of market participants to predict future policy rates, and leads to higher financial market volatility. Jansen and De Haan (2006), who focus on euro area central bankers, also find that comments outside meetings on interest rates, inflation and economic growth have often been contradictory, while Hayo and Neuenkirch (2013) find that Federal Reserve presidents' speeches can be driven by regional developments.

Concerning formal voting in monetary policy committees, there is evidence that the voting records are informative for future policy decisions. Gerlach-Kristen (2004) finds that the voting record of the Bank of England's MPC helps predict future policy rate changes. Gerlach-Kristen (2009) also finds that external MPC members dissent more often than internal ones. Interestingly, dissents by external members help to forecast future interest rate

²In cases where transcripts of meetings are available, one could also analyse voiced dissent, as in Meade (2005). Given that these transcripts are either not released, or only with a lag, we do not include voiced dissent in our analysis.

changes, in contrast to dissents by internal members. Andersson, Dillen, and Sillen (2001) find for the Riksbank that the votes of dissenting policymakers are informative about future changes in policy. Riboni and Ruge-Murcia (2014) confirm for the Bank of England and for the Riksbank that dissents in monetary policy committees help predict future policy decisions. They also present a theoretical model consistent with this evidence. By contrast, Fujiki (2005) shows that the voting record at the Bank of Japan does not forecast policy changes well.

There is also evidence on the structure of dissent. For the FOMC, career background and the political channel of appointment of committee members were found to affect dissent (Havrilesky and Schweitzer, 1990; Chappell et al., 1993), while these factors were found to have a negligible effect for dissent in the Bank of England's MPC (Harris et al., 2011). Harris et al. (2011), for instance, find that the distinction between external and internal MPC members was relevant for an MPC member's decision to dissent, while career background was not. Deviations of the MPC's inflation forecasts from target do influence dissent of external members, but not of internal members. The publicity of the debate may also be relevant for dissent. For instance, Meade and Stasavage (2008) study the FOMC's 1993 decision to begin releasing transcripts. For Board Governors and voting Presidents of regional Federal Reserve Banks, they find a significant reduction in the likelihood of voicing dissent during FOMC meetings.

Finally, there is also information on the role of minutes and dissent coming from policymakers themselves. Bernanke (2004) mentions that minutes of FOMC meetings are one vehicle to help convey the breadth of opinion on the FOMC, by describing "the range of viewpoints and many of the key considerations underlying policy decisions". He suggests that providing information on the views of individual members, for example through the publication of

minutes, can provide “useful information about the diversity of views and the balance of opinion on a committee”. In a survey of the Riksbank’s present and former MPC members, Apel et al. (2010) ask about the effects of the publication of attributed minutes on the nature of the discussion. The statement that attributed minutes make the discussion more inhibited and less spontaneous received the least support (“applies only to a slight extent”), while the statement that attributed minutes make the discussion better received the most support (“applies to some extent”). In a survey of MPC members of Norges Bank and the Riksbank, Apel et al. (2015) find that those in Sweden think that verbal communication of differing views among committee members could improve the public’s understanding of policy. By contrast, the members in Norway think it could reduce the clarity of the central bank’s communication. These arguments are in line with those of Issing (2005), who argues that with attributed votes the voting behavior of national central bank governors might be interpreted by the public from a “national” perspective. Then President of Federal Reserve Bank of Kansas City, Thomas Hoenig (2011), has argued that dissent should not necessarily be seen as counterproductive.

3 Methodology and data

We collect information on minutes and voting records from the central bank websites. Concerning the minutes, we construct a separate text file for each meeting that retains only the relevant information on the monetary policy discussion. This means that we clean the original file with minutes, as provided by the central banks on their web site, from irrelevant information for our purposes, such as time and date of the meeting, the list of persons who are present, or the logo of the central bank.

Applying the Loughran and McDonald (2014) measure is straightforward, as this procedure only entails registering the size of the file and then taking the natural logarithm of this number. As our documents are much smaller in size than the sample used by Loughran and McDonald, we use file size in kilobytes rather than megabytes. Figure 2 shows the results for the four countries included in our analysis, where the samples run from 1997 to 2015. The size measures range between 2.5 and 4.5, implying that the file sizes are between 12 and 90 kB. During the early part of the sample, the size of the minutes move around a constant mean, but during the global financial crisis the size of the minutes increases, most clearly so in Sweden and the United States.

insert Figure 1 around here

Secondly, we apply the Flesch-Kincaid (FK) grade level – a standard measure for document readability – to the minutes. This measure is computed as follows:

$$FK = 0.39 * \frac{words}{sentences} + 11.8 * \frac{syllables}{words} - 15.59 \quad (1)$$

where FK denotes the Flesch-Kincaid grade level, and $words$, $sentences$ and $syllables$ denote three key textual characteristics of the individual communications. A higher average number of words per sentences ($words/sentences$), or longer words ($syllables/words$) makes the text less readable. We use an R package called koRpus to calculate the FK grade level (Michalke, 2012).

Figure 2 shows the Flesch-Kincaid grade level for the minutes. Compared to the size measure, there is more variation across institutions and time.³ The measure for the minutes by the Bank of England is least volatile,

³This paper focuses on variation over time, and we do not run regressions to explain

with the Flesch-Kincaid grade level measure mostly moving around a value of 12, also during the financial crisis. The interpretation of this number is that an average reader with 12 years of education would be able to comprehend the contents of the minutes. Minutes by Sveriges Riksbank during the early 2000s have similar values for the Flesch-Kincaid measure, but during the crisis period, the minutes become less accessible to the average reader. Minutes by the Bank of Japan and the Federal Reserve generally require between 14 and 16 years of education. In the case of the Federal Reserve, there also seems to be a recent upward trend in the complexity of the minutes. This evidence is in line with results for the FOMC statements, the complexity of which has also been increasing in recent years, mainly since the start of unconventional monetary policies (Hernández-Murillo and Shell, 2014).

insert Figure 2 around here

Figure 3 suggests a trade-off between file size and readability of monetary policy meeting minutes. The scatter plot is based on all the minutes in our sample for the four central banks. The horizontal axis shows the log file size measure and the vertical axis shows the Flesch-Kincaid grade level. The upward sloping bivariate regression line suggests that increases in file size go hand in hand with lower levels of readability: A higher Flesch-Kincaid grade level means more education would be needed to understand a particular text. One may well imagine that dissent among committee members leads to longer deliberations, which would presumably increase the file size of the minutes. This, in turn, raises the issue of whether the readability of the minutes will also be impaired.

the variation across institutions. Some of the variation across institutions may be due to the role of translating the minutes from the original language.

insert Figure 3 around here

We analyse the effects of dissent on the file size as well as readability of minutes for each of the four central banks in the following least-squares regression framework:

$$y_t = \alpha + \mathbf{x}_t' \boldsymbol{\beta} + \epsilon_t \quad (2)$$

where y_t is either the log file size or the Flesch-Kincaid grade level, and the vector \mathbf{x}_t contains a measure of voting dissent as well as a range of control variables. For dissent, we measure the fraction of minority votes. By construction, this measure lies between 0 and 0.5. Figure 4 plots the degree of dissent during policy meetings. Again, there are differences across time and institutions. Dissents are generally infrequent and few in the case of the Bank of Japan and the Federal Open Market Committee.

insert Figure 4 around here

Table 1 gives an overview of the regression variables, including the remaining right-hand side variables. We use the number of voters, since more individuals present at the meeting may increase the size of minutes, and potentially affect the clarity of the debate. We also include a dummy that measures whether or not a policy change occurs and the monthly change in the balance sheet as a proxy for the unconventional monetary policies that were implemented during the latter part of the sample period. Changes in (un)conventional policies may lead to longer deliberations and more extensive explanations from the policy committee. We also include the Baker, Bloom, and David (2015) measure for policy uncertainty, as greater uncertainty may lead to longer deliberations and may also have an effect on the

clarity of the discussions. Following the literature on dissent (e.g. Harris et al, 2011), we also include the forecasted deviation from the inflation target and the projected growth in GDP. It should be noted that this information is only available for the full sample period for the Bank of England. For Sveriges Riksbank and the Federal Reserve, this information is available for the latter years of the sample period. Therefore, for these two cases, we present regression results with and without the forecast variables. We also include year and month dummies in all regressions.

insert Table 1 around here

4 Results

Table 2 presents estimation results that use the log file size measure as dependent variable. Column 1 has results for minutes by the Bank of Japan, columns 2 - 3 have results for Sveriges Riksbank, column 4 has results for the Bank of England's MPC, and the last two columns have results for the Federal Reserve. For each institution, we show results for a baseline regression (columns 1, 2, 4, and 5). As noted above, for Sveriges Riksbank and the Federal Reserve, we also show results for specifications that include variables on forecasts (columns 3 and 6).

We find strong indications that diverging views in a monetary policy committee increases the file size of the minutes. For three of the four institutions, we find a positive and significant coefficient for the voting dissent variable. The estimates range between 0.23 (Bank of England, column 4) and 1.19 (Bank of Japan, column 1). These estimates mean that between a meeting with no dissent and one with maximum dissent, the file size of the minutes increases by between 11.5% and 59.5%. The Federal Reserve is the only in-

stitution for which the estimated coefficient is not significantly different from zero.

Regarding the control variables, we find no robust effects. In some cases (columns 1 and 2), we find that the number of voters leads to longer minutes. A policy rate change has, in contrast, no effect on the length of minutes. The growth of the balance sheet and the level of policy uncertainty, in turn, do have a positive relationship with the length of minutes in some cases. The projected deviation from the inflation target as well as forecasted GDP growth do not appear to have a robust effect on the file size of the minutes.

insert Table 2 around here

Turning to readability, we find no indications that dissent on policy decisions increases the language complexity of minutes. Table 3 presents estimation results, once again for four countries and a range of specifications. The only case where the estimated coefficient is significant is for the Bank of Japan. The coefficient is, however, negative, implying that an increase in voting dissent goes hand in hand with minutes that are more accessible. This could be because special care might have been taken in communicating clearly about controversial issues. The coefficient of -1.97 implies that between no dissent and maximum dissent, the Flesch-Kincaid grade level declines by 0.985. For none of the other three institutions does the coefficient on dissent differ significantly from zero.

Finally, we find no clear link between the control variables and the Flesch-Kincaid grade level. Only for the Federal Reserve, there is evidence that a greater number of voters on the FOMC coincides with greater clarity of the minutes. For the Bank of Japan and the Federal Reserve, policy changes coincide with clearer minutes, while changes in the balance sheet have no

connection with readability. Policy uncertainty, in turn, leads to higher grade levels in two cases, meaning that the minutes are harder to understand for the average person. There are no effects of inflation and GDP forecasts on the readability measure.

insert Table 3 around here

5 Conclusions

This paper studies whether dissent in monetary policy committees affects the file size and readability of monetary policy meeting minutes. In this context, we find no evidence of a trade-off between the amount of information that is shared with the general public and the accessibility of this information. Using two measures for the information content of minutes, we find evidence that formal dissent among committee members leads to longer minutes. However, the degree of dissent does not reduce the readability of the minutes. These two results show that publishing minutes can be useful in providing accountability without necessarily impairing transparency.

This paper focuses on explaining the effects of dissent on the trade-off between length and readability of monetary policy minutes. We do not study to what extent, if any, there is in itself an optimal length or clarity of central bank minutes. Following existing work on optimal central bank transparency (Morris and Shin, 2002; Eijffinger and Geraats, 2006; Van der Cruijssen et al., 2010) this may be a fruitful avenue for future research.

References

- Andersson, M., H. Dillen, and P. Sellin. 2001. Monetary Policy Signaling and Movements in the Swedish Term Structure of Interest Rates. Riksbank Working Paper No. 132.
- Apel, M., C. A. Claussen and P. Lennartsdotter. 2010. Picking the Brains of MPC Members. Sveriges Riksbank Working Paper No. 237.
- Apel, M. and M. Blix Grimaldi. 2012. The Information Content of Central Bank Minutes. Sveriges Riksbank Working Paper No. 261.
- Apel M., C. A. Claussen, P. Lennartsdotter and Ø. Røisland. 2015. Monetary policy committees – comparing theory and “inside” information from MPC members. *International Journal of Central Banking* 11(4): 47-89.
- Baker, S. R., N. Bloom, and S. J. Davis. 2015. Measuring Economic Policy Uncertainty. NBER Working Paper No. 21633.
- Bernanke, B. 2004. FedSpeak. Remarks at the meetings of the American Economic Association, San Diego, 3 January.
- Bernanke, B. 2010. Central Bank Independence, Transparency, and Accountability. Speech at the Institute for Monetary and Economic Studies International Conference, Bank of Japan, Tokyo, Japan, May 25.
- Blinder, A. S., M. Ehrmann, M. Fratzscher, J. De Haan, and D. Jansen. 2008. Central bank communication and monetary policy: A survey of theory and evidence. *Journal of Economic Literature* 46(4): 910-945.

Bloom, N. 2014. Fluctuations in uncertainty. *Journal of Economic Perspectives* 28(2): 153-176.

Boukous, E. and J. V. Rosenberg. 2006. The Information Content of FOMC Minutes. Manuscript, Federal Reserve Bank of New York.

Bulíř, A., M. Čihák, and D. Jansen. 2013. What Drives Clarity of Central Bank Communication About Inflation? *Open Economies Review* 24(1): 125-145.

Chappell, H. W. Jr., Havrilesky, T. M., & McGregor, R. R. 1993. Partisan monetary policies: Presidential influence through the power of appointment. *Quarterly Journal of Economics* 108(1): 185-218.

Dincer, N. and B. Eichengreen. 2014. Central Bank Transparency and Independence: Updates and New Measures. *International Journal of Central Banking* 10(1): 189-253.

Ehrmann, M. and M. Fratzscher. 2005. How should central banks communicate? ECB Working Paper No. 557.

Eijffinger, S. C. W. and P. M. Geraats. 2006. How transparent are central banks? *European Journal of Political Economy* 22(1): 1-21.

El-Shagi, M. and A. Jung. 2015. Has the publication of minutes helped markets to predict the monetary policy decisions of the Bank of England's MPC? ECB Working Paper No. 1808.

Fujiki, H. 2005. The Monetary Policy Committee and the Incentive Problem: A Selective Survey. IMES Discussion Paper E-4.

Gerlach-Kristen, P. 2004. Is the MPC's Voting Record Informative about Future UK Monetary Policy? *Scandinavian Journal of Economics* 106: 299-313.

Gerlach-Kristen, P. 2009. Outsiders at the Bank of England's MPC. *Journal of Money, Credit and Banking* 41(6), 1099-1115.

Harris, M., Levine, P. and C. Spencer. 2011. A decade of dissent: explaining the dissent voting behavior of Bank of England MPC members. *Public Choice*: 146:413-432.

Havrilesky, T., & Schweitzer, R. 1990. A theory of FOMC dissent voting with evidence from the time series. In T. Mayer (Ed.), *The political economy of American monetary policy* (pp. 197-210). Cambridge: Cambridge University Press.

Hayo, B. and M. Neuenkirch. 2013. Do Federal Reserve presidents communicate with a regional bias? *Journal of Macroeconomics* 35: 62-72.

Hernández-Murillo, R. and H. Shell. 2014. The rising complexity of the FOMC statement. Federal Reserve Bank of St. Louis, Economic Synopses 23.

Hoenig, T. M. 2011. Monetary policy and the role of dissent. Speech at

the Central Exchange, Kansas City, 5 January 2011.

Issing, O. 2005. "Communication, Transparency, Accountability: Monetary Policy in the Twenty-First Century", *Federal Reserve Bank of St Louis Review*, March/April, 87: 65-83.

Jansen, D. and J. De Haan. 2006. Look who's talking: ECB communication during the first years of EMU. *International Journal of Finance and Economics* 11(3): 219-228.

Jansen, D.. 2011. Has the clarity of central bank communication affected volatility in financial markets? Evidence from Humphrey-Hawkins testimonies. *Contemporary Economic Policy* 29(4): 494-509.

Kedan, D. and R. Stuart. 2014. Central bank Communications: A Comparative Study. *Central Bank of Ireland Quarterly Bulletin* 02/April 14: 89-104.

Kincaid, J. P., R. P. Fishburne, R. L. Rogers, and B. S. 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. Millington, Tennessee: U.S. Naval Air Station.

Loughran, T. and B. McDonald. Measuring readability in financial disclosures. *Journal of Finance* LXIX(4): 1643-1671.

Meade, E. E. 2008. The FOMC's preferences, voting, and consensus. *Federal Reserve Bank of St Louis Review* 87: 93-101.

Meade, E. E. and D. Stasavage. 2008. Publicity of debate and the incentive to dissent: Evidence from the U.S. Federal Reserve. *Economic Journal* 118: 695-717.

Michalke, M. (2012). koRpus – ein R-Paket zur Textanalyse. Paper presented at the Tagung experimentell arbeitender Psychologen (TeaP), Mannheim.

Morris, S. and H. S. Shin. 2002. Social value of public information. *American Economic Review* 92(5): 1521-1534.

Reeves, R. and M. Sawicki. 2007. Do financial markets react to Bank of England communication? *European Journal of Political Economy* 23(1): 207-227.

Riboni, A. and F. Ruge-Murcia. 2014. Dissent in monetary policy decisions. *Journal of Monetary Economics* 66(C): 137-154.

Rosa, C. 2013. The Financial Market Effect of FOMC Minutes. Federal Reserve Board of New York Economic Policy Review 19(2): 67-81.

Siklos, P. 2011. Central Bank Transparency: Another Look. *Applied Economics Letters* 18(10): 929-33.

Svensson, L. E. O. 2006. Social value of public information: Morris and Shin (2002) is actually pro-Transparency, not con. *American Economic Review* 96: 448-451.

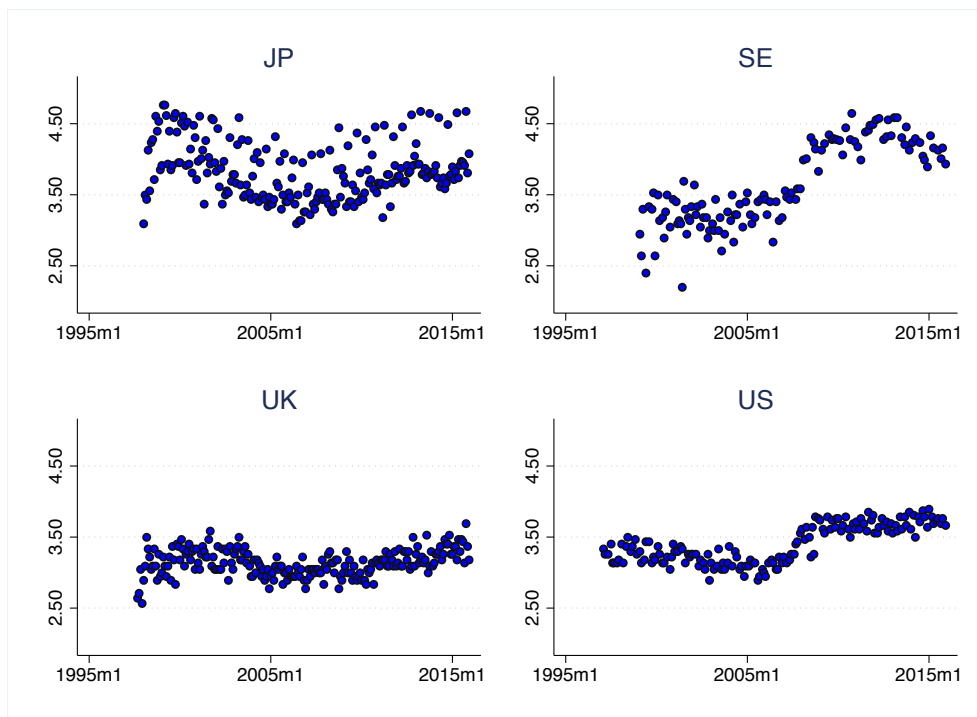
Taborda, R. 2015. Procedural transparency in Latin American central banks

under inflation targeting schemes. A text analysis of the minutes of the Boards of Directors. *Ensayos sobre Política Económica* 33(76): 76-92.

Van der Cruijssen, C. A. B, S. C. W. Eijffinger, and L. H. Hoogduin. 2010. Optimal central bank transparency. *Journal of International Money and Finance* 29(8): 1482-1507.

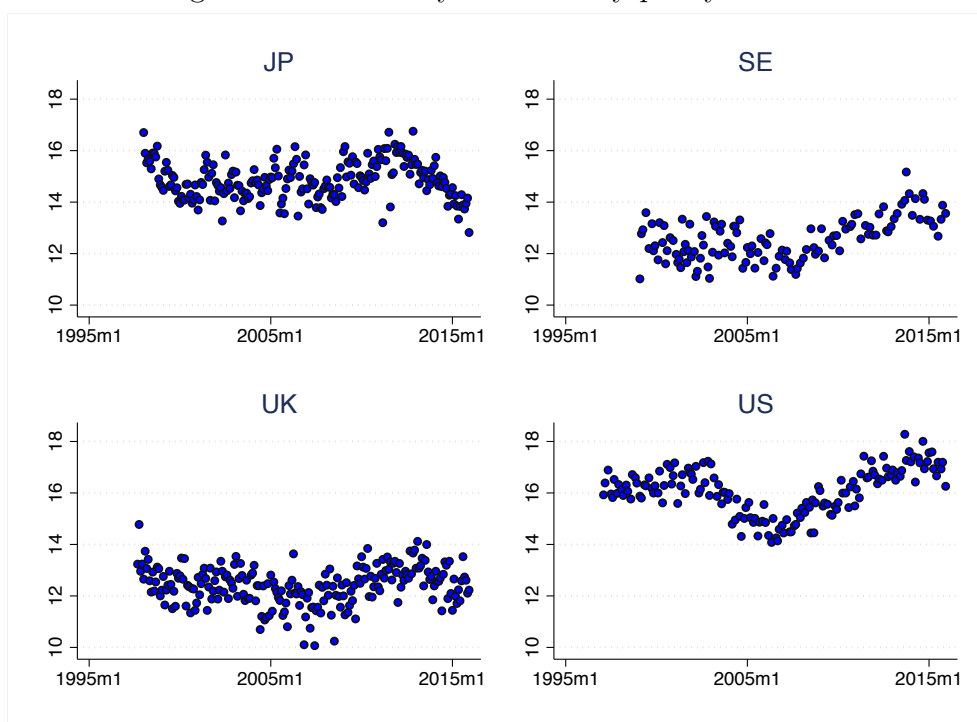
Woodford, M. 2005. Central bank communication and policy effectiveness. Paper presented at Jackson Hole Symposium on The Greenspan Era: Lessons for the Future, August 25-27.

Figure 1: File size of monetary policy minutes



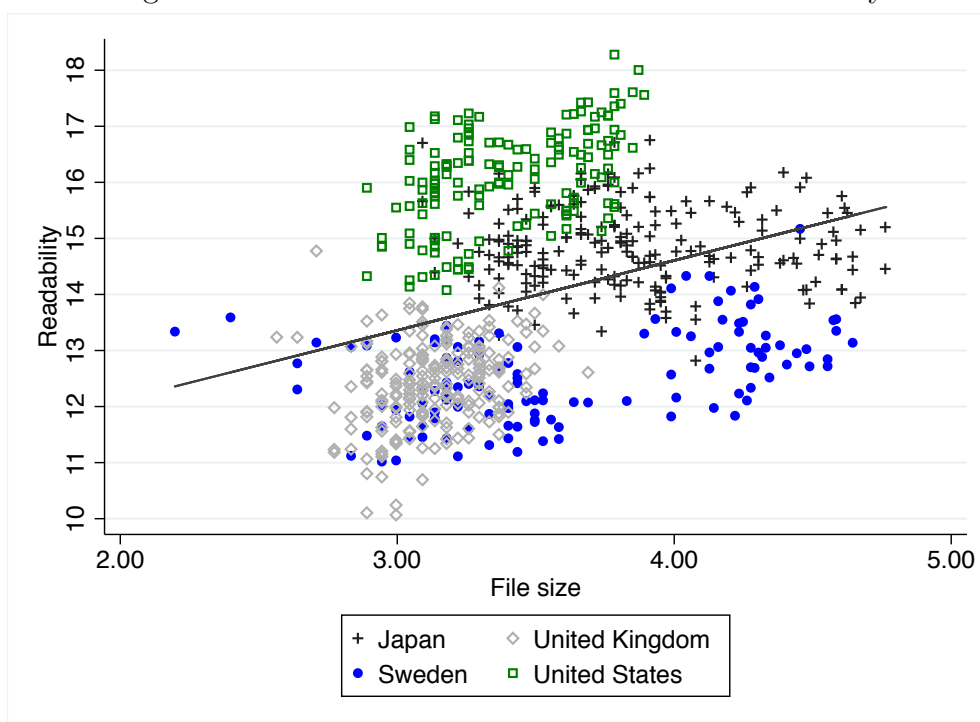
Notes: This figure presents the Loughran and McDonald (2014) log file size measure (in kB) for minutes of the Monetary Policy Meeting of the Bank of Japan (JP), the Executive Board of Sveriges Riksbank (SE), the Monetary Policy Committee of the Bank of England (UK), and the Federal Open Market Committee of the Federal Reserve (US).

Figure 2: Readability of monetary policy minutes



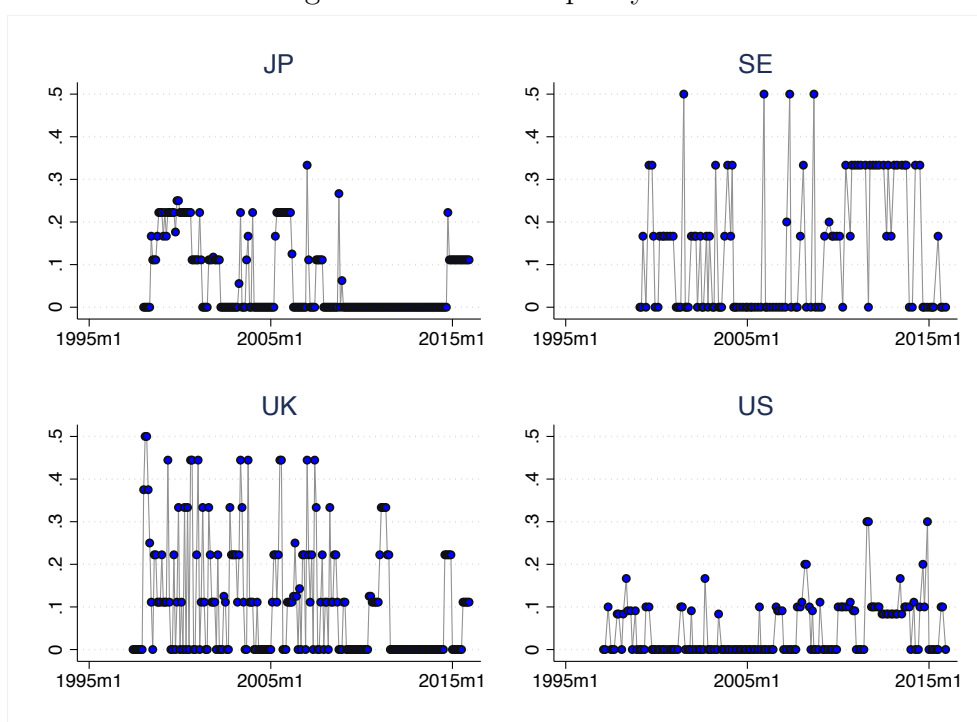
Notes: This figure presents the Flesch-Kincaid grade level, which can be interpreted as the number of years of education needed to sufficiently comprehend a text. A higher level of the Flesch-Kincaid indicates a lower degree of readability. This measure is shown for minutes of the Monetary Policy Meeting of the Bank of Japan (JP), the Executive Board of Sveriges Riksbank (SE), the Monetary Policy Committee of the Bank of England (UK), and the Federal Open Market Committee of the Federal Reserve (US).

Figure 3: Central bank minutes: file size and readability



Notes: This figure show the relationship between the Loughran and McDonald (2014) log file size measure (horizontal axis) and the Flesch-Kincaid grade level for readability (vertical axis). A higher level of the Flesch-Kincaid indicates a lower degree of readability. The sample includes minutes by the Bank of Japan, Sveriges Riksbank, the Bank of England, and the Federal Reserve between 1997 and 2015. The solid line is based on a bivariate regression model.

Figure 4: Dissent on policy rates



Notes: This figure show the fractions of dissenting voters. The sample includes policy rate decisions by the Bank of Japan, Sveriges Riksbank, the Bank of England, and the Federal Reserve.

Table 1. Data description

Variables	Definition
<i>Dependent</i>	
File size	Natural log of file size in kilobytes
Readability	Flesch-Kincaid grade level: number of years of education needed to understand the texts.
<i>Independent</i>	
Dissent	Fraction of dissenting votes
Number of voters	Number of voters
Policy rate change	Binary dummy, 1 equals policy rate change
Balance sheet	Size in local currency, monthly growth in %
Policy uncertainty	Baker et al. (2015) divided by a factor of 100
Inflation deviation	Deviation between inflation forecast and inflation target SE: CPI inflation, 2 year horizon (1999 - 2015). UK: RPIX (97 - 03) / CPI (04 - 15), 2 year horizon US: Summary of Economic Projections (2007 - 15) Mid-point of central tendency PCE inflation in next calendar year
GDP forecast	Forecast for GDP growth SE: 1 year horizon (2003 - 15). UK: 1 year horizon. US: Summary of Economic Projections (2007 - 15). Mid-point of central tendency, next calendar year.

Notes: Data are obtained from institutions' websites, except the policy uncertainty index.

The regressions also include year and month dummies.

Table 2. File size of minutes: Regression results

	(1)	(2)	(3)	(4)	(5)	(6)
	JP	SE	SE(2)	UK	US	US(2)
Dissent	1.19*** (0.25)	0.63*** (0.12)	0.33* (0.18)	0.23*** (0.09)	0.46 (0.33)	-0.02 (0.30)
Number of voters	0.10*** (0.03)	0.12*** (0.04)	0.14 (0.09)	0.02 (0.04)	0.01 (0.02)	-0.00 (0.03)
Policy change	0.10 (0.09)	-0.04 (0.04)	-0.01 (0.06)	-0.03 (0.02)	0.01 (0.03)	-0.01 (0.05)
Balance sheet	0.01** (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.01 (0.01)
Policy uncertainty	0.11* (0.06)	0.07 (0.06)	0.16 (0.15)	0.05** (0.02)	-0.05 (0.07)	0.06 (0.12)
Inflation deviation			0.09 (0.15)	0.10* (0.05)		-0.44 (0.27)
GDP forecast			-0.05 (0.06)	0.02 (0.02)		0.08 (0.07)
Observations	212	118	61	218	103	34
Adjusted R^2	0.71	0.89	0.89	0.51	0.84	0.23

Notes: Coefficients and robust standard errors (in parentheses) for least-squares regressions using the Loughran and McDonald (2014) log file size measure as dependent variable. Regressions include year and month dummies. */**/** denote significance at the 10/5/1% levels.

Table 3. Readability of minutes: Regression results

	(1)	(2)	(3)	(4)	(5)	(6)
	JP	SE	SE(2)	UK	US	US(2)
Dissent	-1.97*** (0.65)	-0.23 (0.33)	-0.55 (0.47)	0.16 (0.39)	0.64 (0.99)	-0.77 (1.23)
Number of voters	0.04 (0.05)	0.08 (0.20)	-0.02 (0.32)	-0.05 (0.17)	-0.16* (0.09)	-0.31*** (0.09)
Policy change	-0.56* (0.31)	-0.14 (0.12)	-0.08 (0.19)	-0.11 (0.15)	-0.24* (0.13)	-0.43* (0.24)
Balance sheet	-0.00 (0.01)	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.00)	-0.01 (0.01)	-0.07* (0.03)
Policy uncertainty	0.34** (0.14)	0.05 (0.20)	-0.29 (0.43)	0.19* (0.10)	0.36 (0.26)	0.26 (0.52)
Inflation deviation			-0.48 (0.56)	0.05 (0.32)		-0.59 (0.67)
GDP forecast			0.13 (0.20)	0.08 (0.09)		0.10 (0.31)
Observations	212	118	61	218	103	34
Adjusted R^2	0.47	0.55	0.62	0.29	0.82	0.83

Notes: Coefficients and robust standard errors (in parentheses) for least-squares regressions using the Flesch-Kincaid grade level as dependent variable. A higher (lower) value of this measure indicate texts that are less (more) easy to read. Regressions include year and month dummies. */**/** denote significance at the 10/5/1% levels.

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