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Abstract

In this paper, we study whether central bank communication has a positive effect on market participants' perception of central banks' (i) credibility, (ii) unorthodox measures, and (iii) independence. We utilise a survey of more than 550 financial market participants from around the world who answered questions in reference to the Bank of England (BoE), the Bank of Japan (BoJ), the European Central Bank (ECB), and the Federal Reserve (Fed). We find that market participants believe that the Fed communicates best, followed by the BoE, ECB, and BoJ. Similar rankings are found on the issues of credibility, satisfaction with unconventional monetary policy, and possible deterioration in independence. Using ordered probit models, we show that central bank communication has a positive effect on how central banks are perceived and understood, as it enhances credibility, increases satisfaction with unorthodox measures, and fosters perceived independence of central banks.

Keywords: Central Bank, Communication, Credibility, Financial Crisis, Financial Market Participants, Independence, Survey, Unconventional Monetary Policy.

JEL: E52, E58

1. Introduction

The role of central banks has undergone a dramatic change since the financial crisis compared to the part they played previously. Before the crisis, during the 'Great Moderation' period, central banks were primarily concerned with ensuring stable prices and stabilising the economy. Following the outbreak of the global financial crisis, the scope of central bank activity increased dramatically. Rather than focussing on inflation rates, many central banks are heavily engaged in jump-starting economic activity in an environment characterised by low GDP growth and high unemployment. To this end, they continue to keep monetary policy rates extremely low and engage in several types of unconventional monetary policy, such as asset purchases, exceptional liquidity provision, conditional commitments, and sometimes are even willing to purchase large amounts of public debt.

Starting with attempts to fine-tune monetary policy during the 'Great Moderation', central banks have been increasingly concerned with improving their communication with financial markets. On the one hand, better communication is believed to facilitate the conduct of monetary policy by anchoring inflation expectations and reducing private-sector uncertainty over monetary policy. On the other hand, communication is supposed to increase the transparency of independent central banks thus making them more accountable to the public.

Reflecting this movement toward more transparency, central banks have invested a great deal of effort in thoroughly communicating about the unconventional monetary policies adopted during the financial crisis. An important purpose of these communications is to make the point that in spite of providing almost unlimited amounts of liquidity, financial market participants have no reason to doubt central bank credibility and independence.

By asking financial market participants about how they perceive the performance of four major central banks—the Bank of England (BoE), the Bank of Japan (BoJ), the European Central Bank (ECB), and the Federal Reserve (Fed)—this paper examines the relationship between central bank communication and perceptions of bank credibility and independence during the financial crisis. The analysis is based on a unique dataset of more than 550 market participants from various parts of the world and financial institutions that was collected by Barclays in 2013 using an extensive questionnaire jointly developed with us.

In the first part of our analysis, we study how market participants perceive the central banks' communication ability, credibility, unorthodox measures, and independence. In the second part, we relate the last three aspects to the first, that is, central bank communication ability, and answer the following research question in light of the ongoing economic and financial crisis: Does central bank communication result in more positive perceptions of the bank's (i) credibility, (ii) unorthodox measures, and (iii) independence?

Moreover, the paper contains a methodological innovation. To the best of our knowledge, and consistent with a literature review conducted by Blinder et al. (2008), this is the first paper that studies central bank communication from a different angle.[1] Typically, the usefulness of central bank communication is evaluated by its (i) impact on financial markets (see the extensive survey by Blinder et al., 2008), (ii) contribution to predicting future interest rate decisions (Jansen and de Haan, 2009; Hayo and Neuenkirch, 2010; Sturm and de Haan, 2011), or (iii) role in the monetary policy transmission process (Neuenkirch, 2013). Hence, all these studies rely on economic outcomes to study indirectly how central bankers influence the expectations of economic agents. We go one step further and examine directly how central bank communication is perceived by financial market participants. In our view, the perception of communication is a crucial component of the transmission process to economic outcomes, the analysis of which is somewhat neglected in the literature. Thus, by studying economic agents' perceptions, this paper highlights some novel aspects of how central bank communication influences economic outcomes.

This paper also contributes to that branch of the finance literature that uses surveys of financial market participants to glean insight into, for example, information acquisition and trading behaviour (see, e.g., Shiller and Pound, 1989; Menkhoff, 1998; Cheung and Chinn, 2001; Oberlechner and Hocking, 2004; Menkhoff and Nikiforow, 2009). However, to the best of our knowledge, none of these papers study the *perceptions* of financial market participants in regard to central banks and their communications and actions.

The remainder of this paper is organised as follows. Section 2 introduces the survey and provides some descriptive statistics. Section 3 presents the empirical

[1] A different part of the questionnaire is used as input for a study on how financial market participants process central bank news (see Hayo and Neuenkirch, 2014).

methodology. Section 4 discusses the empirical results of the survey. Section 5 concludes.

2. The Survey

The survey was conducted by Barclays Europe between 17 April and 1 May 2013. All subscribers to Barclay's fixed income newsletter were invited via e-mail to participate in an online survey. Our sample consists of 554 completed questionnaires. Respondents are from all over the world and work in different occupations and positions (see Table A1 in the Appendix). Barclays also surveyed market participants in August 2007 and August 2008. However, very few of the questions from those surveys overlap with the current survey and the data have no panel structure. A general analysis of the recent round of survey data, targeted to Barclays' clients, can be found in Barclays (2013).

In the following subsections, we introduce the subset of the survey questions relevant for this paper and discuss some descriptive results. Respondents were asked to answer these questions separately for four central banks: the Bank of England, the Bank of Japan, the European Central Bank, and the Federal Reserve. After completing the survey, respondents were given the opportunity to comment on the general theme of the survey, i.e., central bank communication. We occasionally refer to these comments, as they contribute some added depth to the answers to the structured questions; in a sense, taking the comments into consideration gives our predominantly quantitative analysis the added spice of a qualitative analysis.

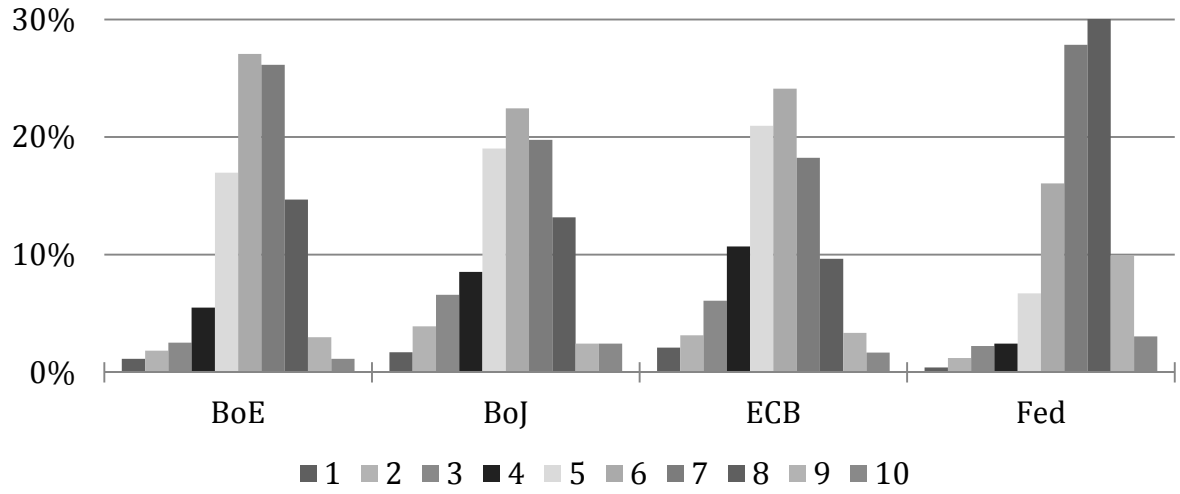
2.1. Perception of Central Bank Communication in General

Q1: Please rank your overall sense of how well the BoE/BoJ/ECB/Fed communicates.

The answer scale for this question ranges from 1 (extremely poor) to 10 (extremely well).[2] Figure 1 summarises the distribution of answers and Table 1 provides some descriptive statistics.

[2] Note that, throughout the survey, participants were allowed to answer 'don't know' or skip questions. In fact, about 500 respondents did not complete the entire questionnaire, possibly due to time constraints. In light of this loss in the number of observations, we investigated the possibility of sample selection. However, we found no evidence that there are notable differences between those who completed the survey and those who did not based on the questions answered by both groups.

Figure 1: Perception of Central Bank Communication in General



Notes: 10 = extremely well … 1 = extremely poor.

Table 1: Perception of Central Bank Communication in General

	Means			**'Within-Transformed' Means**			
	2013	2008	2007	Overall	Rank	Home	Non-Home
BoE	6.2	6.8	6.9	0.00	2	0.03	–0.01
BoJ	5.8	5.9	5.1	–0.40	3	–0.56	–0.36
ECB	5.7	7.0	7.2	–0.51	3	–0.40	–0.54
Fed	7.0	7.4	7.4	0.82	1	0.81	0.83

Notes: Coding: 10 = extremely well … 1 = extremely poor. Left panel shows actual mean responses. Right panel shows mean responses after subtracting the mean response over all central banks, that is, after a 'within transformation'. Rank is determined by mean-comparison tests with unequal variances. The '2008' and '2007' columns contain means from prior rounds of Barclays' survey. The 'Home' column shows means from respondents located in the home region of the respective central bank compared to those from the rest of the world ('Non-Home'). Significant differences at the 5% level are indicated by bold figures.

Figure 1 shows that, in general, the Fed's communication abilities are perceived to be superior (mode = 8) to those of the other three central banks (mode = 6). Moreover, the distribution of answers is left-skewed in the case of the Fed, whereas it is right-skewed in the case of the BoJ and BoE. Mean comparison tests are summarised in Table 1. On the left-hand side of the table, unconditional means are given. On the right-hand side, we show 'within-transformed' means, which are derived by subtracting the mean response over all central banks from the individual means. We find again that the Fed performs best, followed by the BoE, the BoJ, and the ECB. Moreover, we find no significant evidence of a home bias in the perception of central bank communication abilities (columns 'Home' and 'Non-Home').

As mentioned above, respondents were given the opportunity to make comments on the subject of the survey. One respondent's comment is a concise verbal description of the results given in Figure 1: 'The Fed is the benchmark for communications from central banks. I think that the BoJ is especially bad at it, judging from the excessive market moves post their last announcement.' Another respondent remarked similarly: 'The two most useful communication tools are 1) clear and concise statements after EVERY meeting and 2) well written minutes. Fed is doing a good job on both accounts. BoE publishes very good minutes but not regular statements (I am puzzled why). The ECB statement and press conference is very useful but there are no minutes. BoJ still have an amazing ability to communicate in a convoluted manner, e.g., the last set of statements.' Thus, based on these comments, the ECB's failure to publish minutes, the BoE's failure to provide regular statements, and the BoJ's lack of clarity in its communications are at least some of the reasons why these banks received lower scores than the Fed.

In the case of the ECB, there also appear to be structural reasons for why it is perceived as a less successful communicator than the Fed or the BoE. Respondent comments on this issue include: 'The ECB is hamstrung by its multinational character'; 'ECB also has a good communication policy but many speakers'; 'The large number of ECB council members (all of whom have a vote) further obfuscates matters'; and 'The ECB is a quite young central bank. Their communication is good but must improve'. However, since the ECB is a young, supranational institution, with a federally-organised decision-making process, short of completely remodelling its design, which is certainly unrealistic and perhaps even undesirable, there is not much that can be done about most of these perceived shortcomings.

However, other criticisms of the ECB could be addressed within the given structure of the Eurosystem. For instance, one commentator says: 'I find the ECB incredibly inarticulate in their communication. Their insistence on codewords, 10 words/sentences when one would do makes it very hard to see what it is exactly they have done. Even the fact that they have 3 headline rates as opposed to the UK & US's one is an example of this'. To another respondent, it is '[d]isappointing that the ECB does not publish the minutes', and another claims that '[l]ack of transparency regarding ECB decision-making and voting makes speeches and media coverage disproportionately important relative to other major central banks'.

It thus seems possible that the ECB could improve its communication, or at least the perception of it, by providing minutes—which it will do from 2015 onwards—and, more generally, becoming more transparent about its decision making and changing the language it uses, as well as the format of the information presented on its website.

Since the question about perception of central bank communication in general was also asked in the two previous rounds of Barclays' survey, we can compare the results over time. The overall rating of communication in 2013 deteriorated compared to the 2007 and 2008 surveys. The only exception is the BoJ, but this could simply be because its communication was already viewed as less than helpful previously. However, it is unclear whether these worse ratings represent an actual decline in the quality of central bank communication; they could be a consequence of central banks being evaluated more critically since the outbreak of the global financial crisis.

Again, the survey respondents' comments help us understand our quantitative results. For example, '[the] ECB is much less transparent than the Fed or BoE, and has become less so under Draghi despite regular press conferences'. Thus, at least one respondent believes that the worse communication has to do with the personal influence of a specific central bank president. However, we believe it is unlikely that this personal influence is sufficiently strong to explain the perceived loss of communication quality. It seems more likely to us that during the crisis, problems with the ECB's communications were much more obvious than they were during the 'Great Moderation'.

2.2. Perception of Credibility

Q2: How well do you think the BoE/BoJ/ECB/Fed performs on credibility?

The answer scale for this question ranges from not well (1) to extremely well (4). Figure 2 summarises the distribution of answers and Table 2 provides some descriptive statistics.

Similar to the findings for Q1, we observe a left-skewed pattern in case of the Fed, whereas the distribution of answers is more balanced for the other three central banks. The Fed is perceived as the most credible central bank, with 77% of respondents answering (extremely) well. A potential explanation is that the Fed's dual mandate gives it more discretion in monetary policy, and it therefore has more flexibility in deviating

from the 2% inflation 'target' when such is necessary. The Fed's good rating suggests that, at least to some extent, financial market participants prefer discretion-based monetary policy over more rule-based policy. If this indeed is the case, it runs counter to the monetarist dictum that passive monetary policy is preferable for reducing market uncertainty.

Figure 2: Perception of Credibility

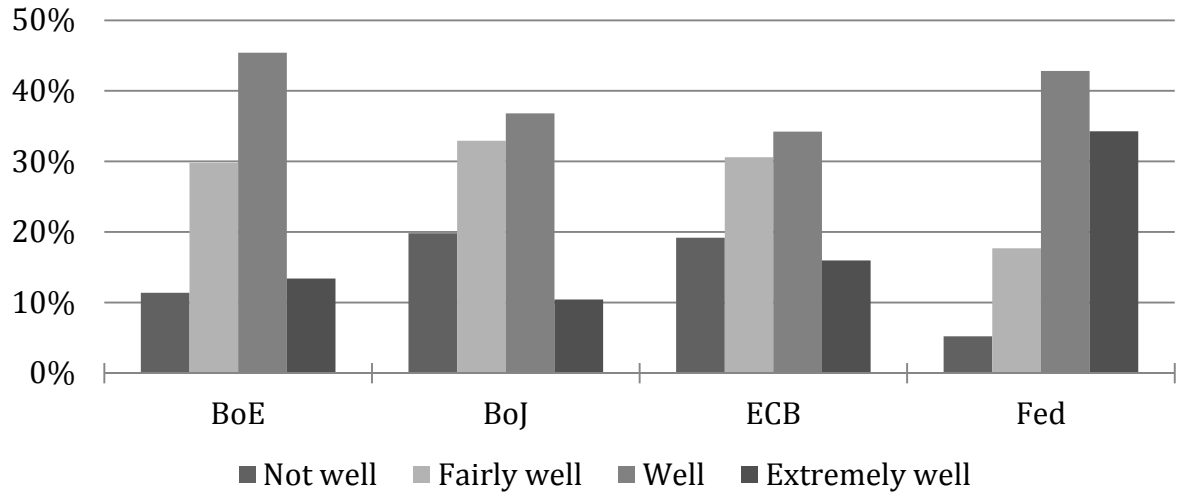


Table 2: Perception of Credibility

	Means	**'Within-Transformed' Means**			
	Overall	Overall	Rank	Home	Non–Home
BoE	2.6	–0.03	2	–0.03	–0.02
BoJ	2.4	–0.26	4	**–0.46**	**–0.23**
ECB	2.5	–0.16	3	**0.02**	**–0.22**
Fed	3.1	0.43	1	**0.53**	**0.39**

Notes: Coding: 1 = not well, 2 = fairly well, 3 = well, 4 = extremely well. Left panel shows actual mean responses. Right panel shows mean responses after subtracting the mean response over all central banks, that is, after a 'within transformation'. Rank is determined by mean-comparison tests with unequal variances. The 'Home' column shows means from respondents located in the home region of the respective central bank compared to those from the rest of the world ('Non-Home'). Significant differences at the 5% level are indicated by bold figures.

Table 2 shows that the BoE ranks second in terms of credibility, followed by the BoJ and the ECB. Although the idea that 'more transparency is better' currently dominates in the literature (see, e.g., Eijffinger and Geraats, 2006; Demertzis and Hughes Hallett, 2007; Hayo and Mazhar, 2014), less transparency in monetary policy making also has its advantages (see, e.g., Cukierman and Meltzer, 1986; Sørensen, 1991; Grüner et al., 2009). Indeed, central bank efforts to be highly transparent can have a sort of 'backfire' effect on credibility. As one respondents notes: 'Credibility dilemma: Central

banks impact the market with surprising actions, but each surprise hurts credibility when all possible scenarios and paths have been made transparent. I believe central banks will be better off with less transparency. That way the banks can surprise the market without hurting credibility'.

Other comments further explain why the ECB is seen as less credible than the Fed. One participant wrote: 'Especially in the EMU, political influences have blurred the communication of the ECB and also caused a massive credibility loss in terms of crisis management'. As noted above, the ECB is relatively more heterogeneous than other central banks due to its supranational character. However, until recently, any disagreements between national representatives on the ECB's Governing Council were not directly observable (see Hayo and Méon, 2013), which might explain why the earlier assessment of the ECB was more positive. However, the open dispute between ECB president Mario Draghi and the president of Bundesbank, Jens Weidmann, over unconventional monetary policy appears to have alerted market participants to the potential danger of national influences in the ECB, resulting in a loss of credibility.

Two things are of note when it comes to the ECB's level of credibility. First, the answers tend to be more extreme, i.e., have a higher variance, than in case of the other central banks and, second, there is a statistically significant home bias, that is, respondents living in Europe (excluding the UK) perceive the ECB as more credible than those living in the rest of the world. This finding suggests that non-European market participants perceive the problems created by national influences in the ECB as more problematic than their European colleagues, who are more used to this type of supranational institutional design. Finally, the Fed is viewed as more credible by North American respondents and Japanese survey participants have a less favourable opinion of their home central bank.

2.3. Satisfaction with Unorthodox Measures

Q3: Since the financial crises began, how satisfied are you with the BoE's/BoJ's/ECB's/Fed's unorthodox monetary policy measures (for instance, asset purchases, provision of exceptional liquidity, and conditional commitments on the future interest rate path)?

The answer scale for this questions ranges from extremely unsatisfied (1) to extremely satisfied (4). Figure 3 summarises the distribution of answers and Table 3 provides some descriptive statistics.

Figure 3: Satisfaction with Unconventional Monetary Policy Measures

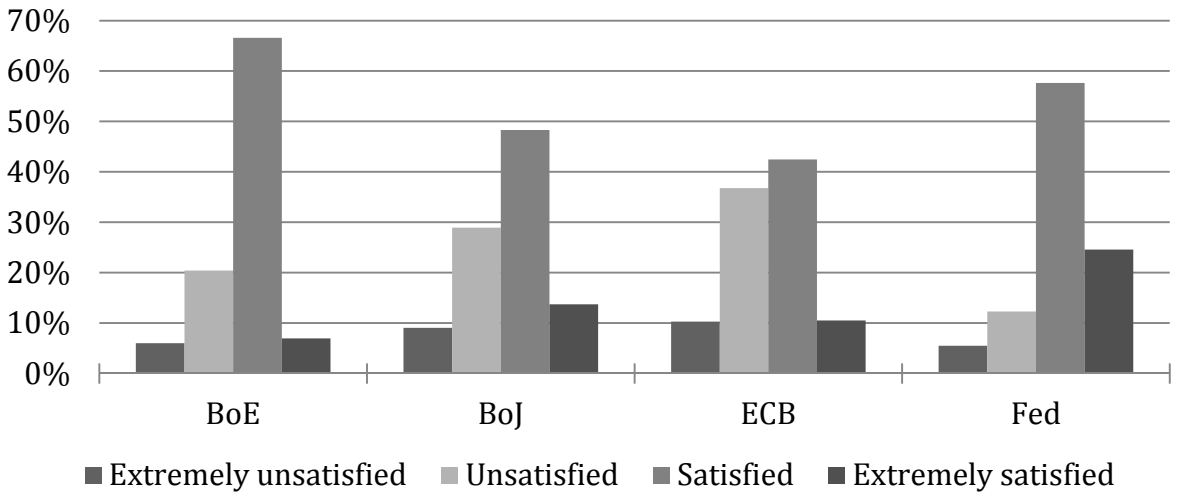


Table 3: Satisfaction with Unconventional Monetary Policy Measures

	Means	**'Within-Transformed' Means**			
	Overall	Overall	Rank	Home	Non–Home
BoE	2.7	0.00	2	–0.06	0.02
BoJ	2.7	–0.08	3	**–0.33**	**–0.03**
ECB	2.5	–0.21	4	–0.16	–0.23
Fed	3.0	0.28	1	0.26	0.28

Notes: Coding: 1 = extremely unsatisfied, 2 = unsatisfied, 3 = satisfied, 4 = extremely satisfied. Left panel shows actual mean responses. Right panel shows mean responses after subtracting the mean response over all central banks, that is, after a 'within transformation'. Rank is determined by mean-comparison tests with unequal variances. The 'Home' column shows means from respondents located in the home region of the respective central bank compared to those from the rest of the world ('Non-Home.'). Significant differences at the 5% level are indicated by bold figures.

Figure 3 shows that, in general, market participants are pleased with the unorthodox measures undertaken by the Fed and the BoE, as 83% and 74%, respectively, answered (extremely) satisfied. Approval of the ECB is not as strong, as 43% are (extremely) unsatisfied with its unconventional measures, meaning that this bank ranks last among all four central banks.

We propose three reasons for this finding. First, there is uncertainty as to whether the ECB's Securities Markets Programme or Outright Monetary Transactions Programme violates Article 123 of the Treaty of Lisbon. Second, whereas market participants can download detailed information about the Fed's unconventional

measures from its website, the ECB is comparatively opaque. For instance, the public did not even know at the time which member states' bonds and what amounts of them were purchased by the ECB under its Securities Markets Programme. Finally, financial market participants appear to view the central bank with the least aggressive asset purchase strategy as performing worst, whereas providing cheap liquidity is rewarded with a more positive rating.

Statistical tests confirm that the Fed takes first place; the BoE comes next, followed by the BoJ and the ECB, which ranks last. Finally, Japanese survey respondents are less pleased with the BoJ's unorthodox measures compared to participants living in the rest of the world.

2.4. (Non-)Deterioration of Independence

Q4: The monetary policy measures undertaken by the BoE/BoJ/ECB/Fed during the financial crises has reduced its independence.

The answer scale for this question ranges from strongly agreeing with the statement (1) to strongly disagreeing with the statement (5). Figure 4 summarises the distribution of answers and Table 4 provides some descriptive statistics.

Figure 4: (Non-)Deterioration of Independence

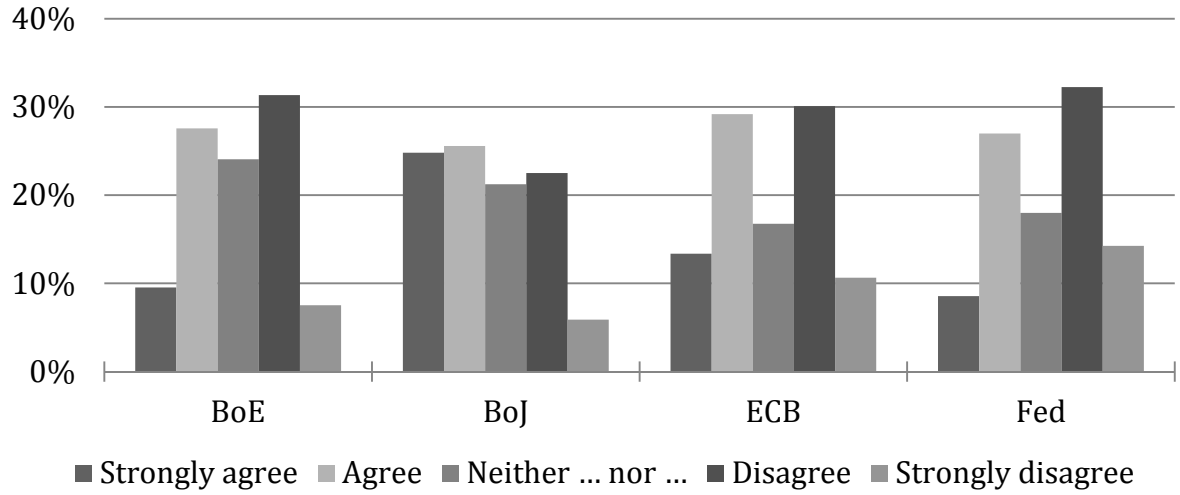


Figure 4 reveals a more differentiated picture than did the answers to the previous questions. In case of the ECB and the Fed, respondents tend to give extreme answers, as only 17% and 18%, respectively, answer that they neither agree nor

disagree. However, in case of the ECB (and the BoE), the answers are almost symmetrically distributed. Comparing means, the Fed performs best, followed by the BoE and the ECB. The BoJ is clearly the worst performer on this question, possibly due to Prime Minister Shinzo Abe's attempt to push the BoJ toward looser monetary policy in early 2013. Finally, we observe a negative home bias, as statistical tests confirm that UK respondents perceive a greater loss of independence for the BoE than those living in the rest of the world.

Table 4: (Non-)Deterioration of Independence

	Means	**'Within-Transformed' Means**			
	Overall	Overall	Rank	Home	Non–Home
BoE	3.0	0.05	2	**–0.11**	**0.12**
BoJ	2.6	–0.36	4	–0.15	–0.13
ECB	3.0	0.03	2	–0.04	–0.10
Fed	3.2	0.24	1	0.12	0.15

Notes: Coding: 1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree. Left panel shows actual mean responses. Right panel shows mean responses after subtracting the mean response over all central banks, that is, after a 'within transformation'. Rank is determined by mean-comparison tests with unequal variances. The 'Home' column shows means from respondents located in the home region of the respective central bank compared to those from the rest of the world ('Non-Home.'). Significant differences at the 5% level are indicated by bold figures.

2.5. Other Questions[3]

Market participants were also asked two additional questions about more specific aspects of communication. Q5 inquires about the perception of communications accompanying unorthodox monetary policy. Market participants are most satisfied with the way the Fed communicates about its unorthodox monetary policy and there is a negative home bias in the case of the BoJ.

> Q5: Since the financial crises began, how satisfied are you with the BoE's/BoJ's/ECB's/Fed's communications accompanying the 'unorthodox' monetary policy measures?

Q6 asks whether unorthodox measures affected the central banks' ability to communicate. Across all four central banks, market participants note little change in communication ability. Respondents located in the UK (in Japan) see significantly more

[3] To conserve space, we relegate descriptive statistics to Tables A2–A5 in the Appendix.

evidence of deteriorating communication ability by the BoE (BoJ) than do those located in other regions whereas the opposite is found for survey participants located in Europe (excluding the UK) in case of the ECB.

Q6: The monetary policy measures undertaken by the BoE/BoJ/ECB/Fed during the financial crises has affected its ability to communicate with financial markets.

In the multivariate empirical analysis below, we also control for perceptions of how well the central banks convey their objectives.

Q7: How well do you think the BoE/BoJ/ECB/Fed performs on conveying its objectives?

Answers to Q7 show that market participants perceive the Fed as very successful in conveying its objectives; the other central banks do not perform nearly as well. Again, respondents from Europe (excluding the UK) have a more favourable view of their home central bank.

Finally, we ask for an evaluation of central bank predictability.

Q8: How well do you think the BoE/BoJ/ECB/Fed performs on predictability?

Results for Q8 show that the Fed is regarded as the most predictable central bank. We observe no significant differences across regions.

3. Empirical Methodology

Econometrically, we use ordered probit models to explain whether communication in general (Q1) is useful for the perception of our three left-hand side variables, (i) credibility (Q2), (ii) unconventional measures (Q3), and (iii) independence (Q4). Since all participants were asked the same questions for each of the four central banks, we can analyse our research questions in a quasi-panel setup.

There are four key advantages of this approach compared to estimating separate models for each central bank. First, we can eliminate individual-fixed effects when it comes to the perception of credibility, unorthodox measures, and independence, that is, we explicitly control for possible individual heterogeneity of financial market participants. Second, estimating these effects in one model takes into account the

expectation that individuals' views about communication are not independently distributed across the four central banks. Third, a quasi-panel setup allows for direct comparison of coefficients and the implementation of efficient statistical tests in one nested model. Finally, a pooled setup allows us to obtain direct estimates of a home bias, that is, the difference in the central-bank-fixed effect between survey participants living in the respective central bank's home region and those living in other parts of the world.

However, a common drawback of panel estimation is the imposition of homogeneity assumptions with respect to the estimated parameters. Here, we have a sufficient number of observations to let the coefficients of the explanatory variables vary across central banks, i.e., our specification does not make *a priori* homogeneity assumptions. However, based on statistical testing, we reduce the degree of heterogeneity as much as possible by implementing non-rejected equality restrictions. Thus, while allowing for heterogeneity of participants' answers with respect to the four central banks, the resulting models are as efficiently estimated as possible.

Our general specification is as follows:

$$(1)\ y^*_{i,k} = \beta'_k X_{i,k} + \varepsilon_i + \eta_k + \mu_{i,k}.$$

$y^*_{i,k}$ is the latent continuous variable representing the ordinal choice for the perception of central bank's k credibility/unconventional measures/independence by survey participant i. β'_k denotes a vector of coefficients for the explanatory variables $X_{i,k}$. Three explanatory variables capture the central banks' communication abilities (communication in general, communications accompanying unorthodox measures, and perceived deterioration in communication abilities). We also control for the participants' opinion as to how well the central banks convey their objectives and their views on the banks' predictability. Finally, in light of intensive public debate over this issue, we include the respondent's perception of unorthodox measures in the models explaining credibility and independence. Individual-fixed effects are captured by ε_i and central-bank-fixed effects by η_k. The residuals $\mu_{i,k}$ are assumed to follow a standard normal distribution and the ordered probit models are estimated by maximum likelihood.

After estimating baseline models including all explanatory variables and coefficients, which are allowed to vary for the four central banks, we improve estimation efficiency in a three-step approach. First, we exclude each explanatory variable jointly for all central banks. A non-rejection of the null hypothesis leads to an exclusion of these

variables from the final model. Second, in the event that the null hypothesis—that the joint effect of a variable is zero—cannot be rejected, we test a homogeneity restriction on the variable across the four central banks. If the null hypothesis is not rejected, we impose homogeneous coefficients across central banks in the final model. Otherwise, we allow for heterogeneity. Finally, the exclusion and homogeneity restrictions are confirmed by a joint test over all imposed restrictions on the general model. Central-bank-fixed effects and individual-fixed effects are not subject to exclusion tests.

4. Empirical Results

4.1. Perception of Credibility

Table A6 in the Appendix shows the results for the full model explaining the survey participants' perception of monetary policy credibility. Two variables can be jointly excluded for all four central banks. First, communications accompanying unorthodox measures do not significantly explain the level of credibility in central banks. Second, there is no significant link between a central bank's ability to communicate during the crisis and its credibility as perceived by financial markets. The other four groups of explanatory variables are jointly significant. For these variables, we cannot reject the hypothesis that their impact on credibility is homogenous across central banks. The joint exclusion and homogeneity restriction ($Chi^2(20) = 26.1$) leads to the reduced model, the estimation results of which are presented in Table 5.

Columns Pr(1) to Pr(4) show average marginal effects of the ordered probit model. A one unit increase in the communications rating of a central bank increases the probability that market participants perceive a central bank as highly credible by 5 percentage points (pp). This implies that a better perception of communications is almost as important as a one unit increase in the perceived (i) quality of unorthodox measures (6 pp), (ii) success in conveying objectives (7 pp), and (iii) degree of predictability (8 pp). In fact, statistical testing shows that only the latter value is significantly larger than that for the communication rating ($Chi^2(1) = 6.2$*).[4] Finally, the conditional level of credibility is significantly higher for the ECB than for the BoE, whereas it is significantly lower for the BoJ.

[4] The test statistics for comparisons with unorthodox measures and conveying objectives are $Chi^2(1) = 1.4$ and $Chi^2(1) = 2.0$, respectively.

Table 5: Explaining Credibility: Reduced Model

	Coeff.	Pr(1)	Pr(2)	Pr(3)	Pr(4)
Comm. in General	0.46 **	-0.03 **	-0.04 **	0.02 **	0.05 **
Objectives	0.63 **	-0.04 **	-0.05 **	0.02 **	0.07 **
Predictability	0.78 **	-0.05 **	-0.06 **	0.03 **	0.08 **
Unorthodox Measures	0.61 **	-0.04 **	-0.05 **	0.02 **	0.06 **
BoE	Ref.	Ref.	Ref.	Ref.	Ref.
BoJ	-0.37 **	0.03 **	0.03 **	-0.02 **	-0.03 **
ECB	0.29 *	-0.02 *	-0.02 *	0.01 *	0.03 *
Fed	0.15	-0.01	-0.01	0.01	0.02
1st Cut Point	4.89 **				
2nd Cut Point	7.48 **				
3rd Cut Point	10.19 **				

Notes: Table shows coefficients and average marginal effects of ordered probit model with implemented restrictions. Model includes individual-fixed effects (not shown) and central bank-fixed effects with the Bank of England as a reference. Number of observations: 1,259. Pseudo R-squared: 0.59. Coding of dependent variable: 1 = not well, 2 = fairly well, 3 = well, 4 = extremely well. Huber (1967)/White (1980) robust standard errors are used. ** and * indicate the 1% and 5% significance level, respectively.

4.2. Satisfaction with Unorthodox Measures

Table A7 in the Appendix shows the results for the full model explaining financial market participants' satisfaction with unorthodox measures. Three variables can be jointly excluded for all four central banks. Similar to the estimations explaining credibility, there is no link between the central banks' ability to communicate during the crisis and market participants' satisfaction with unorthodox measures. The special role of communication during the financial crisis, however, is captured by satisfaction with communications explaining unorthodox measures, as this variable is highly significant. Also significant is the variable measuring communication abilities in general. In both cases, we cannot reject homogeneous effects across the four central banks. Finally, the central banks' success in conveying objectives and their degree of predictability are not significantly related to the respondents' satisfaction with unorthodox measures. The joint exclusion and homogeneity restriction ($Chi^2(18) = 24.6$) leads to the reduced model, the estimation results of which are presented in Table 6.

For the perception of unorthodox measures, only communication matters. A one unit increase in communication ability increases the probability of being extremely satisfied with a central bank's unorthodox measures by more than 2 pp. With 21 pp, the effect of special communications explaining these unorthodox measures has the greatest

effect. This impact is 10 times larger than that of communications in general. Therefore, expending more effort on explaining their actions and intentions, may reap huge benefits for central banks in terms of how satisfied financial market participants are with their unconventional monetary policy. Finally, we find no significant central-bank-fixed effects, i.e., there is no systematic difference between central banks after controlling for the influence of the other explanatory variables, particularly communication about unorthodox policies.

Table 6: Explaining Satisfaction with Unorthodox Measures: Reduced Model

	Coeff.	Pr(1)	Pr(2)	Pr(3)	Pr(4)
Comm. in General	0.26 **	-0.01 **	-0.02 **	0.01 **	0.02 **
Comm. Unorth. Measures	2.25 **	-0.09 **	-0.17 **	0.05 **	0.21 **
BoE	ref.	ref.	ref.	ref.	ref.
BoJ	0.16	-0.01	-0.01	0.00	0.02
ECB	-0.21	0.01	0.02	-0.01	-0.02
Fed	0.13	0.00	-0.01	0.00	0.01
1st Cut Point	5.03 **				
2nd Cut Point	8.11 **				
3rd Cut Point	11.67 **				

Notes: Table shows coefficients and average marginal effects of ordered probit model with implemented restrictions. Model includes individual-fixed effects (not shown) and central bank-fixed effects with the Bank of England as a reference. Number of observations: 1,266. Pseudo R-squared: 0.63. Coding of dependent variable: 1 = extremely unsatisfied, 2 = unsatisfied, 3 = satisfied, 4 = extremely satisfied. Huber (1967)/White (1980) robust standard errors are used. ** and * indicate the 1% and 5% significance level, respectively.

4.3. (Non-)Deterioration of Independence

Table A8 in the Appendix shows the results for the full model explaining the perceived level of independence. A positive coefficient implies that market participants agree less with the statement that 'the monetary policy measures undertaken by the BoE/BoJ/ECB/Fed during the financial crises has reduced its independence'.

Similar to the regression explaining respondents' assessment of unorthodox measures, we can exclude the variables measuring conveying objectives and predictability jointly for all four central banks. Communications accompanying unorthodox measures do not matter for independence either. The perceived deterioration of communication ability due to the implementation of unorthodox policy measures is significant, as is the variable measuring communication in general.

Homogeneity restrictions cannot be rejected for the variables measuring communication in general and the perception of unorthodox measures. However, the test statistic is highly significant for the variable measuring the deterioration of communication abilities. Since the joint exclusion restriction and homogeneity restrictions for (i) communication in general and (ii) unorthodox measures cause a rejection of the null hypothesis, we also allow for variation in the coefficients of market participants' assessment of unorthodox measures.[5] This joint restriction ($Chi^2(15) = 19.1$) leads to the reduced model, the results of which are presented in Table 7.

Table 7: Explaining (Non-)Deterioration in Independence: Reduced Model

	Coeff.	Pr(1)	Pr(2)	Pr(3)	Pr(4)	Pr(5)
Comm. in General	0.25 **	-0.02 **	-0.03 **	0.00	0.03 **	0.02 **
Unorth. Measures						
… BoE	0.47 **	-0.04 **	-0.05 **	0.00	0.05 **	0.04 **
… BoJ	0.04	0.00	0.00	0.00	0.01	0.00
… ECB	0.10	-0.01	-0.01	0.00	0.01	0.01
… Fed	0.41 **	-0.04 **	-0.04 **	0.00	0.05 **	0.03 **
Deter. in Comm. Abil.						
… BoE	-0.08	0.01	0.01	0.00	-0.01	-0.01
… BoJ	-0.19 *	0.02 *	0.02 *	0.00	-0.02 *	-0.02 *
… ECB	0.22 **	-0.02 **	-0.02 **	0.00	0.03 **	0.02 **
… Fed	-0.11	0.01	0.01	0.00	-0.01	-0.01
BoE	ref.	ref.	ref.	ref.	ref.	ref.
BoJ	0.81	-0.07	-0.08	0.00	0.08	0.07
ECB	0.25	-0.03	-0.02	0.00	0.03	0.02
Fed	0.33	-0.03	-0.03	0.00	0.04	0.02
1st Cut Point	1.96 **					
2nd Cut Point	3.81 **					
3rd Cut Point	4.80 **					
4th Cut Point	6.82 **					

Notes: Table shows coefficients and average marginal effects of ordered probit model with implemented restrictions. Model includes individual-fixed effects (not shown) and central bank-fixed effects with the Bank of England as a reference. Number of observations: 1,199. Pseudo R-squared: 0.41. Coding of dependent variable: 1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree. Huber (1967)/White (1980) robust standard errors are used. ** and * indicate the 1% and 5% significance level, respectively.

[5] The decision in favour of variation in the coefficients of unorthodox measures rather than in the coefficients of communication in general is based on a lower test statistic for the latter restriction ($Chi^2(15) = 19.1$) compared to the former ($Chi^2(15) = 23.3$).

We find that well-perceived central bank communication helps avoid the impression of deteriorating independence. A one unit increase in communication ability increases the probability of strongly disagreeing with the statement about deteriorating independence by 2 pp. The perception of unorthodox measures is significant only for the BoE and the Fed and leads to a higher likelihood, 4 pp and 3 pp, respectively, of strongly disagreeing with the statement. In the case of the ECB, disagreeing with the statement 'the monetary policy measures undertaken by the ECB during the financial crises has affected its ability to communicate with financial markets' is associated with a higher level of disagreement with the statement concerning independence (2 pp). Again, the influence of communication is found to be as important as that of the other explanatory variables in determining financial markets' impression of a key central bank characteristic.[6]

Finally, as another part of our analysis, we attempt to explain the individual-fixed effects obtained from the final models in Tables 5–7 by the different occupations in which the survey participants work. Research from various fields of economics suggests that people working in different occupations may be characterised by different views about economic processes and policies, because of selection and/or socialisation effects (e.g., Carter and Irons, 1991; Caplan, 2002; Göhlmann and Vaubel, 2007; Dreher et al. 2009; Haferkamp et al. 2009). Here, only for perception of unorthodox measures do we find a significant difference at the 10% level. Participants in 'other' occupations perceive the unorthodox measures as significantly worse than the reference group, 'analysts/economists'. Therefore, we do not find much evidence for notable conditional differences in the perception of central banks across respondents' occupations.

5. Conclusions

In this paper, we provide an answer to the question of whether central bank communication has a positive effect on market participants' perception of (i) credibility, (ii) unorthodox measures, and (iii) independence. We also implement a methodological innovation, as this is the first paper to look at central bank communication from a different angle. Rather than relying on economic outcomes to evaluate the effectiveness

[6] Statistical testing fails to differentiate between the impact of these variables. Test statistics: Communication in general versus unorthodox measures by the BoE and the Fed: $Chi^2(1) = 1.7$ and $Chi^2(1) = 0.9$, respectively. Communication in general versus the statement concerning the ECB's communication abilities: $Chi^2(1) = 0.1$.

of central bank communication, we use a large worldwide survey of financial market participants to shine some light into the black box of how central bank communication impacts economic outcomes.

In the first step of our investigation, we conduct an extensive descriptive analysis, which reveals several interesting findings. First, the overall rating of central bank communication is now worse than it was in 2007 and 2008. Second, the Fed is typically perceived as performing best in terms of communication ability, credibility, unorthodox measures, and independence. Typically, the BoE ranks second, followed by the ECB and the BoJ. Third, market participants tend to have more extreme views when it comes to the ECB than is the case for the other central banks. Fourth, we find some evidence of a home bias in the respondents' perception of central banks. In particular, in case of the ECB do we find that people living in Europe (excluding the UK) rate the central bank's credibility and ability to convey its objectives better than those living in the rest of the world. In contrast, Japanese respondents have a less favourable view of the BoJ's credibility and unorthodox measures, and survey participants from the UK are more concerned about the BoE's independence than their counterparts in the rest of the world.

In the second step of our analysis, we estimate ordered probit models to link communication to three different left-hand side variables: perceived level of central bank credibility, success of unorthodox monetary policy measures, and deterioration in central bank independence. In general, the results are homogenous across central banks, with the estimations explaining perceived independence being the only exception. First, a perceived higher quality of central bank communication is found to enhance the bank's credibility in the eyes of financial market participants. The size of the average marginal effects indicates that quality of communication is as important to central bank credibility as successful conveyance of bank objectives and positive perceptions of unorthodox policy measures. It is worth noting that the ECB's conditional degree of credibility is significantly higher compared to that of the BoE but lower than that of the BoJ. Second, central bank communication improves the perceived success of unorthodox measures. In addition to good communication in general, providing market participants with specific information explaining unorthodox measures is particularly useful for the assessment of these policies by the markets. Therefore, central banks may derive huge benefits, in terms of improved market perceptions of them, by expending more effort on explaining unconventional monetary policy. Finally, successful communication fosters a

perceived greater independence of central banks. Also relevant in this context is the positive evaluation of unorthodox measures, but only in case of the BoE and the Fed, as well as the perceived ability of the ECB to communicate well during the financial crisis after controlling for other influences.

Over the last two decades, central banks have increased their operational transparency so as to improve their accountability to the public. Open communication policy is an important aspect of this effort. Relying on our unique dataset, which is based on a global survey of financial market participants, we draw several conclusions that extend and complement the extant literature. An open central bank communication policy pays off, as it moves economic variables in the (intended) direction (see the literature cited in Section 1). In addition, our results show that good communication improves the central bank's image in the eyes of financial market participants. In our view, this finding offers a reason for why central bank communication can influence economic variables in the first place. Thus, the missing link between communication and economic outcomes is the change in financial market participants' perceptions of and expectations for the quality of monetary policy making.

Finally, an obvious question is: Should other central banks copy the Fed's communication strategy since the Fed is perceived to perform best out of the four central banks in the survey? As of now, we have no definite answer to this question. On the one hand, the Fed made an innovation in its communication strategy at the end of 2012 that was well received, as evidenced by this comment from one of the survey respondents: 'I am happy to see conditional benchmarks being added, such as the level of unemployment versus inflation'. On the other hand, until recently, the Fed lagged behind the other central banks in certain areas, for instance, it introduced an inflation 'target' and regular press conferences after monetary policy decisions much later than did other central banks.

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Appendix

Table A1: Distribution of Respondents

Location			**Position**		
Africa and Middle East	19	3%	Analyst/economist	155	28%
Australasia/Asia ex-Japan	61	11%	Asset allocation/CIO	28	5%
Europe (excluding the UK)	121	22%	Execution/trading	103	19%
Japan	73	13%	Portfolio/liability manager	119	21%
North America	131	24%	Press/media	20	4%
South America	16	3%	Other	129	23%
United Kingdom	133	24%			
Sum	554	100%	Sum	554	100%

Table A2: Satisfaction with Communications Accompanying Unorthodox Measures

	Means	**'Within-Transformed' Means**			
	Overall	Overall	Rank	Home	Non–Home
BoE	2.8	0.00	2	–0.06	0.02
BoJ	2.7	–0.12	3	**–0.37**	**–0.07**
ECB	2.6	–0.22	4	–0.15	–0.23
Fed	3.1	0.31	1	0.32	0.30

Notes: Coding: 1 = extremely unsatisfied, 2 = unsatisfied, 3 = satisfied, 4 = extremely satisfied. Left panel shows actual mean responses. Right panel shows mean responses after subtracting the mean response over all central banks, that is, after a 'within transformation'. Rank is determined by mean-comparison tests with unequal variances. The 'Home' column shows means from respondents located in the home region of the respective central bank compared to those from the rest of the world ('Non-Home.'). Significant differences at the 5% level are indicated by bold figures.

Table A3: Perception of (Non-)Deterioration in Communication Ability

	Means	**'Within-Transformed' Means**			
	Overall	Overall	Rank	Home	Non–Home
BoE	3.2	0.06	2	**–0.07**	**0.10**
BoJ	3.0	–0.13	3	**–0.74**	**–0.28**
ECB	3.1	–0.08	3	**0.18**	**–0.01**
Fed	3.3	0.14	1	0.16	0.27

Left panel shows actual mean responses. Right panel shows mean responses after subtracting the mean response over all central banks, that is, after a 'within transformation'. Rank is determined by mean-comparison tests with unequal variances. The 'Home' column shows means from respondents located in the home region of the respective central bank compared to those from the rest of the world ('Non-Home.'). Significant differences at the 5% level are indicated by bold figures.

Table A4: Perception of Conveying Objectives

	Means	**'Within-Transformed' Means**			
	Overall	Overall	Rank	Home	Non–Home
BoE	2.7	–0.10	2	–0.09	–0.10
BoJ	2.7	–0.06	2	–0.03	–0.07
ECB	2.5	–0.28	4	**–0.13**	**–0.32**
Fed	3.2	0.42	1	0.46	0.41

Notes: Coding: 1 = not well, 2 = fairly well, 3 = well, 4 = extremely well. Left panel shows actual mean responses. Right panel shows mean responses after subtracting the mean response over all central banks, that is, after a "within transformation." Rank is determined by mean-comparison tests with unequal variances and 5% level of significance. The 'Home' column shows means from respondents located in the home region of the respective central bank compared to those from the rest of the world ('Non-Home.'). Significant differences at the 5% level are indicated by bold figures.

Table A5: Perception of Predictability

	Means	**'Within-Transformed' Means**			
	Overall	Overall	Rank	Home	Non–Home
BoE	2.6	–0.01	2	0.03	–0.02
BoJ	2.4	–0.27	3	–0.26	–0.27
ECB	2.4	–0.19	3	–0.15	–0.21
Fed	3.1	0.45	1	0.50	0.43

Notes: Coding: 1 = not well, 2 = fairly well, 3 = well, 4 = extremely well. Left panel shows actual mean responses. Right panel shows mean responses after subtracting the mean response over all central banks, that is, after a 'within transformation'. Rank is determined by mean-comparison tests with unequal variances. The 'Home' column shows means from respondents located in the home region of the respective central bank compared to those from the rest of the world ('Non-Home.'). Significant differences at the 5% level are indicated by bold figures.

Table A6: Explaining Credibility: Full Model

	Coefficients		Excl. Test		Equal. Test
Communication in General					
… BoE	0.46	**	48.0	**	0.6
… BoJ	0.46	**			
… ECB	0.43	**			
… Fed	0.49	**			
Comm. Accom. Unorth. Measures					
… BoE	0.08		4.8		
… BoJ	0.07				
… ECB	0.31				
… Fed	0.36				
Deterioration in Comm. Ability					
… BoE	-0.05		1.1		
… BoJ	0.06				
… ECB	0.06				
… Fed	0.00				
Objectives					
… BoE	0.59	**	49.9	**	3.8
… BoJ	0.44	**			
… ECB	0.87	**			
… Fed	0.55	**			
Predictability					
… BoE	0.89	**	59.7	**	1.9
… BoJ	0.85	**			
… ECB	0.66	**			
… Fed	0.67	**			
Unorthodox Measures					
… BoE	0.69	**	26.4	**	4.2
… BoJ	0.25				
… ECB	0.54	**			
… Fed	0.66	**			
Central Banks					
BoE	Ref.				
BoJ	1.10				
ECB	-0.12				
Fed	-0.21				
1st Cut Point	5.73	**			
2nd Cut Point	8.35	**			
3rd Cut Point	11.13	**			

Notes: Table shows coefficients of ordered probit model. Model includes individual-fixed effects (not shown) and central bank-fixed effects with the Bank of England as a reference. Number of observations: 1,259. Pseudo R-squared: 0.60. Joint exclusion and homogeneity restriction: $Chi^2(20) = 26.1$. Huber (1967)/White (1980) robust standard errors are used. ** and * indicate the 1% and 5% significance level, respectively.

Table A7: Explaining Satisfaction with Unorthodox Measures: Full Model

	Coefficients		Excl. Test		Equal. Test
Communication in General					
… BoE	0.33	**	19.6	**	4.0
… BoJ	0.12				
… ECB	0.24	**			
… Fed	0.26	**			
Comm. Accom. Unorth. Measures					
… BoE	2.04	**	265.6	**	5.3
… BoJ	2.57	**			
… ECB	2.36	**			
… Fed	2.04	**			
Deterioration in Comm. Ability					
… BoE	-0.10		7.7		
… BoJ	-0.03				
… ECB	-0.11				
… Fed	0.19	*			
Objectives					
… BoE	0.14		6.3		
… BoJ	0.15				
… ECB	0.36	*			
… Fed	0.08				
Predictability					
… BoE	-0.20		3.4		
… BoJ	-0.01				
… ECB	-0.21				
… Fed	-0.06				
Central Banks					
BoE	Ref.				
BoJ	-0.82				
ECB	-1.03				
Fed	-0.55				
1st Cut Point	4.39	**			
2nd Cut Point	7.57	**			
3rd Cut Point	11.20	**			

Notes: Table shows coefficients of ordered probit model. Model includes individual-fixed effects (not shown) and central bank-fixed effects with the Bank of England as a reference. Number of observations: 1,266. Pseudo R-squared: 0.63. Joint exclusion and homogeneity restriction: $Chi^2(18) = 24.6$. Huber (1967)/White (1980) robust standard errors are used. ** and * indicate the 1% and 5% significance level, respectively.

Table A8: Explaining (Non-)Deterioration in Independence: Full Model

	Coefficients		Excl. Test		Equal. Test	
Communication in General						
… BoE	0.20	**	14.8	**	1.6	
… BoJ	0.20	*				
… ECB	0.19	**				
… Fed	0.28	**				
Comm. Accom. Unorth. Measures						
… BoE	0.33		8.6			
… BoJ	0.22					
… ECB	-0.26					
… Fed	-0.13					
Deterioration in Comm. Ability						
… BoE	-0.09		16.9	**	15.6	**
… BoJ	-0.20	*				
… ECB	0.22	**				
… Fed	-0.12					
Objectives						
… BoE	0.25		8.0			
… BoJ	-0.07					
… ECB	0.28	*				
… Fed	0.22					
Predictability						
… BoE	-0.05		2.8			
… BoJ	0.13					
… ECB	-0.08					
… Fed	-0.16					
Unorthodox Measures						
… BoE	0.23		9.6	*	5.0	
… BoJ	-0.07					
… ECB	0.27					
… Fed	0.44	**				
Central Banks						
BoE	Ref.					
BoJ	1.14					
ECB	0.75					
Fed	0.72					
1st Cut Point	2.60	**				
2nd Cut Point	4.48	**				
3rd Cut Point	5.48	**				
4th Cut Point	7.54	**				

Notes: Table shows coefficients of ordered probit model. Model includes individual-fixed effects (not shown) and central bank-fixed effects with the Bank of England as a reference. Number of observations: 1,199. Pseudo R-squared: 0.42. Joint exclusion and homogeneity restriction: $Chi^2(15) = 19.1$. Huber (1967)/White (1980) robust standard errors are used. ** and * indicate the 1% and 5% significance level, respectively.