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ABSTRACT

The role of central bank transparency for guiding private sector forecasts

There is a broad consensus in the literature that costs of information processing and acquisition may generate costly disagreements in expectations among economic agents, and that central banks may play a central role in reducing such dispersion in expectations. This paper analyses empirically whether enhanced central bank transparency lowers dispersion among professional forecasters of key economic variables, using a large set of proxies for central bank transparency in 12 advanced economies. It finds evidence for a significant and sizeable effect of central bank transparency on forecast dispersion, be it by means of announcing a quantified inflation objective, other forms of communication, or by publishing central banks' inflation and output forecasts. However, there also appear to be limits to central bank transparency, with decreasing marginal returns to enhancing (economic) transparency, and given our findings that disagreement among inflation expectations in the general public is not affected by the various central bank transparency measures analyzed in this paper.

JEL Classification: C53, E37 and E52
Keywords: central bank communication, central banking, disagreement, forecasting, inflation targeting, monetary policy, survey expectations and transparency

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Non-technical summary

Deviating from the assumption of rational expectations, e.g. by assuming costs of information processing, leads to macroeconomic models that can generate disagreement among economic agents. In such models, there is a role for central bank transparency and communication to reduce the cost of information processing, either by increasing the precision of signals received by economic agents, or by making the information acquisition less costly. Over the last decades, central banks have undertaken great efforts in that direction, leading to major improvements in the predictability of their decisions and/or in the anchoring of inflation expectations.

This paper studies to what extent greater central bank transparency and communication have contributed to a convergence in expectations of economic agents, by testing for their effects on the disagreement in forecasts of key macroeconomic variables. Compared to earlier contributions to this literature, our tests and proxies for central bank transparency and communication are substantially broader and more systematic. The paper finds empirical evidence that several of these measures (in particular the announcement of a quantified inflation objective and enhanced transparency about economic dimensions of the conduct of monetary policy, such as the release of the central bank's internal forecasts of inflation and output) are effective in that regard, and that the effects are partially additive. The reduction in forecaster disagreement is not only statistically significant, but also economically important. The findings of the paper indicate that this reduction has been achieved because forecasters in countries with more transparent and open central banks manage to update their forecasts in response to news in a smoother fashion, generating less disagreement.

At the same time, the findings of the paper also point at possible limits to the effects of central bank transparency. Increasing economic transparency seems to be particularly powerful at low levels of transparency. Yet at higher levels, the additional effects that can be reaped by further enhancements of economic transparency appear to be much smaller. Furthermore, the present paper does not find that the dispersion in expectations among the general public (in contrast to those of professional forecasters) is affected by any of the various measures of central bank transparency that it analyzes.

1. Introduction

Many modern macroeconomic models assume that all agents form full-information rational expectations. Under this assumption, all economic agents share a common information set and form expectations conditional on that information, indicating that everyone has the same expectations, and there are no disagreements. However, this assumption is easily rejected when looking at forecast survey data, where disagreements, e.g. in inflation forecasting, appear to be particularly substantial. A variety of explanations have been offered to explain these findings. For example, Mankiw and Reis (2002) propose a sticky-information model, in which economic agents update their expectations only periodically because of costs of collecting and processing information. Using this model, Mankiw, Reis and Wolfers (2003) show that disagreement exhibits substantial variation through time, moving with inflation, the absolute value of the change in inflation, and relative price variability. Woodford (2001) argues for an imperfect-information model, in which agents observe a noisy signal about the current state. Sims (2003) argues that individual agent has limited capacity for processing information, and we must thus add information-processing constraints to model behavior in macroeconomic models.

In all these cases, economic outcomes could be improved if it was possible to ensure that agents update their information sets more frequently, that the signals were observed with less noise, or if the cost of information processing was reduced. Accordingly, there might be a role for central bank transparency and communication in shaping better economic outcomes. Of course, neither is relevant when assuming that the public has full-information rational expectations. If the public understood monetary policy perfectly, any systematic pattern in the way that policy is conducted should be correctly inferred from the central bank's observed behavior (Woodford, 2005). Thus, when predicting future interest rates, it suffices to interpret (forecasts of) economic data in view of the central bank's policy rule. On the contrary, the assumption of imperfect information is crucial for central bank communication and transparency. Imperfect information generates disagreements among forecasters, making the economy volatile. Via communication and transparency, central banks may anchor market expectations, reduce volatility in the economy, and thus achieve a better economic (inflation) performance.

Central banks have over the last decades started to play this role, by becoming remarkably more transparent, and by actively using communication as an instrument to steer agents' expectations. A large academic literature has accompanied these processes, and has identified numerous ways in which they have turned out to be beneficial to the conduct of monetary policy. As pointed out, e.g., in the survey of the literature on central bank communication by Blinder et al. (2008), the anchoring of inflation expectations has been one point in case, and an improved predictability of monetary policy decisions another.

In this paper we investigate whether and to what extent central bank communication and increased transparency have affected the disagreement among private agents' forecasts of inflation, interest rates, and other macroeconomic variables. Our hypothesis is that we should see a reduction in forecast dispersion if i) information-related deviations from the rational expectation assumptions outlined above hold, and if ii) central banks manage to increase the signal-to-noise ratio of their public communication, or alternatively to reduce the cost of information processing by making relevant pieces of information available more readily.

For that purpose, we use two kinds of datasets in our empirical analysis. The first one is the Consensus Economics forecast data from 1990 to 2008, which covers professional analysts' forecasts of various macroeconomic variables for 12 advanced economies, over different forecasting horizons The second is the European Commission household survey data (Eurobarometer) from 1985 to 2008, which measures inflation expectations of the general public. We find that central bank transparency and communication are indeed powerful tools to reduce the dispersion of professional forecasters' views. These effects can be generated by announcing a quantified inflation objective, by being transparent about the economic data and the policy models, as well as by publishing internal forecasts, and are therefore based on a

broad set of central bank policies. They are also economically large, with reductions in dispersion reaching up to 20%.

How is this reduction in heterogeneity brought about? The paper shows that the updating process of forecasts in response to macroeconomic news generates less dispersion in the case of more transparent central banks, or if the news are accompanied by explicit central bank communication. This suggests that the private sector can gain a clearer understanding of the implications of news on the future evolution of the economy if aided by central banks. At the same time, the paper also identifies possible limits to the effectiveness of these central bank measures. In particular, there is some evidence for diminishing marginal returns in (economic) transparency, and the paper finds that neither of the central bank measures affects the disagreement among the general public, while the levels of inflation expectations of the public are responsive to the announcement of a quantified inflation objective or increasing economic transparency.

This paper relates to an emerging literature that studies the determinants of disagreement among economic agents, and the role of central banks (for a detailed overview of the respective papers, see Table A1 in the Appendix).[1] As to the determinants of disagreement, Coibion and Gorodnichenko (2009) use three different surveys of economic forecasts to assess both the support for and the properties of informational rigidities faced by agents. Specifically, they track the impulse responses of mean forecast errors and disagreement among agents after exogenous structural shocks. They conclude that after structural shocks, agents fail to adjust their forecasts by a sufficient amount, inducing a non-zero response of forecast errors. As time goes by, forecast errors converge monotonically to the full information outcome. They interpret these results as providing a robust empirical basis for models of informational rigidities that has previously been sorely lacking. In a similar fashion, Andrade and Le Bihan (2009) find that rational inattention can explain some of the disagreement in the ECB's Survey of Professional Forecasters, although other factors must also be at work, given that these models cannot generate sufficient stickiness in expectations.

Capistran and Timmermann (2009) go beyond the models that base different views of forecasters on differences in information sets and assume that agents weight the consequences of over- and under-predictions differently and, as a result, calculate their forecasts under asymmetric loss with a shape of the loss function that differs across agents. The authors find empirical evidence of such asymmetries in forecasters' loss functions. Finally, Dovern, Fritsche and Slacalek (2009) investigate determinants of disagreement about six key economic indicators using the Consensus Economics dataset from G7 countries. Their estimates document a dichotomy between disagreement about real variables (GDP, consumption, investment and unemployment), which is more strongly affected by real factors, and disagreement about nominal variables (inflation and interest rate), which reacts to the institutional setting of monetary policy (in particular central bank independence). Disagreement about real variables intensifies strongly during recessions. Disagreement about nominal variables is considerably lower under independent central banks. Cross-sectional dispersion for both groups increases with uncertainty about the underlying indicators. Their findings suggest that more credible monetary policy can substantially contribute to the anchoring of expectations about nominal variables; however its effects on disagreement about real variables are moderate.

Other papers on the role of central banks for forecaster disagreement can be divided by the central bank measures that are analyzed. Swanson (2006) focuses on central bank transparency in general, and finds that with increased transparency of the US Federal Reserve, private sector forecasts of US interest rates have become more precise, both by improving the average quality of forecasts as well as by reducing their dispersion across forecasters. A related finding is presented in Bauer et al. (2006), who show that since 1994 (when the FOMC began to release statements accompanying changes in the policy rate) forecasts for key macroeconomic variables by market participants have become substantially more synchronized. Fujiwara (2005) examines how a central bank's economic forecasts affect forecasts by

[1] For a study on the effect of central bank communication on the rationality of private sector forecasts, see Chortareas et al. (2009).

professional forecasters and vice versa, looking at the case of the Bank of Japan. Empirical results show that while central bank economic forecasts are not significantly influenced by professional forecasts of inflation, they have a notable effect on professional forecasts. Furthermore, tests on the second moment suggest that the Bank of Japan's forecast reduces professional forecasters' uncertainty about the future.

A number of studies relate to the announcement of a quantified inflation objective. Beechey, Johannsen and Levin (2007) compare the recent evolution of long-run inflation expectations in the euro area and the United States as provided in the respective Surveys of Professional Forecasters. They reveal substantially greater dispersion across forecasters' long-horizon projections of US than of euro area inflation, and relate this to the fact that the ECB has announced a definition of price stability, whereas the Federal Reserve has not. Crowe (2006) test whether inflation targeting enhances transparency, using inflation forecast data obtained from the Consensus Economics dataset for 11 inflation targeters. The paper outlines a simple signal-extraction model and derives a testable proposition: if inflation targeting enhances transparency in the manner assumed in the model, then its introduction should promote convergence to lower forecast errors. The author finds that convergence occurs in all countries due to mean-reversion, but that the adoption of inflation targeting leads to greater convergence, as predicted by the model, which serves as strong evidence that inflation targeting does indeed enhance transparency. In a similar vein, Crowe and Meade (2007, 2008) find that enhanced transparency practices are associated with the private sector making greater use of information provided by the central bank, which supports Crowe's (2006) finding that the introduction of inflation targeting (thereby increasing in their transparency score) is associated with a convergence in forecast errors among the private sector. At the same time, Cecchetti and Hakkio (2009) find no or only small effects of the adoption of inflation targets on forecast dispersion, and Capistran and Ramos-Francia (2009) identify such effects only for developing countries.

All the studies listed so far relate to the disagreement among professional forecasters. Much less work has been done with regard to the views of the general public, most likely given the lack of data availability in this context.[2] Two exceptions are Maag and Lamla (2009) as well as Badarinza and Buchmann (2009), both of which find evidence that media coverage affects inflation forecast disagreement of households.

This paper contributes to these strands of the literature by expanding the relevant tests. Whereas most papers focus on one measure of central bank transparency or communication, we broaden the analysis in this respect, allowing for a comparison of the relative strengths of the effects. We will do so for a large set of countries, and furthermore comparing the responsiveness of professional forecasters to the one of the general public. The paper is organized in the following way. Section 2 discusses the data used in the empirical analysis. Section 3 reports on the effects of central bank transparency and communication on private sector forecasts. Section 4 summarizes the findings and draws some policy implications.

2. The data and the econometric model

To test for the effects of central bank transparency on private sector forecasts, we employ various data sets. This section provides a detailed description of the private sector forecast data, our measures for central bank transparency and communication, and other control variables.

2.1 Private sector forecast data

[2] In this respect it should be noticed that the effects of central bank transparency and communication on professional forecasters are likely to be more direct and significant than those regarding the general public, given that the latter receive their information indirectly via the media or via professionals (Carroll 2003). Van der Cruijsen and Eijffinger (2007) show, using household survey data, that actual and perceived transparency in the general public may deviate, making the effects of transparency on the public less obvious.

As to the private sector forecasts, we focus on the data provided by Consensus Economics. These comprise professional forecasts for a large range of variables, for different horizons, and are available for a reasonably long history for a set of industrialized countries. They have also been used in the related studies by Crowe (2006) and Dovern et al. (2009).

In particular, we have available the micro data for 7 countries of the European Union (France, Germany, Italy, the Netherlands, Spain, Sweden and the United Kingdom) and 5 other countries (Canada, Japan, Norway, Switzerland and the United States). The data are monthly, starting from January 1990 (January 1995 for the Netherlands, Spain and Sweden; June 1998 for Norway and Switzerland) and running through November 2008.

To cover a broad range of economic indicators, we will analyze forecasts for consumer price inflation (% change p.a.), real GDP growth (% change p.a.), unemployment (% of labor force), 3-month interest rates and 10-year government bond yields. Importantly, the first three forecasts are made for the end of the current year and for the end of the next year, whereas interest rate forecasts are made for a fixed horizon of 3 and 12 months. In particular the year-end forecasts therefore require careful modeling: over the course of a given year, the forecast horizon decreases; whereas a year-end forecast in January spans nearly an entire year, the forecasting problem in November is much simpler, as much of the year's data are already realized and released. A model of dispersion or forecast errors will therefore have to control for the forecast horizon, as we would expect both to decline over the course of a year. As we will describe below, all econometric models will therefore contain a full set of month-fixed effects.

We have deliberately opted for a broad coverage of economic indicators to probe the extent to which forecasts are affected. Forecasts of interest rates are obviously very closely linked to expectations about the future course of monetary policy, and these in turn should be more aligned to the extent that the central bank's reaction function and assessment of the current economic situation are better understood. With regard to forecasts for inflation, GDP growth and unemployment, a more homogeneous understanding of the central bank's reaction function will only lead to a partial alignment, as long as agents do not have similar views about the transmission mechanism of monetary policy. However, some of our proxies for central bank transparency (discussed in more detail below) relate to whether central banks publish their macroeconomic policy models – which, in turn, could align agents' views about the transmission process. Also, we will test whether the publication of the central bank's inflation and output growth forecasts reduces dispersion among the private sector forecasters, such that we are particularly interested in the effects on precisely those variables.

On average, the dataset comprises 18 forecasters per country and month, although there is some variation. For instance, survey participation is relatively smaller in the Netherlands and Norway, with 10 forecasters on average, whereas the number of forecasters in the United Kingdom is relatively large, with 29 on average. Table 1 provides an overview of the forecaster coverage.

TABLE 1 HERE

Note that analysts need not give their forecast for every single variable and every forecasting horizon each time. Accordingly, the number of actual forecasts differs slightly across variables. Our dataset contains around 41,000 to 42,000 observations for inflation and GDP forecasts, whereas the number of forecasts for unemployment and interest rates is somewhat lower, at around 31,000 to 38,000.

For the purposes of this paper, we are interested in measures of cross-sectional dispersion on the one hand, and of forecast accuracy on the other. As explained in the introduction, our focus is on the effects of central bank transparency and communication on cross-sectional dispersion, as we are interested in the extent to which central banks can make the information acquisition of the private sector more effective. At the same time, however, it is also important to test how forecast accuracy is affected, as we need to ensure that transparent and communicative central banks do not align forecasts at *lower* levels of accuracy. While we would expect that more transparency and communication improves accuracy, this need not necessarily show up in our econometric estimates, for the following reason: Forecasts with

more transparent and better communicating central banks might be qualitatively more accurate than otherwise *ex ante*. What we observe, however, is only forecast accuracy *ex post*, i.e. after the realization of shocks. The ex ante forecast accuracy is not observable. If it were the case that central bank transparency and communication is correlated with the incidence of large, unexpected shocks (for instance, because central banks in small open economies – which are more subject to shocks and therefore more volatile – are more inclined to stabilize agents' expectations by being more transparent), ex post forecast accuracy might turn out to be lower under more transparent central banks.[3] We will consequently take the analysis of forecast accuracy as a robustness test rather than as the focal point of this paper.

Our preferred measure of cross-sectional dispersion is, in line with the literature (Mankiw et al. 2003, Dovern et al. 2009), the *inter-quartile range* of forecasts in a given country and month. The advantage of this measure over the simple standard deviation is that it is insensitive to outliers, which might be important in the analysis of survey data. We will, in any case, check for robustness of our results by using the standard deviation.[4] For a measure of forecast accuracy, we will calculate the *average absolute forecast error* per country and month.

Table 2 provides some summary statistics for the resulting variables. The dataset comprises 2342 country-month observations for most forecasts (albeit for unemployment, only 1589 observations are available). The inter-quartile range is on average around 0.2 to 0.5 percentage points, although it ranges from forecasts where the 25th as well as the 75th percentile of forecasters expressed the same view to those where the differences amounted to around 2 percentage points. Mean absolute forecast errors are comparably scaled, ranging on average from around 0.4 to 1.2 percentage points, and spanning for the individual variables a broader range from 0 to 6.7 percentage points.

TABLE 2 HERE

In order to contrast the results for the professional forecasts to those for the general public, we will also make use of a second dataset, which is based on the European Commission's Consumer Survey. This survey is also conducted monthly, covering around 1000 respondents in 20 European Union countries. The data are available to us starting from January 1985 at the earliest, through November 2008.[5] Different to the Consensus Economics dataset, only inflation forecasts are contained in the consumer survey – and furthermore, these are not quantitative, but rather only qualitative. Respondents are asked to indicate whether, in their view, prices will, over the next 12 months, i) increase more rapidly, ii) increase at the same rate, iii) increase at a slower rate, iv) stay about the same, or v) fall.

While the micro data are not directly available, the share of responses in the various categories is mostly substantial. This allows us to construct a measure of dispersion, which needs to reflect the qualitative nature of the responses. We therefore opted for the measure proposed by Lacy (2006), and also applied in Badarinza and Buchmann (2009):

[3] For this and other reasons, our econometric models will include country fixed effects. Still, the same argument might apply if the change in central bank transparency is correlated with the change in an economy's exposure to shocks.

[4] It is important to note that this measure is not necessarily a good proxy for uncertainty about the variable to be forecasted. As shown by D'Amico and Orphanides (2008), disagreement across forecasters is not necessarily equivalent to the inflation uncertainty expressed by forecasters in the form of probabilistic responses, as in the Survey of Professional Forecasters. While this is important to keep in mind when interpreting our results, we are primarily interested in the determinants of disagreement rather than uncertainty.

[5] More precisely, the data cover Belgium, Ireland, Greece, France, Italy, the Netherlands and the United Kingdom since 1985m1; Spain (1986m6); Latvia (1993m1); Hungary (1993m2); Estonia (1993m4); Czech Republic (1995m1); Austria and Sweden (1995m10); Finland (1995m11); Slovenia (1996m3); Cyprus, Lithuania, Poland and Romania (2001m5). The remaining countries (amongst which, for instance, Germany) conduct the survey, but do not make the breakdown of the response shares per answer category available on the Eurostat website.

$$d^2 = \sum_{j=1}^{4} F_j(1 - F_j) \tag{1}$$

where F_j is the *cumulative relative frequency* of the j^{th} category. Note that the 5^{th} category can be excluded, given that its cumulative relative frequency is equal to one, and accordingly does not provide any relevant information about the distribution of the variable.[6]

Unfortunately, the qualitative nature of the question does not allow constructing a measure of forecast accuracy. The European Commission releases a balance statistic that is supposed to provide an aggregated measure of the responses, based on the formula

$$B = (PP + 0.5P) - (0.5M + MM) \tag{2}$$

where PP denotes the share of responses expecting prices to increase more rapidly, P the share of responses that prices will increase at the same rate, M equivalently for expectations of prices to stay about the same, and MM referring to expectations that prices will fall. We will analyze this balance statistic to test whether central bank transparency and communication can affect the level of inflation expectations. Given that quantitative surveys on inflation expectations have typically concluded that consumers tend to overestimate inflation by non-negligible amounts (Bryan and Venkatu 2001), we take this to suggest that a reduction in the level of inflation expectations is equivalent to an improvement in forecast accuracy. For both measures (d^2 and the balance statistic), our dataset comprises 3967 country-month observations.

It is of course apparent that the two datasets differ along various dimensions. Our main interest are the different target groups across the two data sources, with professional forecasters in the Consensus Economics survey, and the general public in the EC's Consumer Survey. At the same time, however, the latter survey asks a qualitative question, whereas the former is interested in a quantified forecast, and the coverage of countries and across time differs. This of course limits the comparability of results. At the same time, we are not aware of any other consumer survey that is done in a comparable fashion across countries, asks quantitative questions, and spans a sufficiently long time sample.

2.2 Measures of central bank transparency

Being interested in how central bank transparency and communication affect private sector forecasts, we need to define measures for the former. To be as broad as possible, we have constructed four such measures. The first one relates to whether or not a central bank has announced a quantified inflation objective. This measure is constructed as a dummy variable, taking the value of one as of the month when the quantified inflation objective was adopted (as, e.g., in Ball and Sheridan 2005), according to the central bank websites. Alternatives to the adoption dates might be the announcement date (as, e.g., in Bernanke et al. 1999), or alternatively a later date to allow for a build-up of credibility (see, e.g., Goldberg and Klein 2005 for the ECB). By opting for the adoption date, we place ourselves in the middle of these alternatives. For the Consensus Economics dataset, 7 out of the 12 countries adopt a quantified inflation objective over the course of our sample period, two countries (Spain and Sweden) are considered to have a quantified inflation objective throughout (note that their data only start in 1995), and the remaining three countries (Switzerland, Japan and the United States) do not have a quantified inflation objective over the entire sample.

[6] To construct this measure, we have excluded the "don't know" response shares, and calculated the cumulative relative frequencies just taking into account the response shares of the remaining answer categories. This measure has the advantage that it does not require the quantification of the distances between the various answer categories. The measure will be equal to zero if all responses fall into a single category, and it will be equal to one, its maximum value, if 50% of respondents expect prices to rise more rapidly and 50% expect prices to fall.

A second set of variables relates to more general measures of central bank transparency. Eijffinger and Geraats (2006) have developed a central bank transparency index, which is an aggregate of subindices relating to (1) political, (2) economic, (3) procedural, (4) policy and (5) operational transparency. This index has recently been extended and updated for a large set of countries by Dincer and Eichengreen (2009). The data is annual and covers the period from 1998 to 2006. In light of the large number of subindices, we will concentrate on the overall index, as well as the subindex related to economic transparency.[7] A detailed explanation of the construction of these data is provided in Eijffinger and Geraats (2006); for the purposes of this paper, it shall suffice to state that central banks are given ranks between 0 and 3 for economic transparency, depending on (a) whether they provide timely information on key economic data (money supply, inflation, GDP, unemployment rate and capacity utilization), (b) whether or not central banks announce what policy models are employed internally, and finally (and probably most important for our purposes) (c) whether or not central banks release numerical internal forecasts for inflation and/or output. The overall index is a simple aggregate of the 5 subindices, each of which can vary from 0 to 3, such that the overall index is defined over a range from 0 to 15. For the Consensus Economics dataset, the economic transparency index ranges from 1 to 3, whereas the overall index takes values in between 6 and 15.

One important issue relates to the relatively short time sample for which these data are available. To maintain a maximum number of observations, we have decided to use the 1998 data for all earlier years, and to assume that in the years 2007 and 2008, the 2006 indices are still applicable. Of course, we have tested for the robustness of our results using only the actual transparency data.

A last measure for central bank transparency is closely related to one aspect of the economic transparency index, namely whether central banks publish their internal forecasts for inflation and output. We have constructed a variable (which we will label *central bank communication*) that is equal to one in those months where such forecasts are published, and zero otherwise. Practices across central banks differ widely with regard to the specific nature of the forecasts; for instance, some central banks release forecasts that are owned by the decision-making body, whereas others provide staff forecasts. Also, practices differ with regard to the underlying assumptions about the future path of interest rates, which could be assumed to be constant, based on market interest rates, or reflect the central bank's own forecast. Finally, the forecasting horizons are also different across central banks. Unfortunately, the dataset does not contain sufficient variation in order to test for the effects of different practices separately. Instead, we pool all these forecast releases in one dummy variable, assuming that regardless of their precise nature, they provide useful signals to the public which in turn might align private sector forecasts. For the countries of the euro area, we consider both the relevant publications of the ECB as well as of the National Central Banks. Whereas the former provides staff projections for the euro area as a whole, we prefer to treat this as relevant information also for the national forecasts, given that this potentially allows forecasters to better assess the future course of monetary policy, which in turn might allow for more accurate (or more aligned) national forecasts. A robustness test for the inclusion of ECB staff projections for the euro area will be conducted. A final note on the construction of the central bank communication variable relates to the precise timing. Given that the Consensus Economics survey takes place at the beginning of a month, we have made sure that the central bank publication can affect the survey. If it takes place after the collection of the Consensus Economics data, we enter it in the subsequent month.

One might expect that these four variables measure related concepts, and are therefore positively correlated. Table 3 displays the correlation coefficients, some of which are indeed relatively large. It is apparent that central banks with a quantified inflation objective are on average more transparent. At the same time, the correlation coefficient with economic transparency is not that high, presumably because also many other central banks fare relatively high on the economic transparency ranking. Central bank communication is least correlated with the other measures, which is explained by the fact that it contains much more time variation: whereas all other measures are best described by step functions, our

[7] It should be noted that we have tested also the subindices for political, procedural, policy and operational transparency, which didn't prove to be significant in reducing the dispersion among professional forecasters.

communication measure switches between the values zero and one repeatedly (in many cases, the relevant publications take place quarterly, or semi-annually, leading to non-zero entries for 4 or 2 months a year, respectively). These correlation coefficients suggest that in our empirical analysis it will not always be possible to clearly identify which measure is triggering an effect. At the same time, we are comforted by the relatively low correlation measures between quantified inflation objectives, economic transparency, and central bank communication. Note that we will subsume all of these variables under the heading of central bank transparency, even though we will use the term also for the narrower definition of the central bank transparency index.

TABLE 3 HERE

2.3 Control variables

When explaining cross-sectional forecaster dispersion, a number of other factors need to be considered. Most straightforwardly, it is important to include month fixed effects, as well as country fixed effects in any model. The former are necessary due to the changing forecasting horizon in the Consensus Economics survey, as discussed above. The latter can take account of a myriad of issues that might have a bearing on the dispersion that we observe on average in a given country, such as the quality of the forecaster pool, the difficulty in forecasting a given economy (e.g. because smaller economies are more prone to shocks, and as such might *ceteris paribus* be relatively more volatile), or possibly the availability of a well-established forecasting institution that might affect the views expressed in this survey.

Following Capistran and Timmermann (2009), we also include the conditional volatility of the variable that needs to be forecasted. Such a control variable is useful for two reasons. First, higher volatility can imply a more difficult forecasting task which, in turn, might increase cross-sectional dispersion. Second, our estimation sample is in large part coinciding with the so-called great moderation, i.e. a stable macroeconomic environment. At the same time, central banks have become more transparent over the sample. In order not to confuse the two time variations, it is important to control for the impact of the great moderation. We do this by including the conditional volatility of the variable that needs to be forecasted.[8] In concordance with the approach of Capistran and Timmermann (2009), we estimated GARCH(1,1) models (where for our purposes 2 lags proved to be sufficient to reduce remaining serial correlation), and extracted the estimates of the conditional volatility. Adding the level of the variable to be forecasted (e.g. because inflation might be more difficult to forecast when it is high) does not affect our results, and generates issues of correlated regressors, given that the conditional volatility and the level of the variables are highly correlated. We have, therefore, decided to only include the conditional volatility measure. The actual data on the variables to be forecasted was sourced from the OECD's Main Economic Indicators database.

Furthermore, we include the absolute change in oil prices (sourced from the Bank for International Settlements) that was observed prior to the survey, to incorporate possible effects this variable might have on the evolution of forecasts, and the disagreement among forecasters in particular. Importantly, the inclusion of this variable does not change our results.

A final set of variables that we include in the extension of the empirical models relates to the news component of macroeconomic announcements. With new macroeconomic data arriving, forecasters need to update their information set and adjust their forecasts. This in itself might affect forecaster disagreement; an interesting hypothesis in that respect is whether the adjustment in forecasts can take

[8] An alternative would be to include time fixed effects in the model, which would control for all time variation that is common across countries, i.e. both for possible common variations due to the great moderation and due to changes in central bank transparency. However, effects stemming from a common time variation in central bank transparency would then no longer be identifiable. Furthermore, the conditional volatility of the variable to be forecasted is more direct, as it allows for a country-specific control for the great moderation.

place in a "smoother" fashion under transparent central banks, and as such would lead to a relatively smaller increase in cross-sectional dispersion.[9]

To test for this possibility, we have constructed a series of macroeconomic announcements and the surprise component contained therein. Following the standard in the announcement literature (see, e.g., Andersen et al. 2003), we deduct the expectation of the announcement from the actual announcement value of the variable to get a measure of the surprise component, and standardize these surprises by their own, national, standard deviation. Due to this standardization, the regression coefficients for each series can be interpreted as a response per one national standard deviation surprise. As is standard in this literature, we obtained data on expectations of the macroeconomic releases from a survey among financial market participants conducted by Bloomberg Financial Services, and use the median response as our measure of expectations. It is important to note, however, that these data are not available for the entire sample period. To maximize the sample, we focus on the releases of inflation and unemployment, for which the Bloomberg surveys have the longest history. As with the central bank communication variable, we ensure that the data release is appropriately assigned to the relevant Consensus Economics forecast round.[10]

3. The effects of central bank transparency on private sector forecasts

What effects do central banks exert on private sector forecasts by means of their transparency and communication? This section presents the empirical results. We will first focus on a benchmark regression that analyzes the determinants of the inter-quartile range in the Consensus Economics forecasts, before expanding the analysis and testing its robustness in several ways. Following this, we will turn to an analysis of the responsiveness to news shocks, and then probe the limits of the effects of central bank transparency.

3.1 Overall effects

Our benchmark econometric model is given as

$$\Omega_{i,c,t} = \alpha_c + \alpha_m + \beta\, x_{c,t} + \gamma_1 \Omega_{i,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 \left|\Delta oil_{t-1}\right| + \varepsilon_{i,c,t} \tag{3}$$

where $\Omega_{i,c,t}$ denotes our dependent variable, i.e. the *cross-sectional forecast dispersion* for forecast *i* in country *c* at time *t*, or alternatively the *absolute mean forecast error*, and α_c and α_m stand for the country and month fixed effects. Our measures for central bank transparency and communication are given by $x_{c,t}$; $\Sigma_{i,c,t}$ marks the conditional volatility of the variable to be forecasted, and $\left|\Delta oil_{t-1}\right|$ denotes the absolute change in oil prices in the preceding month. As outlined in detail in section 2, our hypotheses are that disagreement among forecasters should depend negatively on central bank transparency and communication ($\beta < 0$), that disagreement is likely to be persistent ($\gamma_1 > 0$), and that higher volatility of the variable increases disagreement ($\gamma_2 > 0$), as do larger oil price changes ($\gamma_3 > 0$).

We estimate different variants of this model, including different measures of Ω (inter-quartile range and mean absolute error), for different forecasts *i* (varying the variable to be forecasted as well as the

[9] This test is related to the influential work by Gürkaynak, Sack and Swanson (2005), who show that, in response to macroeconomic news shocks, long-term inflation expectations are better anchored in inflation-targetting countries.

[10] An alternative might be to use the magnitude of the change in the announced values for the macroeconomic releases, assuming that larger changes require more substantial forecast revisions, and as such could raise disagreement. Our preferred measure is based on the shocks – assuming that if large parts of a macroeconomic release have not been foreseen, this should trigger more substantive revisions, whereas a large change in the announcement could have been foreseen, and therefore already factored into the earlier forecast rounds.

horizon), and different central bank transparency and communication measures *x* each time (although we will also estimate a joint model for three central bank measures for each forecast). The models will be estimated by simple OLS. Since our observations are clustered by country, the standard errors are estimated taking the cluster structure into account.[11]

Table 4 provides the results parameter estimates obtained in the benchmark model. Column (1) contains the estimates testing for the importance of quantified inflation objectives, column (2) for overall transparency, column (3) for economic transparency, and column (4) includes our central bank communication variable. Column (5) combines quantified inflation objectives, economic transparency, and communication (the three central bank measures with the lowest correlation coefficients) in a joint model.

TABLE 4 HERE

All models contain the various control variables discussed in the preceding section. To save space, the regression coefficients for the month and country fixed effects are not provided. It is important to note, however, that especially the former are extremely relevant for the year-end forecasts. Not only are they highly statistically significant at the 1% level and large in magnitude (the inter-quartile range in December is up to 80% lower than in January for the current-year forecasts, and up to 20% for the next-year forecasts), but their importance also increases monotonically over the course of the year. Country effects are at times significant, but not as consistently so as the month effects.

The results for the other control variables show that disagreement is indeed persistent. The own lag has statistically significant and sizable coefficients. As these are significantly smaller than one, disagreement is, however, not described by a unit root process. Also the conditional volatility of a variable is apparently an important determinant of disagreement, with large and (for all forecasts) statistically significant effects. Oil prices, in contrast, seem to affect only a number of forecasts, such as interest rate forecasts at the 3-month horizon and inflation forecasts for the subsequent year. In these cases, larger oil price changes do, as to be expected, increase disagreement.

Turning to our variables of interest, the central bank transparency and communication measures, it is apparent that there is a large majority of cases where more transparency reduces disagreement.[12] In many cases the effect is statistically significant, and the coefficients are furthermore always negative. The largest effects are exerted by the adoption of quantified inflation objectives and by increasing the level of economic transparency: with a quantified inflation objective, the inter-quartile range of forecast dispersion is reduced by 7 to 19% (depending on the variable we look at), and an improvement in the economic transparency index by one lowers the inter-quartile range by 6 to 20%. This compares to a reduction of up to 5% if the overall transparency index increases by one, and of up to 10% in the central bank communication months.

In addition, these effects are partially additive, especially when it comes to the interest rate forecasts. The models in column (5) show that in many cases, there are joint effects of quantified inflation objectives, economic transparency and/or communication, which add to larger reductions than estimated in the separate models. Another important result is that the dispersion-reducing effect, which is apparent for the overall transparency index is nearly entirely generated by the contribution of economic

[11] This assumes that errors are correlated within, but uncorrelated across countries. For the euro area countries, it might be possible that errors are also correlated across countries, given that the central bank measures are partially identical. We have therefore tested whether allowing for correlated errors within the non-euro area countries and within the euro area affects our results, and note that this is not the case. If anything, the standard errors when clustering by country are slightly more conservative, and are therefore reported in this paper.

[12] It might be surprising to find that the disagreement in CPI forecasts is not affected by all central bank transparency measures. At the same time, however, it is important to note that monetary policy affects inflation only with rather long lags, which are often estimated in the range of 1.5 to 2 years. The forecast horizons in this dataset might therefore be too short to reflect possible effects of enhanced central bank transparency.

transparency. Constructing an overall transparency index *excluding* economic transparency, and re-estimating the econometric models shows that the other dimensions of transparency manage to reduce dispersion only in the case of long-term interest rate forecasts.

These results are robust to a number of model variations, such as using the standard deviation instead of the inter-quartile range, or allowing for correlated errors within the non-euro area countries and within the euro area (i.e. dropping the assumption of uncorrelated errors across the euro area countries). Similary, a reclassification of the Deutsche Bundesbank (prior to 1999) as a central bank with a quantified inflation objective, given that it had released the so-called "inflation norm", does not affect results. What is important, though, is the treatment of the ECB. Excluding the ECB staff projections from the communication variable, or dropping the ECB from the set of central banks with quantified inflation objectives (such that all remaining central banks in the group are defined as formal inflation targeters) implies much reduced effects for the communication variable and the quantified inflation objective on dispersion, respectively. Against the background that 5 of our 12 countries in the sample are members of the euro area, this change in results is not all too surprising, and suggests the following. First, the ECB staff projections, although for the euro area, are useful information in predicting the main macroeconomic variables in the euro area national economies. Second, for the purpose of aligning agents' expectations of these variables, what matters is not that a central bank follows a formal inflation targeting policy, but rather that it announces a quantified inflation objective. For brevity, these robustness tests are not reported in the paper.

Another robustness test is contained in Table 5. As mentioned above, we have expanded the sample for the transparency indices beyond those originally available, by extrapolating using the first observation forward, i.e. for the years prior to 1998, and the last observation backward, for 2007 and 2008. Using only the original data covering the years 1998 to 2006 reduces sample size by around half. Accordingly, there are fewer statistically significant effects. However, for a number of forecasts, statistical significance remains, and with only one exception, these cases point to a reduction in forecaster disagreement when transparency is enhanced. This is particularly the case for the interest rate forecasts.

TABLES 5 AND 6 HERE

The final robustness test is provided in Table 6. Here, we attempt to explain the mean absolute error, i.e. a measure of forecast accuracy, rather than the inter-quartile range, our measure of dispersion, in otherwise identical models. As we had conjectured in the preceding section, there is some, but weaker evidence that central bank transparency and communication improves (ex post) forecast accuracy.

Taken together, these results suggest that there are various ways through which central banks can reduce forecast dispersion, with the announcement of a quantified inflation objective and enhanced economic transparency being the most potent channels. Additional effects can be achieved in the months when central banks communicate their inflation and output forecasts.

3.2 The response to shocks

What are the underlying mechanisms by which enhanced central bank transparency and communication leads to a convergence in the views of the private sector? We try to shed light on this question by studying the responsiveness of forecasters' views to shocks, i.e. macroeconomic announcements as outlined in section 2. In the light of a changed information set, agents need to reassess their earlier forecasts, and possibly revise them. This in itself is likely to generate disagreement among forecasters outside a rational expectations world. In the presence of a more transparent central bank, agents might be in a better position to infer on the likely response of the central bank, and/or might possess better information on the shock absorption processes in the economy. Accordingly, the disagreement might be less pronounced with more transparent central banks.

TABLES 7 AND 8 HERE

Tables 7 and 8 provide a set of results for this hypothesis. The estimated models include the surprise component contained in the releases of inflation data (Table 7) and unemployment figures (Table 8), as well as the various central bank measures (as before, one at a time) along with an interaction of the two. The model is therefore estimated as

$$\Omega_{i,c,t} = \alpha_c + \alpha_m + \beta_1\ x_{c,t} + \beta_2\ s_{c,t} + \beta_3\ s_{c,t}x_{c,t} + \gamma_1\Omega_{i,c,t-1} + \gamma_2\Sigma_{i,c,t} + \gamma_3\left|\Delta oil_{t-1}\right| + \varepsilon_{i,c,t} \qquad (4)$$

where $s_{c,t}$ denotes the surprise component contained in the macroeconomic releases. Our hypothesis is that $\beta_2 > 0$ and $\beta_3 < 0$. The joint hypothesis is confirmed in a large number of cases, suggesting that central bank transparency can contribute to a more homogeneous shock absorption of forecasters.

3.3 Probing the limits

While the evidence provided so far points to a powerful role of central bank transparency and communication in affecting disagreement among forecasters, in this last subsection we turn to the question whether there are limits to this role. In the first step[13], we will ask whether economic transparency, a key driver identified in the previous analyses, carries diminishing returns, or whether the same benefits can be reaped regardless of the level of economic transparency that has already been established by a central bank. For that purpose, we will split the economic transparency index into four levels, with the thresholds roughly coinciding with the 25th, 50th and the 75th percentile of the distribution.[14] The estimated model is

$$\Omega_{i,c,t} = \alpha_c + \alpha_m + \sum_{k=1}^{3}\beta_k\ x_{k,c,t} + \gamma_1\Omega_{i,c,t-1} + \gamma_2\Sigma_{i,c,t} + \gamma_3\left|\Delta oil_{t-1}\right| + \varepsilon_{i,c,t} \qquad (5)$$

where $x_{k,c,t}$ splits the economic transparency index into dummy variables for the observations of low transparency (index equal to 1.5 or 2), medium transparency (index equals 2.5) or high transparency (with an index of 3). The level of disagreement for these different levels is tested against those cases with very low values of economic transparency (where the index is lower than 1.5). The hypotheses are that with higher economic transparency, disagreement should decline, such that β_1 to β_3 should be negative. In the case of diminishing returns, we would see that disagreement is reduced more strongly in the lower ranges of the index, and that less additional reduction can be achieved for higher ranges. Accordingly, β_2 might not be different from β_3 any more, whereas both might be substantially smaller than β_1.

TABLE 9 HERE

The results of this test are provided in Table 9. With the exception of unemployment forecasts, where the β_k seem to be monotonically increasing, there is clear evidence for diminishing returns. Typically, β_2 is not statistically significantly different from β_3, and there is a relatively large jump when moving from β_1 to β_2. This suggests that there are large benefits to be reaped when moving from very low levels of

[13] We have identified other limits, which are for brevity not reported here. For instance, central bank transparency does not seems to affect the persistence of disagreement, nor the magnitude of the effects of a variable's volatility on disagreement.

[14] An alternative might be the inclusion of a quadratic term, as suggested by Van der Cruijsen et al. (2008). This would suggest the existence of an *optimal* level of transparency, after which disagreement starts rising again. Such a squared term is indeed statistically significant in one of the models (namely for the current-year CPI forecasts).However, the resulting trade-off is such that there is only a very minor increase in disagreement for a transparency level of 3. Looking at the results in Table 9, this increase in disagreement is actually not statistically significant, such that the fit of the quadratic term must be owed primarily to the decreasing marginal returns when moving from very low to higher levels of transparency.

economic transparency, whereas the additional benefits for already very transparent central banks are relatively smaller.

For a final test of the limits, we are interested whether and to what extent central bank transparency and communication can also reduce heterogeneity in forecasts of the general public. As mentioned in the preceding section, we employ the inflation expectations as expressed in the European Commission's Consumer Survey for that purpose. The model that we have estimated is equal to our earlier benchmark model for the professional forecasters, with one exception. The question on inflation *expectations* is preceded by one on inflation *perceptions* ("How do you think that consumer prices have developed over the last 12 months?"), which is also answered in a qualitative fashion. As inflation perceptions might affect inflation expectations, we have included the corresponding dispersion measure when explaining disagreement in inflation expectations, and the corresponding balance statistic when regressing the balance statistic for inflation expectations. This leads to the model

$$\Omega_{exp,c,t} = \alpha_c + \alpha_m + \beta\, x_{c,t} + \gamma_1 \Omega_{exp,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 \left|\Delta oil_{t-1}\right| + \gamma_1 \Omega_{perc,c,t} + \varepsilon_{exp,c,t} \quad (6)$$

Results are given in Table 10. The left panel reports results using Lacy's (2006) dispersion measure for ordinal variables. The control variables are clearly important (as for the case of professional forecasters), indicating that disagreement is persistent and depending on the volatility of inflation, the absolute change of oil prices and disagreement about inflation perceptions. Nevertheless, none of the central bank transparency and communication measures enters the models significantly. This might not be surprising, given that the general public clearly does not follow central bank policies as closely as professional central bank watchers and, maybe, rely relatively more on the media coverage of central bank policies. However, the complete absence of any central bank effect (e.g. also for quantified inflation objectives) might still come somewhat unexpected. To test whether this result is an artifact of the type of data that we use (different sample period, different country coverage, qualitative questions and, therefore, a rougher measure of disagreement), we have repeated the analysis using the balance statistics (the right panel of Table 10). Interestingly, some effects are discovered here: both the existence of a quantified inflation objective as well as a high level of economic transparency lead to lower levels of inflation expectations.

TABLE 10 HERE

These results point to a limited role of central bank transparency and communication in aligning inflation expectations among the general public. While enhanced economic transparency and the announcement of a quantified inflation objective do not go unnoticed by the general public, and even manage to lower the public's inflation expectations, the effects to do not extend to reduce their dispersion across individuals.

4. Conclusions

Acknowledging the existence of information processing constraints and costs has led to the emergence of economic models that allow for disagreement among economic agents. That this is a desirable feature of any economic model is clearly demonstrated by ample evidence of such disagreement, such as present in economic forecasts. In such models, there is a role for central bank transparency and communication to reduce the cost of information processing, either by increasing the precision of signals received by economic agents, or by making the information acquisition less costly. Over the last decades, central banks have undertaken great efforts in that direction, leading to major improvements in the predictability of their decisions and/or in the anchoring of inflation expectations.

This paper has studied to what extent greater central bank transparency and communication have contributed to a convergence in expectations of economic agents, by testing for their effects on the disagreement in forecasts of key macroeconomic variables. Compared to earlier contributions to this

literature, our tests and proxies for central bank transparency and communication are substantially broader and more systematic. The paper finds empirical evidence that several of these measures (in particular the announcement of a quantified inflation objective and enhanced transparency about economic dimensions of the conduct of monetary policy, such as the release of the central bank's internal forecasts of inflation and output) are effective in that regard, and that the effects are partially additive. The reduction in forecaster disagreement is not only statistically significant, but also economically important. The findings of the paper indicate that this reduction has been achieved because forecasters in countries with more transparent and open central banks manage to update their forecasts in response to news in a smoother fashion, generating less disagreement.

At the same time, the findings of the paper also point at limits to the effects of central bank transparency. Increasing economic transparency seems to be particularly powerful at low levels of transparency. Yet at higher levels, the additional effects that can be reaped by further enhancements of economic transparency appear to be much smaller. Furthermore, the present paper does not find that the dispersion in expectations among the general public (in contrast to those of professional forecasters) is affected by any of the various measures of central bank transparency that it analyzes. Although we stress the limitations of the data sources to measure such expectations of the general public, this finding is suggestive that monetary authorities may need to think of alternative ways to extend their reach to households and firms.

Whereas these findings speak a clear language about the appropriateness of economic models that incorporate information processing constraints, their normative implications are less straightforward. There could be the possibility that the central bank acts as a focal point for economic agents, as described for instance in the seminal work by Morris and Shin (2002). In this case, the information provided by central banks might crowd out independent information acquisition by the private sector, which carries the risk of an inefficiently low level of information acquisition. This possibility has been deemed implausible in the real world by Svensson (2006) in his comment on Morris and Shin (2002). While not strictly tested, our results also support that forecast accuracy has not really suffered from the greater transparency and communication efforts of central banks so far. We leave a more formal test of this debate on the efficiency of information acquisition by the private sector for future research.

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Table 1: Coverage of the Consensus Economics Dataset

Country	No of forecasters			Sample		Max. no of forecasts
	Average	Min	Max	Start	End	
Canada	15	11	20	1990:1	2008:11	3439
France	18	11	24	1990:1	2008:11	4085
Germany	27	20	33	1990:1	2008:11	6219
Italy	14	6	21	1990:1	2008:11	3168
Japan	20	12	26	1990:1	2008:11	4456
Netherlands	10	7	14	1995:1	2008:11	1610
Norway	10	6	12	1998:6	2008:11	1219
Spain	14	7	19	1995:1	2008:11	2344
Sweden	13	7	18	1995:1	2008:11	2226
Switzerland	12	6	17	1998:6	2008:11	1503
UK	29	19	39	1990:1	2008:11	6621
US	26	19	33	1990:1	2008:11	5915
Total	18	6	39	1990:1	2008:11	42805

Notes: The table provides an overview of the coverage of the Consensus Economics Forecast Dataset. Column "Max. no of forecasts" denotes the maximum number of forecasts that is available in a given country for a given variable (note that forecasters need not give a forecast for every variable and for every forecasting horizon).

Table 2: Summary statistics for cross-sectional dispersion and forecast accuracy in the Consensus Economics Dataset

	Observations	Mean	Std	Min	Max
Inter-quartile range					
CPI - current year	2342	0.21	0.14	0.00	1.20
CPI - next year	2342	0.40	0.21	0.00	1.90
GDP - current year	2342	0.33	0.21	0.00	1.60
GDP - next year	2342	0.48	0.23	0.00	2.00
Unemployment - current year	1589	0.21	0.19	0.00	2.00
Unemployment - next year	1589	0.40	0.21	0.00	2.50
Short-term interest rates - in 3 months	2342	0.25	0.17	0.00	2.00
Short-term interest rates - in 12 months	2342	0.51	0.27	0.00	2.00
Long-term interest rates - in 3 months	2342	0.28	0.13	0.00	1.50
Long-term interest rates - in 12 months	2342	0.46	0.21	0.00	1.60
Mean absolute forecast error					
CPI - current year	2342	0.31	0.34	0.00	2.53
CPI - next year	2210	0.66	0.52	0.00	3.69
GDP - current year	2342	0.74	0.54	0.00	3.45
GDP - next year	2210	1.16	0.86	0.00	4.49
Unemployment - current year	1589	0.53	0.68	0.00	3.93
Unemployment - next year	1512	0.76	0.66	0.00	3.58
Short-term interest rates - in 3 months	2341	0.38	0.45	0.00	5.62
Short-term interest rates - in 12 months	2268	1.01	0.85	0.00	6.41
Long-term interest rates - in 3 months	2342	0.48	0.45	0.00	6.06
Long-term interest rates - in 12 months	2266	0.92	0.73	0.00	6.69

Notes: The table provides summary statistics for the inter-quartile range (top panel) and the mean absolute forecast error (lower panel) of the various forecasts obtained in the Consensus Economics dataset.

Table 3: Correlation between measures of central bank transparency and communication

	Quantified Inflation Objective	Transparency	Economic Transparency	Communi-cation
Quantified Inflation Objective	1.00			
Transparency	0.56	1.00		
Economic Transparency	0.27	0.53	1.00	
Communication	0.22	0.14	0.06	1.00

Notes: The table displays the correlation coefficients between the various measures for central bank transparency and communication, for the sample of the Consensus Economics dataset.

Table 4: Central bank transparency and forecaster dispersion, benchmark model

IQR	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	CPI - current year					**CPI - next year**				
Quantified Inflation	0.004				0.011	-0.019				-0.008
Objective	*0.016*				*0.016*	*0.020*				*0.021*
(Ec.) Transparency		0.000	-0.019*		-0.020*		-0.007	-0.049**		-0.047**
		0.004	*0.009*		*0.009*		*0.006*	*0.020*		*0.020*
Communication				-0.011*	-0.011*				-0.013	-0.006
				0.005	*0.005*				*0.010*	*0.010*
Own Lag	0.396***	0.397***	0.390***	0.396***	0.389***	0.660***	0.657***	0.636***	0.661***	0.636***
	0.036	*0.036*	*0.032*	*0.035*	*0.032*	*0.067*	*0.064*	*0.058*	*0.068*	*0.058*
Cond. volatility	0.127***	0.126***	0.118***	0.123***	0.117***	0.139***	0.151***	0.127**	0.138**	0.125**
	0.021	*0.022*	*0.027*	*0.024*	*0.023*	*0.039*	*0.048*	*0.047*	*0.048*	*0.042*
Oil Prices	0.001	0.002	0.001	0.003	0.001	0.165***	0.159***	0.158***	0.164***	0.161***
	0.050	*0.049*	*0.049*	*0.049*	*0.048*	*0.048*	*0.046*	*0.044*	*0.045*	*0.046*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2330	2330	2330	2330	2330	2330	2330	2330	2330	2330
R2	0.54	0.54	0.54	0.54	0.55	0.55	0.55	0.55	0.55	0.55
	GDP - current year					**GDP - next year**				
Quantified Inflation	-0.025*				-0.016	0.000				0.009
Objective	*0.013*				*0.013*	*0.011*				*0.013*
(Ec.) Transparency		-0.007*	-0.045***		-0.042***		-0.001	-0.042***		-0.042***
		0.003	*0.010*		*0.009*		*0.005*	*0.013*		*0.013*
Communication				-0.018***	-0.011*				-0.011*	-0.008
				0.005	*0.005*				*0.006*	*0.006*
Own Lag	0.526***	0.525***	0.509***	0.529***	0.507***	0.593***	0.593***	0.577***	0.592***	0.577***
	0.026	*0.025*	*0.024*	*0.025*	*0.025*	*0.021*	*0.021*	*0.017*	*0.021*	*0.017*
Cond. volatility	0.038*	0.041*	0.035	0.044*	0.029	0.050*	0.049*	0.040*	0.049**	0.042
	0.018	*0.021*	*0.021*	*0.020*	*0.018*	*0.023*	*0.022*	*0.021*	*0.021*	*0.024*
Oil Prices	0.019	0.012	0.015	0.017	0.021	0.079	0.079	0.080	0.081	0.080
	0.051	*0.050*	*0.053*	*0.049*	*0.054*	*0.048*	*0.050*	*0.049*	*0.049*	*0.049*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2330	2330	2330	2330	2330	2330	2330	2330	2330	2330
R2	0.60	0.60	0.61	0.60	0.61	0.55	0.55	0.56	0.55	0.56
	Unemployment - current year					**Unemployment - next year**				
Quantified Inflation	-0.033**				-0.032**	-0.040*				-0.029
Objective	*0.010*				*0.010*	*0.017*				*0.015*
(Ec.) Transparency		-0.009**	-0.013**		-0.003		-0.012*	-0.037*		-0.026
		0.004	*0.005*		*0.003*		*0.005*	*0.019*		*0.016*
Communication				-0.010**	0.000				-0.028**	-0.015
				0.004	*0.005*				*0.011*	*0.008*
Own Lag	0.763***	0.775***	0.779***	0.781***	0.763***	0.650***	0.658***	0.652***	0.661***	0.644***
	0.098	*0.096*	*0.099*	*0.099*	*0.098*	*0.029*	*0.032*	*0.039*	*0.034*	*0.034*
Cond. volatility	0.356**	0.371**	0.378**	0.361**	0.352**	0.856**	0.865***	0.870***	0.799**	0.806**
	0.119	*0.131*	*0.135*	*0.126*	*0.118*	*0.246*	*0.229*	*0.211*	*0.262*	*0.226*
Oil Prices	-0.016	-0.024	-0.025	-0.025	-0.016	0.114	0.105	0.106	0.104	0.116
	0.015	*0.016*	*0.016*	*0.017*	*0.015*	*0.082*	*0.076*	*0.075*	*0.076*	*0.079*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1582	1582	1582	1582	1582	1582	1582	1582	1582	1582
R2	0.71	0.71	0.71	0.71	0.71	0.53	0.53	0.53	0.53	0.54

Table 4 (continued): Central bank transparency and forecaster dispersion, benchmark model

IQR	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Short-term interest rates - in 3 months					**Short-term interest rates - in 12 months**				
Quantified Inflation	-0.048**				-0.039*	-0.065**				-0.053**
Objective	*0.020*				*0.019*	*0.022*				*0.020*
(Ec.) Transparency		-0.008	-0.038***		-0.031***		-0.013**	-0.058***		-0.049***
		0.005	*0.010*		*0.008*		*0.005*	*0.017*		*0.015*
Communication				-0.026**	-0.016*				-0.034**	-0.019
				0.010	*0.008*				*0.014*	*0.012*
Own Lag	0.460***	0.476***	0.464***	0.478***	0.443***	0.584***	0.598***	0.585***	0.603***	0.567***
	0.044	*0.036*	*0.032*	*0.032*	*0.044*	*0.043*	*0.043*	*0.039*	*0.043*	*0.041*
Cond. volatility	0.074***	0.080***	0.082***	0.081***	0.075***	0.059***	0.067***	0.070***	0.070***	0.059***
	0.014	*0.014*	*0.014*	*0.014*	*0.013*	*0.011*	*0.011*	*0.010*	*0.011*	*0.010*
Oil Prices	0.132**	0.121**	0.125**	0.129**	0.135**	-0.028	-0.042	-0.037	-0.031	-0.027
	0.044	*0.046*	*0.049*	*0.046*	*0.047*	*0.054*	*0.063*	*0.064*	*0.061*	*0.056*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2330	2330	2330	2330	2330	2330	2330	2330	2330	2330
R2	0.41	0.40	0.41	0.40	0.41	0.55	0.54	0.55	0.54	0.55
	Long-term interest rates - in 3 months					**Long-term interest rates - in 12 months**				
Quantified Inflation	-0.032**				-0.021*	-0.032*				-0.022
Objective	*0.011*				*0.011*	*0.017*				*0.015*
(Ec.) Transparency		-0.014***	-0.057***		-0.052***		-0.018***	-0.055***		-0.051***
		0.003	*0.010*		*0.008*		*0.005*	*0.013*		*0.012*
Communication				-0.018**	-0.009				-0.017	-0.007
				0.008	*0.007*				*0.010*	*0.008*
Own Lag	0.316***	0.306***	0.286***	0.321***	0.279***	0.540***	0.528***	0.523***	0.544***	0.519***
	0.046	*0.042*	*0.039*	*0.044*	*0.041*	*0.038*	*0.036*	*0.031*	*0.036*	*0.034*
Cond. volatility	0.056*	0.057**	0.058**	0.070**	0.046*	0.103**	0.101***	0.107***	0.118***	0.095**
	0.030	*0.024*	*0.020*	*0.029*	*0.022*	*0.040*	*0.032*	*0.029*	*0.037*	*0.032*
Oil Prices	0.090*	0.080**	0.087**	0.089**	0.091**	-0.056	-0.068*	-0.062	-0.057	-0.058
	0.041	*0.035*	*0.033*	*0.036*	*0.037*	*0.033*	*0.033*	*0.036*	*0.033*	*0.035*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2330	2330	2330	2330	2330	2330	2330	2330	2330	2330
R2	0.21	0.22	0.23	0.21	0.23	0.41	0.42	0.42	0.41	0.42

Notes: The table shows results of the benchmark model $\Omega_{i,c,t} = \alpha_c + \alpha_m + \beta\, x_{c,t} + \gamma_1 \Omega_{i,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 \left|\Delta oil_{t-1}\right| + \varepsilon_{i,c,t}$, where $\Omega_{i,c,t}$ denotes the inter-quartile range. Numbers in italics denote standard errors, which allow for clustering by countries. Column (2) contains results with the overall transparency index, columns (3) and (5) with the subindex for economic transparency. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5: Central bank transparency and forecaster dispersion, 1998-2006

IQR	(2)	(3)	(2)	(3)
CPI	**Current year**		**Next year**	
(Ec.) Transparency	0.007**	0.000	0.005	-0.020
	0.003	*0.013*	*0.005*	*0.017*
Own Lag	0.339***	0.345***	0.494***	0.492***
	0.043	*0.043*	*0.040*	*0.044*
Cond. volatility	0.145***	0.159***	0.007	0.013
	0.027	*0.026*	*0.034*	*0.033*
Oil Prices	-0.020	-0.031	0.006	-0.013
	0.039	*0.041*	*0.039*	*0.038*
Fixed effects	Yes	Yes	Yes	Yes
Observations	1284	1284	1284	1284
R2	0.55	0.54	0.38	0.38
GDP	**Current year**		**Next year**	
(Ec.) Transparency	0.002	-0.023	-0.007	-0.052*
	0.004	*0.017*	*0.009*	*0.024*
Own Lag	0.418***	0.412***	0.501***	0.484***
	0.026	*0.024*	*0.019*	*0.023*
Cond. volatility	-0.014	-0.023	-0.008	-0.018
	0.014	*0.014*	*0.017*	*0.016*
Oil Prices	-0.017	-0.031	-0.024	-0.035
	0.072	*0.071*	*0.066*	*0.065*
Fixed effects	Yes	Yes	Yes	Yes
Observations	1284	1284	1284	1284
R2	0.59	0.59	0.55	0.55
Unemployment	**Current year**		**Next year**	
(Ec.) Transparency	-0.003	-0.014*	-0.006	-0.050***
	0.005	*0.007*	*0.006*	*0.012*
Own Lag	0.462***	0.457***	0.556***	0.532***
	0.042	*0.044*	*0.025*	*0.021*
Cond. volatility	1.712**	1.743**	1.074	1.235
	0.472	*0.474*	*1.299*	*1.142*
Oil Prices	0.005	0.002	0.031	0.022
	0.042	*0.044*	*0.048*	*0.046*
Fixed effects	Yes	Yes	Yes	Yes
Observations	756	756	756	756
R2	0.57	0.57	0.43	0.44

Table 5 (continued): Central bank transparency and forecaster dispersion, 1998-2006

IQR	(2)	(3)	(2)	(3)
Short-term rates	**In 3 months**		**In 12 months**	
(Ec.) Transparency	-0.012***	-0.035**	0.006	0.002
	0.004	*0.013*	*0.004*	*0.007*
Own Lag	0.380***	0.375***	0.485***	0.488***
	0.040	*0.039*	*0.046*	*0.046*
Cond. volatility	0.187***	0.206***	0.094**	0.082**
	0.047	*0.055*	*0.042*	*0.037*
Oil Prices	-0.049	-0.044	-0.006	-0.017
	0.050	*0.050*	*0.078*	*0.076*
Fixed effects	Yes	Yes	Yes	Yes
Observations	1284	1284	1284	1284
R2	0.35	0.35	0.46	0.46
Long-term rates	**In 3 months**		**In 12 months**	
(Ec.) Transparency	-0.010**	-0.039**	0.004	0.001
	0.005	*0.017*	*0.006*	*0.015*
Own Lag	0.256***	0.247***	0.443***	0.444***
	0.030	*0.031*	*0.041*	*0.043*
Cond. volatility	0.272*	0.231*	0.310	0.265
	0.130	*0.111*	*0.214*	*0.181*
Oil Prices	0.065*	0.068*	0.079	0.072
	0.034	*0.037*	*0.060*	*0.056*
Fixed effects	Yes	Yes	Yes	Yes
Observations	1284	1284	1284	1284
R2	0.16	0.17	0.28	0.28

Notes: The table shows results of the benchmark model $\Omega_{i,c,t} = \alpha_c + \alpha_m + \beta\, x_{c,t} + \gamma_1 \Omega_{i,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 \left|\Delta oil_{t-1}\right| + \varepsilon_{i,c,t}$, where $\Omega_{i,c,t}$ denotes the inter-quartile range. Numbers in italics denote standard errors, which allow for clustering by countries. Column (2) contains results with the overall transparency index, column (3) with the subindex for economic transparency. All models are estimated for the years 1998-2006. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6: Central bank transparency and forecast accuracy, benchmark model

Mean abs. error	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	CPI - current year					**CPI - next year**				
Quantified Inflation	-0.021**				-0.020**	-0.011				-0.005
Objective	*0.008*				*0.008*	*0.009*				*0.009*
(Ec.) Transparency		-0.008***	-0.021*		-0.019*		0.000	-0.013		-0.009
		0.002	*0.010*		*0.011*		*0.002*	*0.008*		*0.008*
Communication				0.004	0.010				-0.021***	-0.019***
				0.006	*0.007*				*0.006*	*0.006*
Own Lag	0.835***	0.833***	0.834***	0.839***	0.831***	0.914***	0.915***	0.913***	0.915***	0.913***
	0.019	*0.021*	*0.021*	*0.020*	*0.020*	*0.009*	*0.010*	*0.010*	*0.009*	*0.010*
Cond. volatility	-0.032	-0.020	-0.039	-0.028	-0.038	-0.016	-0.014	-0.021	-0.020	-0.025
	0.042	*0.039*	*0.036*	*0.031*	*0.043*	*0.051*	*0.054*	*0.055*	*0.053*	*0.053*
Oil Prices	-0.156**	-0.162***	-0.160**	-0.161**	-0.158**	-0.122	-0.124	-0.125	-0.121	-0.122
	0.053	*0.052*	*0.052*	*0.053*	*0.053*	*0.087*	*0.087*	*0.087*	*0.087*	*0.088*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2330	2330	2330	2330	2330	2198	2198	2198	2198	2198
R2	0.81	0.81	0.81	0.81	0.81	0.87	0.87	0.87	0.87	0.87
	GDP - current year					**GDP - next year**				
Quantified Inflation	-0.016				-0.017	-0.003				-0.001
Objective	*0.012*				*0.015*	*0.017*				*0.016*
(Ec.) Transparency		-0.003	-0.004		-0.002		0.003	-0.016		-0.016
		0.006	*0.009*		*0.008*		*0.007*	*0.016*		*0.017*
Communication				0.003	0.006				-0.003	-0.002
				0.017	*0.018*				*0.016*	*0.016*
Own Lag	0.877***	0.878***	0.878***	0.878***	0.877***	0.926***	0.926***	0.925***	0.926***	0.925***
	0.010	*0.010*	*0.010*	*0.010*	*0.010*	*0.006*	*0.007*	*0.007*	*0.007*	*0.006*
Cond. volatility	0.004	0.007	0.008	0.010	0.003	-0.004	0.000	-0.008	-0.003	-0.008
	0.029	*0.030*	*0.031*	*0.030*	*0.030*	*0.021*	*0.017*	*0.017*	*0.019*	*0.021*
Oil Prices	0.171	0.166	0.167	0.166	0.170	-0.228	-0.227	-0.228	-0.228	-0.228
	0.117	*0.117*	*0.117*	*0.117*	*0.117*	*0.218*	*0.218*	*0.217*	*0.218*	*0.217*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2330	2330	2330	2330	2330	2198	2198	2198	2198	2198
R2	0.80	0.80	0.80	0.80	0.80	0.86	0.86	0.86	0.86	0.86
	Unemployment - current year					**Unemployment - next year**				
Quantified Inflation	-0.002				-0.007	0.006				-0.001
Objective	*0.015*				*0.011*	*0.018*				*0.011*
(Ec.) Transparency		0.001	0.012		0.015		0.005	0.026		0.026
		0.006	*0.013*		*0.011*		*0.011*	*0.027*		*0.025*
Communication				0.000	-0.001				0.002	-0.003
				0.007	*0.003*				*0.025*	*0.023*
Own Lag	0.964***	0.965***	0.964***	0.965***	0.962***	0.942***	0.942***	0.939***	0.942***	0.939***
	0.014	*0.012*	*0.009*	*0.012*	*0.011*	*0.018*	*0.017*	*0.015*	*0.017*	*0.016*
Cond. volatility	-0.325***	-0.316***	-0.300***	-0.321***	-0.312***	-0.482*	-0.474*	-0.452	-0.487*	-0.461
	0.069	*0.069*	*0.080*	*0.065*	*0.076*	*0.227*	*0.226*	*0.262*	*0.250*	*0.272*
Oil Prices	0.033	0.031	0.032	0.032	0.034	0.120	0.121	0.124	0.122	0.124
	0.074	*0.072*	*0.072*	*0.072*	*0.074*	*0.108*	*0.106*	*0.105*	*0.106*	*0.106*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1582	1582	1582	1582	1582	1505	1505	1505	1505	1505
R2	0.96	0.96	0.96	0.96	0.96	0.92	0.92	0.92	0.92	0.92

Table 6 (continued): Central bank transparency and forecast accuracy, benchmark model

Mean abs. error	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Short-term interest rates - in 3 months					**Short-term interest rates - in 12 months**				
Quantified Inflation	-0.021				-0.019	0.003				-0.001
Objective	*0.021*				*0.021*	*0.022*				*0.021*
(Ec.) Transparency		0.006	-0.012		-0.009		0.008	0.006		0.005
		0.005	*0.015*		*0.015*		*0.005*	*0.012*		*0.012*
Communication				-0.004	0.000				0.015	0.015
				0.011	*0.011*				*0.012*	*0.009*
Own Lag	0.749***	0.752***	0.750***	0.751***	0.749***	0.923***	0.924***	0.923***	0.923***	0.924***
	0.033	*0.031*	*0.032*	*0.031*	*0.033*	*0.014*	*0.015*	*0.015*	*0.014*	*0.015*
Cond. volatility	0.050	0.057	0.053	0.054	0.049	0.035***	0.038***	0.034***	0.035***	0.035***
	0.041	*0.039*	*0.041*	*0.041*	*0.041*	*0.010*	*0.009*	*0.010*	*0.010*	*0.010*
Oil Prices	-0.105	-0.104	-0.108	-0.107	-0.106	0.129	0.141	0.131	0.128	0.129
	0.073	*0.073*	*0.073*	*0.072*	*0.073*	*0.168*	*0.167*	*0.167*	*0.168*	*0.168*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2328	2328	2328	2328	2328	2255	2255	2255	2255	2255
R2	0.61	0.61	0.61	0.61	0.61	0.86	0.86	0.86	0.86	0.86
	Long-term interest rates - in 3 months					**Long-term interest rates - in 12 months**				
Quantified Inflation	0.000				0.016	-0.028**				-0.019**
Objective	*0.010*				*0.013*	*0.010*				*0.008*
(Ec.) Transparency		-0.010**	-0.045***		-0.044***		-0.010**	-0.050***		-0.046***
		0.004	*0.008*		*0.007*		*0.004*	*0.012*		*0.011*
Communication				-0.028**	-0.025*				-0.017	-0.009
				0.010	*0.012*				*0.010*	*0.010*
Own Lag	0.749***	0.747***	0.743***	0.748***	0.743***	0.900***	0.898***	0.894***	0.901***	0.893***
	0.056	*0.058*	*0.059*	*0.056*	*0.058*	*0.010*	*0.009*	*0.010*	*0.009*	*0.010*
Cond. volatility	-0.116***	-0.130***	-0.133***	-0.122***	-0.128***	0.077**	0.082**	0.082***	0.089***	0.071***
	0.012	*0.007*	*0.009*	*0.013*	*0.010*	*0.029*	*0.027*	*0.023*	*0.029*	*0.023*
Oil Prices	0.060	0.055	0.058	0.064	0.060	-0.084	-0.099	-0.101	-0.082	-0.100
	0.098	*0.098*	*0.101*	*0.097*	*0.102*	*0.199*	*0.201*	*0.201*	*0.200*	*0.201*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2330	2330	2330	2330	2330	2254	2254	2254	2254	2254
R2	0.68	0.68	0.68	0.68	0.68	0.86	0.86	0.86	0.86	0.86

Notes: The table shows results of the benchmark model $\Omega_{i,c,t} = \alpha_c + \alpha_m + \beta\, x_{c,t} + \gamma_1 \Omega_{i,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 \left|\Delta oil_{t-1}\right| + \varepsilon_{i,c,t}$, where $\Omega_{i,c,t}$ denotes the mean absolute forecast error. Numbers in italics denote standard errors, which allow for clustering by countries. Column (2) contains results with the overall transparency index, columns (3) and (5) with the subindex for economic transparency. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7: Central bank transparency and forecaster dispersion, response to CPI surprises

IQR	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	CPI - current year				**CPI - next year**			
Quantified Inflation	0.028				-0.010			
Objective	*0.026*				*0.028*			
(Ec.) Transparency		0.005	0.001			0.003	-0.004	
		0.003	*0.008*			*0.004*	*0.014*	
Communication				0.010				-0.029
				0.007				*0.024*
Shock	-0.027	0.185***	0.190**	0.047	-0.008	0.184	0.245***	0.034
	0.057	*0.055*	*0.065*	*0.030*	*0.038*	*0.150*	*0.050*	*0.023*
Shock*CB measure	0.070	-0.016***	-0.071**	-0.086**	0.078	-0.013	-0.084***	0.120
	0.082	*0.005*	*0.026*	*0.037*	*0.058*	*0.016*	*0.026*	*0.119*
Own Lag	0.323***	0.334***	0.331***	0.335***	0.474***	0.473***	0.466***	0.476***
	0.030	0.027	0.027	0.027	0.059	0.057	0.060	0.056
Cond. volatility	0.130***	0.154***	0.157***	0.158***	0.117*	0.126**	0.123**	0.123**
	0.037	0.034	0.037	0.040	0.059	0.049	0.048	0.049
Oil Prices	-0.013	-0.009	-0.015	-0.006	0.158*	0.155*	0.148*	0.156*
	0.070	0.071	0.073	0.073	0.079	0.079	0.080	0.077
Joint hyp. accepted		+++	+++	+++		++	+++	
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1444	1444	1444	1444	1444	1444	1444	1444
R2	0.55	0.55	0.55	0.55	0.42	0.42	0.42	0.42
	GDP - current year				**GDP - next year**			
Quantified Inflation	0.029**				0.000			
Objective	*0.012*				*0.019*			
(Ec.) Transparency		-0.010***	-0.048***			0.002	-0.027*	
		0.002	*0.012*			*0.005*	*0.013*	
Communication				-0.032**				0.007
				0.014				*0.017*
Shock	0.056	-0.183	-0.057	-0.025	0.033	0.095	0.008	-0.020
	0.050	*0.115*	*0.045*	*0.026*	*0.047*	*0.128*	*0.037*	*0.030*
Shock*CB measure	-0.072	0.018	0.023	0.114	-0.082	-0.013	-0.019	-0.079
	0.050	*0.011*	*0.021*	*0.079*	*0.046*	*0.013*	*0.020*	*0.083*
Own Lag	0.492***	0.484***	0.472***	0.491***	0.596***	0.595***	0.584***	0.594***
	0.036	*0.034*	*0.035*	*0.036*	*0.031*	*0.031*	*0.027*	*0.031*
Cond. volatility	0.019	0.017	0.009	0.019	0.041	0.040	0.033	0.042
	0.022	*0.018*	*0.018*	*0.022*	*0.040*	*0.042*	*0.036*	*0.039*
Oil Prices	-0.070*	-0.069*	-0.074*	-0.065*	0.160**	0.159**	0.155**	0.164**
	0.033	*0.033*	*0.034*	*0.032*	*0.064*	*0.064*	*0.064*	*0.064*
Joint hyp. accepted	+++				++	++	++	
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1444	1444	1444	1444	1444	1444	1444	1444
R2	0.60	0.61	0.61	0.61	0.49	0.49	0.49	0.49
	Unemployment - current year				**Unemployment - next year**			
Quantified Inflation	0.011**				0.017**			
Objective	*0.004*				*0.005*			
(Ec.) Transparency		0.005	0.017			0.003	-0.009	
		0.007	*0.024*			*0.003*	*0.027*	
Communication				0.007				-0.004
				0.009				*0.008*
Shock	0.015	0.130	0.312**	0.002	0.004	-0.040	0.228	-0.053**
	0.030	*0.095*	*0.108*	*0.012*	*0.039*	*0.248*	*0.135*	*0.015*
Shock*CB measure	-0.022	-0.013	-0.121**	-0.043	-0.071	-0.001	-0.108*	-0.014
	0.034	*0.009*	*0.042*	*0.026*	*0.039*	*0.025*	*0.050*	*0.035*
Own Lag	0.497***	0.497***	0.498***	0.498***	0.553***	0.554***	0.548***	0.554***
	0.039	*0.035*	*0.039*	*0.039*	*0.043*	*0.044*	*0.039*	*0.042*
Cond. volatility	0.690***	0.694***	0.607***	0.662***	1.100***	1.106***	0.966***	1.059***
	0.124	*0.128*	*0.154*	*0.120*	*0.210*	*0.221*	*0.226*	*0.204*
Oil Prices	-0.039	-0.036	-0.037	-0.037	0.039	0.040	0.034	0.041
	0.030	*0.027*	*0.031*	*0.031*	*0.092*	*0.091*	*0.097*	*0.092*
Joint hyp. accepted	++	++	+++	++			+++	
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	911	911	911	911	911	911	911	911
R2	0.56	0.56	0.56	0.56	0.43	0.43	0.43	0.43

Table 7 (continued): Central bank transparency and forecaster dispersion, response to CPI surprises

IQR	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Short-term interest rates - in 3 months				**Short-term interest rates - in 12 months**			
Quantified Inflation	-0.001				0.051***			
Objective	*0.025*				*0.016*			
(Ec.) Transparency		0.005	-0.002			0.004	-0.001	
		0.004	*0.011*			*0.005*	*0.018*	
Communication				-0.005				-0.014
				0.011				*0.018*
Shock	-0.063	0.151	0.119*	-0.008	0.077**	0.271*	0.155***	-0.008
	0.054	*0.101*	*0.059*	*0.013*	*0.030*	*0.136*	*0.041*	*0.027*
Shock*CB measure	0.054	-0.017*	-0.061**	-0.055	-0.109***	-0.029*	-0.075***	-0.032
	0.058	*0.009*	*0.022*	*0.047*	*0.021*	*0.014*	*0.017*	*0.039*
Own Lag	0.501***	0.499***	0.494***	0.498***	0.553***	0.554***	0.551***	0.554***
	0.023	*0.024*	*0.026*	*0.024*	*0.047*	*0.046*	*0.046*	*0.047*
Cond. volatility	0.186***	0.184***	0.181***	0.181***	0.131***	0.110***	0.111***	0.112**
	0.031	*0.030*	*0.032*	*0.030*	*0.036*	*0.033*	*0.035*	*0.037*
Oil Prices	0.098	0.098	0.093	0.103	0.074	0.074	0.072	0.085
	0.075	*0.072*	*0.074*	*0.072*	*0.077*	*0.074*	*0.076*	*0.074*
Joint hyp. accepted		+++	+++		+++	+++	+++	
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1444	1444	1444	1444	1444	1444	1444	1444
R2	0.41	0.41	0.41	0.41	0.51	0.51	0.51	0.51
	Long-term interest rates - in 3 months				**Long-term interest rates - in 12 months**			
Quantified Inflation	-0.034***				-0.038			
Objective	*0.009*				*0.036*			
(Ec.) Transparency		-0.007**	-0.033**			-0.016***	-0.026	
		0.003	*0.012*			*0.004*	*0.018*	
Communication				-0.025*				0.003
				0.013				*0.014*
Shock	-0.052	-0.105	-0.023	-0.015	-0.061	-0.408**	-0.139*	-0.013
	0.038	*0.086*	*0.053*	*0.023*	*0.069*	*0.167*	*0.070*	*0.034*
Shock*CB measure	0.059	0.010	0.009	0.067*	0.048	0.040**	0.052	-0.041
	0.034	*0.008*	*0.018*	*0.036*	*0.062*	*0.018*	*0.037*	*0.040*
Own Lag	0.299***	0.300***	0.295***	0.297***	0.546***	0.545***	0.549***	0.549***
	0.041	*0.041*	*0.039*	*0.042*	*0.039*	*0.037*	*0.036*	*0.038*
Cond. volatility	0.720*	0.638*	0.573	0.721*	0.970	0.833	0.878	0.967
	0.351	*0.342*	*0.330*	*0.341*	*0.637*	*0.612*	*0.646*	*0.632*
Oil Prices	0.088**	0.079**	0.075**	0.086**	-0.020	-0.029	-0.028	-0.022
	0.038	*0.034*	*0.034*	*0.033*	*0.044*	*0.047*	*0.045*	*0.044*
Joint hyp. accepted								
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1444	1444	1444	1444	1444	1444	1444	1444
R2	0.25	0.25	0.26	0.26	0.45	0.46	0.45	0.45

Notes: The table shows results of the model $\Omega_{i,c,t} = \alpha_c + \alpha_m + \beta_1\, x_{c,t} + \beta_2\, s_{c,t} + \beta_3\, s_{c,t} x_{c,t} + \gamma_1 \Omega_{i,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 \left|\Delta oil_{t-1}\right| + \varepsilon_{i,c,t}$, where $\Omega_{i,c,t}$ denotes the inter-quartile range, and $s_{c,t}$ the surprise component contained in the releases of CPI inflation. Numbers in italics denote standard errors, which allow for clustering by countries. Column (2) contains results with the overall transparency index, column (3) with the subindex for economic transparency. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. +++, ++ and + denote statistical significance for the test of the joint hypothesis $\beta_2>0$ and $\beta_3<0$, based on the share of replications in which the parameter restrictions are binding in 500 bootstrap simulations (following, e.g., Ehrmann, Fratzscher and Rigobon, 2009).

Table 8: Central bank transparency and forecaster dispersion, response to unemployment surprises

IQR	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	CPI - current year				**CPI - next year**			
Quantified Inflation	0.109***				0.066**			
Objective	*0.020*				*0.026*			
(Ec.) Transparency		0.003	-0.009			0.002	-0.021	
		0.003	*0.011*			*0.004*	*0.017*	
Communication				-0.008				-0.012
				0.006				*0.011*
Shock	0.117***	0.016***	0.004***	0.001***	0.072**	0.044***	0.013***	0.003***
	0.026	*0.003*	*0.001*	*0.000*	*0.025*	*0.011*	*0.004*	*0.001*
Shock*CB measure	-0.116***	-0.001***	-0.002***	0.000	-0.069**	-0.004***	-0.006***	0.000
	0.026	*0.000*	*0.001*	*0.000*	*0.025*	*0.001*	*0.002*	*0.000*
Own Lag	0.374***	0.386***	0.382***	0.392***	0.639***	0.614***	0.591***	0.642***
	0.051	0.043	0.041	0.045	0.098	0.082	0.074	0.095
Cond. volatility	0.054	0.106**	0.107**	0.109**	-0.019	0.031	0.029	0.017
	0.075	0.043	0.039	0.036	0.101	0.081	0.075	0.070
Oil Prices	-0.021	-0.020	-0.020	-0.023	0.168*	0.172**	0.178**	0.169**
	0.078	0.083	0.085	0.085	0.079	0.077	0.072	0.075
Joint hyp. accepted	+++	+++	+++		+++	+++	+++	++
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1211	1211	1211	1211	1211	1211	1211	1211
R2	0.57	0.56	0.56	0.56	0.55	0.55	0.56	0.54
	GDP - current year				**GDP - next year**			
Quantified Inflation	0.014				0.005			
Objective	*0.011*				*0.021*			
(Ec.) Transparency		-0.008*	-0.049***			0.000	-0.038	
		0.004	*0.015*			*0.006*	*0.023*	
Communication				-0.010				-0.010
				0.011				*0.010*
Shock	-0.007	0.004	-0.002	0.000	0.057	0.012**	0.002	0.001
	0.026	*0.003*	*0.001*	*0.000*	*0.048*	*0.005*	*0.002*	*0.000*
Shock*CB measure	0.007	0.000	0.001	0.000	-0.056	-0.001**	-0.001	-0.001**
	0.026	*0.000*	*0.001*	*0.001*	*0.048*	*0.000*	*0.001*	*0.000*
Own Lag	0.545***	0.541***	0.523***	0.546***	0.623***	0.622***	0.600***	0.624***
	0.050	*0.048*	*0.051*	*0.049*	*0.026*	*0.024*	*0.018*	*0.025*
Cond. volatility	0.040	0.035	0.027	0.040	0.051	0.052	0.043	0.051
	0.024	*0.020*	*0.020*	*0.023*	*0.044*	*0.047*	*0.042*	*0.045*
Oil Prices	-0.003	-0.009	-0.007	0.000	0.135	0.138	0.143	0.139
	0.061	*0.059*	*0.060*	*0.059*	*0.101*	*0.103*	*0.099*	*0.099*
Joint hyp. accepted		++			+++	+++	++	++
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1211	1211	1211	1211	1211	1211	1211	1211
R2	0.62	0.62	0.63	0.62	0.52	0.52	0.52	0.52
	Unemployment - current year				**Unemployment - next year**			
Quantified Inflation	0.034				0.065			
Objective	*0.020*				*0.077*			
(Ec.) Transparency		-0.006	-0.016			-0.003	-0.044*	
		0.008	*0.015*			*0.010*	*0.022*	
Communication				0.003				-0.013
				0.008				*0.008*
Shock	0.015	-0.011	-0.001	0.001***	0.052	0.010	-0.001	-0.001**
	0.028	*0.006*	*0.001*	*0.000*	*0.099*	*0.009*	*0.002*	*0.000*
Shock*CB measure	-0.015	0.001*	0.001	-0.001*	-0.053	-0.001	0.000	0.000
	0.028	*0.001*	*0.001*	*0.000*	*0.099*	*0.001*	*0.001*	*0.000*
Own Lag	0.456***	0.450***	0.453***	0.457***	0.595***	0.589***	0.566***	0.595***
	0.030	*0.039*	*0.036*	*0.031*	*0.044*	*0.044*	*0.044*	*0.044*
Cond. volatility	1.215***	1.206***	1.183***	1.233***	1.139***	1.157***	1.122***	1.103***
	0.045	*0.058*	*0.069*	*0.046*	*0.165*	*0.217*	*0.239*	*0.183*
Oil Prices	0.018	0.017	0.020	0.020	0.071	0.082	0.091	0.080
	0.033	*0.033*	*0.033*	*0.032*	*0.102*	*0.106*	*0.103*	*0.108*
Joint hyp. accepted	++			++	+++	+++		
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	838	838	838	838	838	838	838	838
R2	0.60	0.60	0.60	0.60	0.49	0.49	0.49	0.49

Table 8 (continued): Central bank transparency and forecaster dispersion, response to unemployment surprises

IQR	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Short-term interest rates - in 3 months				**Short-term interest rates - in 12 months**			
Quantified Inflation	-0.019				0.024			
Objective	*0.018*				*0.027*			
(Ec.) Transparency		0.000	-0.004			0.003	-0.007	
		0.003	*0.011*			*0.005*	*0.020*	
Communication				-0.015				-0.013
				0.010				*0.019*
Shock	0.007	0.009***	0.004***	0.000	0.021	0.027***	0.007**	-0.001
	0.037	*0.002*	*0.001*	*0.000*	*0.047*	*0.006*	*0.003*	*0.000*
Shock*CB measure	-0.006	-0.001***	-0.002**	0.002**	-0.021	-0.002***	-0.004***	0.000
	0.037	*0.000*	*0.001*	*0.001*	*0.047*	*0.000*	*0.001*	*0.001*
Own Lag	0.467***	0.467***	0.464***	0.465***	0.589***	0.581***	0.575***	0.588***
	0.038	*0.037*	*0.037*	*0.036*	*0.050*	*0.051*	*0.051*	*0.051*
Cond. volatility	0.205***	0.209***	0.207***	0.208***	0.189**	0.190**	0.182**	0.185**
	0.043	*0.044*	*0.043*	*0.043*	*0.067*	*0.067*	*0.062*	*0.066*
Oil Prices	0.127	0.131	0.136	0.134	-0.018	-0.010	-0.004	-0.015
	0.090	*0.093*	*0.095*	*0.093*	*0.108*	*0.107*	*0.105*	*0.106*
Joint hyp. accepted	++	+++	+++		+++	+++	+++	
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1211	1211	1211	1211	1211	1211	1211	1211
R2	0.41	0.41	0.42	0.42	0.57	0.57	0.57	0.57
	Long-term interest rates - in 3 months				**Long-term interest rates - in 12 months**			
Quantified Inflation	-0.012***				0.010			
Objective	*0.003*				*0.019*			
(Ec.) Transparency		-0.003	-0.016			-0.001	-0.001	
		0.006	*0.017*			*0.005*	*0.015*	
Communication				0.007				0.005
				0.007				*0.011*
Shock	-0.041***	0.001	0.001	0.000	-0.088*	0.023***	0.008***	0.002***
	0.011	*0.003*	*0.001*	*0.000*	*0.044*	*0.003*	*0.001*	*0.000*
Shock*CB measure	0.040***	0.000	-0.001	-0.001***	0.089*	-0.002***	-0.004***	-0.002***
	0.011	*0.000*	*0.001*	*0.000*	*0.044*	*0.000*	*0.001*	*0.001*
Own Lag	0.310***	0.308***	0.304***	0.310***	0.507***	0.504***	0.500***	0.509***
	0.020	*0.021*	*0.023*	*0.020*	*0.041*	*0.043*	*0.044*	*0.042*
Cond. volatility	1.316***	1.255***	1.138***	1.331***	1.595***	1.474***	1.441**	1.605***
	0.174	*0.206*	*0.224*	*0.168*	*0.389*	*0.390*	*0.484*	*0.394*
Oil Prices	0.057*	0.055*	0.059*	0.055	0.039	0.041	0.053	0.036
	0.030	*0.030*	*0.029*	*0.031*	*0.075*	*0.074*	*0.069*	*0.066*
Joint hyp. accepted		++	++			+++	+++	++
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1211	1211	1211	1211	1211	1211	1211	1211
R2	0.31	0.31	0.31	0.31	0.47	0.47	0.47	0.47

Notes: The table shows results of the model $\Omega_{i,c,t} = \alpha_c + \alpha_m + \beta_1 x_{c,t} + \beta_2 s_{c,t} + \beta_3 s_{c,t} x_{c,t} + \gamma_1 \Omega_{i,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 |\Delta oil_{t-1}| + \varepsilon_{i,c,t}$, where $\Omega_{i,c,t}$ denotes the inter-quartile range, and $s_{c,t}$ the surprise component contained in the releases of unemployment data. Numbers in italics denote standard errors, which allow for clustering by countries. Column (2) contains results with the overall transparency index, column (3) with the subindex for economic transparency. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. +++, ++ and + denote statistical significance for the test of the joint hypothesis $\beta_2>0$ and $\beta_3<0$, based on the share of replications in which the parameter restrictions are binding in 500 bootstrap simulations (following, e.g., Ehrmann, Fratzscher and Rigobon, 2009).

Table 9: Economic transparency and forecaster dispersion

CPI	**current year**		**next year**	
Ec. Transparency = 1.5 or 2	-0.037*	+	-0.051*	+
	0.019		*0.024*	
Ec. Transparency = 2.5	-0.063***	++	-0.110***	
	0.018		*0.024*	
Ec. Transparency = 3	-0.054**		-0.114***	
	0.020		*0.029*	
Fixed effects	Yes		Yes	
Observations	2330		2330	
R2	0.55		0.55	
GDP	**current year**		**next year**	
Ec. Transparency = 1.5 or 2	-0.031***	+++	0.010	
	0.009		*0.009*	
Ec. Transparency = 2.5	-0.073***	++	-0.066**	+++
	0.013		*0.022*	
Ec. Transparency = 3	-0.088***		-0.068**	
	0.020		*0.024*	
Fixed effects	Yes		Yes	
Observations	2330		2330	
R2	0.61		0.56	
Unemployment	**current year**		**next year**	
Ec. Transparency = 1.5 or 2	0.006		0.013	
	0.004		*0.012*	
Ec. Transparency = 2.5	-0.008**	+	-0.036**	+
	0.002		*0.011*	
Ec. Transparency = 3	-0.021**		-0.061***	++
	0.007		*0.015*	
Fixed effects	Yes		Yes	
Observations	1582		1582	
R2	0.71		0.53	
Short-term rates	**in 3 months**		**in 12 months**	
Ec. Transparency = 1.5 or 2	-0.028		-0.039	
	0.031		*0.027*	
Ec. Transparency = 2.5	-0.051*		-0.098***	
	0.025		*0.024*	
Ec. Transparency = 3	-0.075**		-0.121***	
	0.029		*0.022*	
Fixed effects	Yes		Yes	
Observations	2330		2330	
R2	0.41		0.55	
Long-term rates	**in 3 months**		**in 12 months**	
Ec. Transparency = 1.5 or 2	-0.033		-0.032*	
	0.026		*0.015*	
Ec. Transparency = 2.5	-0.081***	++	-0.096***	++
	0.022		*0.018*	
Ec. Transparency = 3	-0.112***	++	-0.113***	
	0.026		*0.019*	
Fixed effects	Yes		Yes	
Observations	2330		2330	
R2	0.23		0.42	

Notes: The table shows estimates of $\Omega_{i,c,t} = \alpha_c + \alpha_m + \sum_{k=1}^{3} \beta_k \; x_{k,c,t} + \gamma_1 \Omega_{i,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 \left|\Delta oil_{t-1}\right| + \varepsilon_{i,c,t}$, where $\Omega_{i,c,t}$ denotes the inter-quartile range, and $x_{k,c,t}$ splits the economic transparency index into dummy variables as described in the text. Numbers in italics denote standard errors, which allow for clustering by countries. ***, **, and * indicate statistical significance against zero at the 1%, 5%, and 10% level, respectively. +++, ++ and + denote statistical significance for the test $\beta_k = \beta_{k-1}$.

Table 10: Central bank transparency and household inflation expectations

	D^2				Balance statistic			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Quantified Inflation	0.005				-1.020**			
Objective	*0.003*				*0.484*			
(Ec.) Transparency		0.001	0.004			-0.090	-0.528**	
		0.001	*0.003*			*0.153*	*0.221*	
Communication				0.001				-0.431
				0.002				*0.317*
Own Lag	0.841***	0.840***	0.833***	0.843***	0.899***	0.901***	0.893***	0.900***
	0.020	*0.019*	*0.022*	*0.019*	*0.023*	*0.021*	*0.021*	*0.022*
Cond. volatility	0.000***	0.000***	0.000***	0.000***	-0.000*	-0.000**	-0.000**	-0.000**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Oil Prices	0.016*	0.016*	0.016*	0.015	1.513	1.671	1.589	1.732
	0.009	*0.009*	*0.009*	*0.009*	*1.872*	*1.826*	*1.828*	*1.849*
Inflation perceptions	0.100***	0.104***	0.111***	0.102***	0.013	0.017*	0.026**	0.017
	0.016	*0.016*	*0.020*	*0.016*	*0.009*	*0.010*	*0.011*	*0.010*
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3909	3909	3909	3909	3909	3909	3909	3909
R2	0.92	0.92	0.92	0.92	0.91	0.91	0.91	0.91

Notes: The table shows results of the model $\Omega_{exp,c,t} = \alpha_c + \alpha_m + \beta\, x_{c,t} + \gamma_1 \Omega_{exp,c,t-1} + \gamma_2 \Sigma_{i,c,t} + \gamma_3 |\Delta oil_{t-1}| + \gamma_1 \Omega_{perc,c,t} + \varepsilon_{exp,c,t}$, where $\Omega_{exp,c,t}$ denotes the Lacy's (2006) dispersion measure for ordinal variables, d^2, in the left panel, and the balance statistics in the right panel, each referring to the EC consumer survey inflation expectations. $\Omega_{perc,c,t}$ relates to the same concept for inflation perceptions. Numbers in italics denote standard errors, which allow for clustering by countries. Column (2) contains results with the overall transparency index, column (3) with the subindex for economic transparency. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Appendix: Table A1: Literature overview

Authors	Contents	Data	Main Model /Specifications[15]	Results
Fujiwara (2005)	How a central bank's economic forecasts affect forecasts by professional forecasters and vice versa	BOJF: Outlook and Risk Assessment of the Economy and Prices; PFs: obtainable from newspapers, the internet, etc.	$x_a^{PF} = \alpha + \beta x_b^{PF} + u$ (1) $x_a^{PF} = \beta x_b^{PF} + \sum_{i=1}^{10} \gamma_i \delta_i + u$ (2) x_a^{PF} : a column vector collecting all the differences after the BOJF; x_b^{PF} : the corresponding vector for those before the BOJF; δ_i : the dummy corresponds to an occasion where the influence of the BOJF is examined.	i) Central bank economic forecasts have a notable effect on professional forecasts, but not significantly influenced by professional forecasts of inflation. ii) BOJF reduces professional forecasters' uncertainty about the future
Beechey, Johannsen and Levin (2007)	Compare the recent evolution of long-run inflation expectations in the euro area and the United States	Surveys of Professional Forecasters; Daily U.S. and euro area financial market data	$f_{n,t} - f_{n,t-1} = \alpha_n + \beta_n X_t + \varepsilon_{n,t}$ (1) $f_{n,t} - f_{n,t-1}$: the change from period *t-1* to *t* of a one-year forward rate ending n-years ahead; X_t : a vector of the surprise components of macroeconomic data released on day *t*.	i) Long-run inflation expectations are reasonably well-anchored in both economies, but also reveal substantially greater dispersion across forecasters' long-horizon projections of U.S. inflation. ii) Long-run inflation expectations are more firmly anchored in the euro area than in the United States.
Crowe (2006)	Test whether inflation targeting (IT) enhances transparency using inflation forecast data for 11 IT adoption countries.	Consensus Forecasts dataset	$\Delta V^{ij} = b_0 + b_{0T} D_T^{ij} - V_0^{ij}(b_1 + b_{1T} D_T^{ij}) + u^{ij}$ (13) i : individual forecaster; j : country; V_0^{ij} : the initial forecast error; D_T : a dummy variable for the .treatment.(IT adoption).	Convergence occurs in all countries due to mean-reversion, but that the adoption of IT leads to greater convergence, as predicted by the model, which serves as strong evidence that IT does indeed enhance transparency.

[15] The equation's number is the same with those in the original paper at first place.

Crowe and Meade (2007)	Survey and quantify the trends in two major areas of central bank governance: independence (CBI) and transparency.	Cukierman et al.(1992); Authors' calculations	$\frac{\pi}{1+\pi_{it}} = \beta_0 + \beta_1 CBI_{it} + \varepsilon_{it}$ (1) $\frac{\pi}{1+\pi_{it}} = \beta_0 + \beta_1 Turnover_{it} + \varepsilon_{it}$ (2) π : the average annual increase in consumer prices during 2000–2004; CBI :the authors updated measure of central bank independence for countries in their sample; $Turnover$: the average annual turnover of the central bank's governor between 1995 and 2004. $\pi_{it} = \beta_0 + \beta_1 Transparency_i + \varepsilon_{it}$ (3) π : the average of 12-month changes in consumer prices from July 2003 through June 2006; $Transparency$: the 2006 transparency score.	i) Although there is a significant increase in central bank independence, they do not find a dramatic effect of central bank independence on inflation. ii) The most robust effect on inflation comes from the aspect of independence most closely related to transparency.
Crowe and Meade (2008)	Presents in more detail the updated central bank independence and transparency measures outlined in Crowe and Meade (2007).	Cukierman et al.(1992); Authors' calculations	$\pi_{it} = \beta_0 + \beta_1 CBI_{it} + \beta_2 Turnover_{it} + \beta_3 GDP_{it} + \beta_4 Open_{it} + \beta_5 \text{Re}\, gime_{it} + \varepsilon_{it}$ (1) π : annual average inflation; CBI : central bank independence; $Turnover$: turnover rate of the central bank's governor. Controls include: GDP -real GDP per capita, Open- the openness measured by the sum of exports and imports divided by GDP, and Regime-the exchange rate regime. $r^b = \beta_0 + \beta_1 Transparency_{it} + \beta_2 Open_{it} + \beta_3 RQ_{it} + \varepsilon_{it}$ (2) r^b : ratio of variance to mean squared error of private	i) Greater CBI is associated with lower inflation. ii) Enhanced transparency practices are associated with the private sector making greater use of information provided by the central bank.

			sector inflation forecasts; RQ: regulatory quality; $Transparency$: transparency score.	
D'Amico and Orphanides (2008)	Compare and contrast quarterly time series of alternative measures of uncertainty and disagreement regarding inflation expectations	Survey of Professional Forecasters	Using the midpoint method, the aggregate measures across all N_t respondents for a specific quarter are: (1) Mean expectation of inflation $\mu_{h,t}^{M} = \frac{1}{N_t}\sum_{i=1}^{N_t} \mu_{i,h,t}^{M}$ (2) Uncertainty about inflation: $\sigma_{h,t}^{M} = \frac{1}{N_t}\sum_{i=1}^{N_t} \sigma_{i,h,t}^{M}$ (3) Disagreement regarding the mean forecast: $s_{h,t}^{M} = \sqrt{\frac{1}{N_t}\sum_{i=1}^{N_t}(\mu_{i,h,t}^{M} - \mu_{h,t}^{M})^2}$ (4) Disagreement about inflation uncertainty: $\phi_{h,t}^{M} = \sqrt{\frac{1}{N_t}\sum_{i=1}^{N_t}(\sigma_{i,h,t}^{M} - \sigma_{h,t}^{M})^2}$	i) Disagreement about the mean inflation outlook is not a particularly good proxy for inflation uncertainty. ii) Higher average expected inflation is associated with both higher average inflation uncertainty and greater disagreement about the inflation outlook.
Capisteran and Timmermann (2009)	Investigate how agents arrive at the beliefs reported in survey data, and offer an explanation for the source of disagreement in agents' beliefs.	Survey of Professional Forecasters	(1) GARCH (1, 1) model: $\pi_{t+1,t} = \lambda_0 + \lambda_1\pi_{t,t-1} + \lambda_2\pi_{t-3,t-4} + \varepsilon_{t+1},$ $\varepsilon_{t+1} \sim N(0, \sigma_{t+1,t}^2),$ $\sigma_{t+1,t}^2 = \omega + \alpha_1\varepsilon_t^2 + \beta_1\sigma_{t,t-1}^2$ (17) (2) Mean forecast errors across forecasters: $(\pi_{t+h} - \overline{f}^{*}_{t+h,t}) = \delta_0 + \delta_1\sigma_{t+h,t}^2 + \varepsilon_{t+h}$ (18) (3) Dispersion across forecasters: $\overline{S}_{t+h,t} = \gamma_0 + \gamma_1\sigma_{t+h,t}^2 + \varepsilon_{t+h}$ (19)	Agents weight the consequences of over- and under-predictions very differently and as a result calculate their forecasts under asymmetric loss with a shape of the loss function that differs across agents. In addition, a constant bias component, which capture agents' tendency to over-predicting inflation, can help explain why a substantial portion of individual forecasters change from under-predicting inflation to over-predicting it

			where $\sigma^2_{t+h,t}$ is the conditional variance in inflation obtained from the GARCH(1,1) model.	around 1982.
Dovern, Fritsche and Slacalek (2009)	Investigate determinants of disagreement about six key economic indicators using individual expert forecasts from G7 countries.	Consensus Economics dataset	$disagr_t = \beta_0 + \beta_1 \times rec_t + \beta_2 \times post\_1998_t + u_t$ (1) where disagr is the disagreement among forecasters, rec denotes the recession dummy, and post-1998 is the dummy for the second part of the sample. $disagr_t = \beta_0 + \beta_2 x_t + \beta_3 \sigma^2_{x,t} + \beta_4 output\_gap + \beta_5 \Delta policy\_rate_t^2 + u_t$ (2) $disagr_t = \beta_0 + \beta_1 CBI_t + \beta_2 x_t + \beta_3 \sigma^2_{x,t} + \beta_4 output\_gap + \beta_5 \Delta policy\_rate_t^2 + u_t$ (3) where CBI is central bank independence capturing credibility of monetary policy, x_t is the level of the underlying actual variables, $\sigma^2_{x,t}$ is the uncertainty about these variables proxy with the variance of permanent shocks, and $\Delta policy\_rate_t^2$ is the squared change in the policy interest rate-a proxy of the variation in monetary policy.	i) Disagreement about real variables (GDP, consumption, investment and unemployment), is more strongly affected by real factors; and disagreement about nominal variables (inflation and interest rate), reacts to the institutional setting of monetary policy (in particular central bank independence). ii) Cross-sectional dispersion for both groups increases with uncertainty about the underlying indicators. iii) More credible monetary policy can substantially contribute to the anchoring of expectations about nominal variables; however its effects on disagreement about real variables are moderate.
Maag and Lamla (2009)	Investigate the effects of media coverage and macroeconomic conditions on inflation forecast disagreement of German households and professional forecasters.	Joint Harmonized EU Consumer Survey; Consensus Economics survey	$Var(\pi_{i,t}) = \beta_1 Var(\pi_{i,t-1}) + \beta_2 \pi_{t-1} + \beta_3 \pi^2_{t-1} + ... + \beta_{p-1} + \beta_p d + \varepsilon_t$ 14 where $Var(\pi_{i,t})$ is inflation forecast disagreement, $Var(\pi_{i,t-1})$ is lagged dependent variable, and *d* is a dummy controlling for the euro cash changeover which is unity from 2002 onwards.	i) Disagreement of households depends on the content of news stories (tone) but is unaffected by reporting intensity (volume) and by the heterogeneity of story content (information entropy). Disagreement of professionals does not depend on media coverage. ii) Disagreement of households and professionals primarily

				depends on the current rate of inflation.
Coibion and Gorodnichenko (2009)	Use three different surveys of economic forecasts to assess both the support for and the properties of informational rigidities faced by agents. Specifically, they track the impulse responses of mean forecast errors and disagreement among agents after exogenous structural shocks.	Michigan Survey of Consumers (MSC); Survey of Professional Forecasters (SPF); Blue Chip Economic Indicators (BCEI)	$F_t\pi_{t+h} = c + \sum_{i=1}^{I} \beta_i F_{t-i}\pi_{t-i+h} + \sum_{j=0}^{J} \gamma_j \varepsilon_{t-j}^{k} + \nu_t$ (8) $\pi_t - F_{t-h}\pi_t = c + \sum_{i=1}^{I} \beta_i (\pi_{t-i} - F_{t-i-h}\pi_{t-i}) + \sum_{j=0}^{J} \gamma_j \varepsilon_{t-j}^{k} + \nu_t$ (9) $\frac{\pi_t - F_{t-h}\pi_t}{\pi_t} = c + \sum_{i=1}^{I} \beta_i \frac{\pi_{t-i} - F_{t-i-h}\pi_{t-i}}{\pi_{t-i}} + \sum_{j=0}^{J} \gamma_j \varepsilon_{t-j}^{k} + \nu_t$ (10) $\ln \sigma(F_t\pi_{t+h}) = c + \sum_{i=1}^{I} \beta_i \ln \sigma(F_{t-i}\pi_{t-i+h}) + \sum_{j=0}^{J} \gamma_j \lvert \varepsilon_{t-j}^{k} \rvert + \nu_t$ (11) where $F_t\pi_{t+h}$ is the mean forecast across agents at time *t* of a variable π_{t+h} h periods ahead, k denotes each type of shock, $h = 4$ for quarterly data or $h = 12$ for monthly data, and $\ln \sigma(F_t\pi_{t+h})$ is the dispersion measured as the logarithm of the cross-sectional standard deviation of inflation forecasts over the next year.	i) Forecasts fail to adjust one-for-one with the variable being forecasted after structural shocks. ii) Conditional forecast errors converge at similar rates across different shocks. iii) Conditional forecast errors converge at similar rates across agents. iv) Structural shocks do not appear to lead to any discernible increase in disagreement.