Central Bank Economic Transparency and Managerial Learning

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Abstract

Central banks have increased public disclosures of their private information regarding the economy's current and future state over time. While previous research focuses on the benefits of this increase in transparency, we provide an analytical framework and empirical evidence for potential unintended costs. We find that central bank economic transparency (CBET) causes managers to rely less on stock price when making investment decisions. This is consistent with central bank disclosures shifting investors' information collection and pricing from the aggregate-level component of cash flows (where managers do not have an information advantage) to the firm-level component (where managers do have an information advantage). The results are pronounced when the firm does not provide guidance and when noise trading in the firm's stock is low. Further, we show that investors shift their search efforts from aggregate-level towards firm-level information, and that investment efficiency of more exposed firms' falls relative to that of less exposed firms. The results are robust to using the Bank of England's Inflation Report amendments as a shock to CBET.

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1. Introduction

Central bank transparency has steadily increased in most countries over the past decades (see Figure 2).[1] While a large literature documents the benefits of central bank transparency, empirical research on its costs is sparse.[2] In this paper, we contribute to the literature by examining an unintended cost of central bank transparency for publicly traded corporations: decreased managerial learning from stock prices.

Transparency about central banks' governance and operating procedures is crucial for facilitating the public monitoring and accountability of central banks (Hansen, McMahon, and Prat 2018). However, it is theoretically unclear whether it is desirable for central banks to disclose their private expectations about the current and future state of the economy. We term such disclosure (in which the recent rise in central bank transparency concentrates) central bank economic transparency (hereafter CBET). The point of contention revolves around CBET's effect on speculators' private information acquisition and thereby the incorporation of this information into stock prices. To formalize the different forces at play, we adopt the analytical framework in Goldstein and Yang (2019) and apply it in our setting to provide initial empirical evidence to inform this debate (Veldkamp 2011).

In Goldstein and Yang's (2019) framework, firms' cash flows comprise firm-level and aggregate-level components. Managers know more than outsiders about the firm-level component but not the aggregate-level component. The central bank publicly discloses some of its private

[1] Central bankers think that transparency about their policy making is important. In a survey of 94 central banks, Maxwell-Fry, Lavan Mahadeva, and Sterne (2000) find that 74% of central banks consider transparency either a "vital" or an "important" component of their policy framework. A recent survey of 375 central bankers from 94 economies during the January 2021 International Monetary Fund (IMF) virtual outreach seminar indicates that central bankers continue to see transparency as a useful tool and believe more transparency is warranted (IMF 2023).

[2] See Geraats (2014) for a review. Broadly speaking, the literature argues that monetary policy transparency helps the private sector to align its expectations with the central bank's, which enhances monetary policy discipline and effectiveness (e.g., by supporting low levels of and stable expectations about inflation).

information about the aggregate-level component, where more precise disclosure corresponds to higher CBET, and managers publicly disclose some of their private information about the firm-level component. Following these disclosures, speculators trade firms' stock based on their private as well as all publicly available information on firm cash flows, impounding speculators' private information into firms' stock prices. Lastly, managers make real investment decisions based on their private information, all publicly available information, and the information they can glean from stock prices.

The model highlights two effects through which CBET affects managers' investment decisions: a direct information effect and an indirect learning effect. The direct information effect arises because CBET provides managers with the central bank's information about the current and future state of the economy, expanding their information set and thereby supporting efficient investment decisions. This benefit, however, is counterbalanced by the indirect learning effect. CBET shifts speculators' incentives from collecting information about cash flows' aggregate-level component towards collecting information about cash flows' firm-level component. As a result, firms' stock prices reflect relatively more of speculators' private information about the firm-level component (about which managers know relatively more than outsiders)[3] than the aggregate-level component (about which managers know relatively less than outsiders), causing managers to rely less on stock price when making investment decisions.

Thus, CBET directly provides managers with central banks' private information but indirectly deprives them of speculators' private information about the aggregate-level component. As a result, it is theoretically unclear whether CBET expands or contracts managers' information

[3] The term "relatively" is important here because it is not necessary that the manager knows more (i.e., has more precise private information) *absolutely* about the firm-level component that outsiders. To arrive at the model's conclusions, it is only necessary that the manager knows more *relatively* about the firm-level than the aggregate-level component than outsiders.

sets and thereby improves or worsens the efficiency of their investment decisions.[4] In this paper, we focus on the indirect learning effect. We use an international sample of publicly traded firms (i.e., those for which stock prices to learn from are available) to study the model's prediction that CBET induces managers to rely less on stock price when making investment decisions.[5] Our measure of CBET is the Dincer, Eichengreen, and Geraats (2022) score of how transparently the central bank of the firm's home country discloses its expectations about the current and future state of the economy to the public. One challenge of using this score is that more developed countries tend to have higher CBET, which prevents a clear interpretation of its direct effect. To address this concern, we hold countries' institutional environment and economic state constant by including country-year fixed effects and identify the effect of CBET through its interactive effect with firm-level monetary policy exposure, measured using the Ozdagli and Velikov's (2020) monetary policy exposure score, because these firms are more sensitive to central bank disclosure and aggregate performance.

We document that higher CBET is associated with lower investment sensitivity to stock prices for firms more exposed to monetary policy. In terms of economic magnitude, the

[4] Romer and Romer (2000) find evidence that central banks make more accurate aggregate-level forecasts than private-sector agents, which suggests that CBET's direct effect should always outweigh its indirect effect and thereby increase investment efficiency. However, there are at least two reasons to believe that the fall in speculators' private aggregate-level information revealed to managers through their firm's stock price might outweigh the gain in central banks' private information revealed to managers through higher CBET. First, at least since Hayek (1945), researchers have recognized that prices created through the trading activities of a myriad of speculators in liquid markets aggregate speculators' private information and can thus be more informative than the private information of any given agent, even when that agent (here the central bank) is better informed than any other individual agent. Second, in contrast to central banks, speculators collect aggregate-level information directly tailored to the firm they are investing in. Thus, while managers must determine themselves how aggregate-level information disclosed by the central bank will affect their firms, for aggregate-level information revealed to managers through their firm's stock price, this task is already taken care of by speculators.

[5] We infer managers' investment-price sensitivity based on the slope coefficient derived by regressing investment on different measures of the ratio of the market value (a proxy for the investment's value in use) relative to the book value (a proxy for cost) of the firm's assets. This approach is standard in the literature and grounded in Q theory (Chen, Goldstein, and Jiang 2007). Specifically, the higher the value in use relative to the cost, the more the manager should invest (Tobin 1969). Thus, most directly, the level of Tobin's Q signals to the manager to expand or shrink the firm.

investment-price sensitivity of firms that are headquartered in countries with higher CBET and more exposed to monetary policy is 0.062 standard deviations lower than that of other firms, which is large relative to the effect magnitudes of Tobin's Q's main effect, leverage, dividend yield, and cash flow (Fazzari, Hubbard, and Petersen 1988). These results are consistent with the indirect learning effect of CBET—i.e., the notion that the public disclosure of information about the aggregate component of cash flows crowds out private collection and incorporation of such information into stock prices, thereby reducing the usefulness of stock price as an information source for managers' investment decisions.

We next examine whether these results vary with two conditions predicted by the Goldstein and Yang (2019) model. First, the model highlights voluntary disclosure of firm-level developments as a way in which firms can mitigate the adverse effect of CBET on speculators' private information collection. Managers can shift speculators' incentives away from collecting information about firm-level developments and towards collecting information about aggregate-level developments by disclosing their private firm-level cash flow information. This raises the relative payoff of collecting information about the aggregate-level cash flow component. As a result, prices reflect more information that managers do not possess and become more useful for their investment decisions. Consistent with this prediction, our results are stronger for firms that do not provide managerial guidance. Second, managers can rely on market prices for their investment decisions only when these prices are not too noisy; it becomes difficult for managers to extract useful information from prices that are too noisy, and the learning effect breaks down. Consistent with this prediction, our findings are stronger for firms with more liquid stocks, which have less noisy prices (Chung, Lee, and Rösch 2020).

To shed light on the mechanism underlying our results, we test whether CBET shifts investors' search efforts from aggregate-level towards firm-level information using Google search intensity as a measure of investors' information search (Da, Engelberg, and Gao 2011; Drake, Roulstone, and Thornock 2012; DeHaan, Shevlin, and Thornock 2015). Consistent with speculators shifting their private search efforts from aggregate-level towards firm-level information, we find that Google search intensity for aggregate-level information declines relative to that for firm-level information when CBET increases.

While our findings suggest that CBET deprives managers of information through the indirect learning effect, the implications of more CBET for investment efficiency remain unclear ex ante because higher transparency also directly provides managers with information (the direct information effect). We test which of the two effects dominates on average by examining the relation between CBET and firm-level return on assets, a commonly employed measure of investment efficiency. We find that CBET is associated with lower investment efficiency for more exposed firms, suggesting that the indirect learning effect is relatively stronger than the direct information effect for more exposed than for less exposed firms. Specifically, the return on assets of firms that are headquartered in countries with higher CBET and more exposed to monetary policy is 0.045 standard deviations or 0.5 percentage points lower than the return on assets of other firms, which again is large relative to the effect magnitudes of our control variables. Using a DuPont decomposition, we find that this effect is driven by changes in efficiency (i.e., asset turnover) and not pricing power (i.e., profit margins). We also find that it is stronger for PPE investments (which are more likely influenced by C-suite managers whose compensation tends to be directly tied to the firm's stock price) than for inventory investments (which are more likely

influenced by operational managers whose compensation tends to be tied to measures of operational performance) (Bushman, Indjejikian, and Smith 1995).

Lastly, while the evidence thus far is consistent with our theoretical predictions, we address concerns that our results might be driven by changes in monetary policy other than CBET, such as central bank independence or monetary policy actions, by examining a shock to CBET arising from the 2013-2014 amendments to the Inflation Report of the Bank of England (BoE). The Inflation Report provides the data and projections upon which the BoE's Monetary Policy Committee bases its interest rate decisions. The amendments considerably expanded the disclosures about the BoE's expectations about the current and future state of the economy contained in the report, thereby increasing the bank's CBET. Importantly, the amendments were not accompanied by contemporaneous changes to monetary policy actions and were not a response to contemporary developments in the UK economy. Instead, the BoE adopted the changes to match similar policies implemented by other central banks in the aftermath of the 2007-2010 financial crisis. We exploit this setting using a difference-in-differences research design in which we compare UK firms to foreign firms during the ten-year period around the amendments. Consistent with our panel-data approach, we find that UK firms experience a decline in investment-to-price sensitivity following the amendments.

Our study is subject to several limitations. First, as noted by Goldstein (2023, p. 9), an empirical challenge of identifying managerial learning from price is that firms' stock prices and managers' investment decisions are affected by the same fundamentals. Hence, while we include country-year fixed effects and employ a quasi-experimental setting to isolate the effect of CBET from other possible confounders, we cannot fully rule out the possibility that an unspecified correlated omitted factor is driving our results. Second, while our analytical framework and

empirical evidence suggest that CBET affects individual firms, we do not consider feedback effects from individual firms' behavior on central banks. However, theory suggests that the existence of such feedback loops should reinforce if not strengthen the mechanism underlying our results (Morris and Shin 2005). Third, our results should not be interpreted as a call for central banks to return to opaqueness. Instead, they should be seen as evidence of the potential costs of CBET that bankers need to weigh against the benefits documented in prior literature, such as enhanced public monitoring and expectation formation, when making policy decisions.

With these limitations in mind, we make three contributions. First, we contribute to the literature examining the consequences of transparency generally and of CBET specifically. While most studies focus on the intended benefits of increased CBET, such as improving financial markets' ability to anticipate future monetary policy actions,[6] we provide empirical evidence for three unintended and interrelated costs for more exposed firms: a shift away from private aggregate-level information search in favor of firm-level information search, a reduction in managerial learning from stock prices, and a decrease in investment efficiency. In the paper most closely related to our study, Middeldorp and Rosenkranz (2011) find in a laboratory experiment with students at Utrecht University that public signals crowd out private information collection especially when speculators are more sophisticated, a condition that likely holds in the stock market. Our investment-price sensitivity and investment efficiency results extend Middeldorp and Rosenkranz's (2011) findings by exploring downstream consequences. These consequences should be of interest to policy makers such as central banks and other public institutions that

[6] See, e.g., Barner, Feri, and Plott (2005), Berger, Ehrmann, and Fratzscher (2006), Carlson, Craig, Higgins, and Melick (2006), Swanson (2006), Mariscal and Howells (2007a), Mariscal and Howells (2007b), Hayford and Malliaris (2007), Middeldorp (2011a), Middeldorp (2011b), and Ehrmann, Eijffinger, and Fratzscher (2012). While most of these studies test their predictions at the aggregate level, we test the predictions of the Goldstein and Yang (2019) model more directly by conducting our analysis at the firm level, the model's unit of observation.

publicly disclose their private expectations about current and future macroeconomic developments, such as governments, regulators, and international organizations including the World Bank and the International Monetary Fund. Our focus on corporate managers also answers Blinder, Ehrmann, Fratzscher, De Haan, and Jansen's (2008) call for research on central bank transparency's effects on decision makers other than traders in financial markets.

Second, we contribute to the literature on managerial learning from stock price.[7] While most of this literature has focused on examining *whether* managers learn from stock price,[8] several recent papers predict and find that mandatory disclosure of firm-level information crowds out private information collection and thereby impedes such learning (Jayaraman and Wu 2019; Pinto 2023).[9] We extend these papers in two ways. First, while prior papers test whether managers' disclosure of *firm*-level information crowds out investors' acquisition of firm-level information, we test whether central banks' disclosure of *aggregate*-level information shifts investors' information acquisition from aggregate-level to firm-level information. Our analysis addresses Goldstein's (2023, p. 15) call to explore how forms of disclosure other than firms' mandatory reports foster or deter managerial learning from prices. Our focus on aggregate-level information disclosure is important given prior findings that 1) 90.2% of managers who learn from their firms' stock price state that they learn aggregate-level information, which means that aggregate-level information is the most important information managers learn from their firms' stock prices (Goldstein et al. 2023); 2) managers do (do not) have an advantage over outsiders when it comes

[7] For a review of this literature, see Goldstein (2023).
[8] Most directly, Goldstein, Liu, and Yang (2023) find that 97.7% of firms state that they care about stock prices and that 80.4% of these firms state that they learn new information that is relevant for their investment decisions.
[9] Sani, Shroff, and White (2023) extend the literature on the effects of disclosure regulation on managerial learning to regulation of the disclosures of agents other than corporate managers. They find evidence that mandatory portfolio disclosures by actively managed investment funds reduce fund managers' incentives to collect and trade on private firm-level information about their portfolio firms, reducing corporate managers' opportunities to learn from their firms' stock prices.

to forecasting firm-level (aggregate-level) information (Hutton, Lee, and Shu 2012); 3) aggregate-level fluctuations largely determine firm-level performance;[10] and 4) central bank disclosures provide market participants with important information about aggregate-level fluctuations.[11] These prior findings suggest that central bank disclosures provide a potent setting to test whether aggregate-level disclosures crowd out the collection of private information that is potentially useful to managers and thereby impede managerial learning from stock prices. Second, while prior papers highlight the negative effects of firm-level disclosure on managerial learning, we highlight a positive effect: by reducing the benefit of collecting private information about firm-level developments (which is less valuable to managers), firm-level disclosures increase speculators' incentives to collect private information about aggregate-level developments (which is more valuable to managers) and thereby make stock prices more informative to managers.[12] That is, we raise the possibility that different types of disclosures interact and thereby affect managerial learning from price differently than they would affect it in isolation.

Third, we contribute to the literature examining the effects of macroeconomic variables on firm-level outcomes.[13] While prior papers in this literature focus on how *realizations* of

[10] Specifically, Brown and Ball (1967) regress different firm-level earnings measures on aggregate-level earnings. Their Table 4 documents that aggregate-level earnings explain up to 79% of the variation in firm-level earnings. Similarly, Bonsall, Bozanic, and Fischer (2013) use firm-level time-series regressions to show that more than 50% of the average firm's earnings variation can be explained by these aggregate-level variables. Lastly, Ball, Sadka, and Sadka (2009) find that aggregate-level factors, which are highly correlated with growth in industrial production, real GDP growth, the unemployment rate, and inflation, explain approximately 60% of the variation in firm-level earnings.
[11] Ai and Bansal (2018) document that 55% of the market equity premium realizes around central bank disclosures. Savor and Wilson (2013) document that stock market returns and Sharpe ratios are significantly higher on days with scheduled macroeconomic announcements.
[12] One exception is Jayaraman and Wu (2020), who document that managers adjust their capital expenditures in response to the stock market's reaction to their capital expenditure forecasts. That is, managers use voluntary disclosure to elicit feedback that informs them about the prospects of their existing investment plans. In contrast, our results suggest that managers can use voluntary disclosure to shift the information content of stock prices towards information that the manager is less likely to have—i.e., aggregate-level information.
[13] See Ball et al. (2009), Rogers, Skinner, and Van Buskirk (2009), Bonsall et al. (2013), Kim, Pandit, and Wasley (2016), Carabias (2018), Jackson, Plumlee, and Rountree (2018), Bonsall, Green, and Muller (2020), Binz (2022), Binz, Joos, and Kubic (2022), Binz, Mayew, and Nallareddy (2022), Holstead, Kalay, and Sadka (2022), Binz, Ferracuti, and Joos (2023a), and Binz, Graham, and Kubic (2023b).

macroeconomic variables affect firm-level outcomes, we focus on how *disclosure* of macroeconomic variables, measured with the disclosure of central banks' expectations about these variables, affects firm-level outcomes. We also provide evidence on how these central bank disclosures interact with disclosures made by corporate managers in affecting speculators' incentives to collect private information about different components of firm-level performance and to incorporate this information into firms' stock prices via the trading process.

2. Hypothesis Development

We derive our hypothesis by deploying the model in Goldstein and Yang (2019) to examine the firm-level effects of CBET.[14] To facilitate direct comparison to their paper, we use their notation but interpret the variables in the context of our research question. The model features four different types of agents: speculators who trade firms' stocks based on their private and public information, noise traders whose exogenous trading demand is strictly decreasing in firms' stock prices, managers (in the form of a representative manager) who learn from stock prices and make investment decisions that determine firms' cash flows, and the central bank. Firms' cash flows comprise a firm-level component ($\tilde{a}$) and an aggregate-level component ($\tilde{f}$).

In the first period, speculators and noise traders trade based on their private information as well as on the central bank's public disclosures about the aggregate-level component of cash flows ($\tilde{\eta}$) (which can be thought of as central banks' nowcasts or forecasts for aggregate-level variables, such as GDP or unemployment) and managers' public disclosures about the firm-level component

[14] Appendix B outlines the structure of the Goldstein and Yang (2019) model. An alternative way to model the same problem is the method of Morris and Shin (2005). The results in Morris and Shin (2005) are driven by the assumption that traders experience complementarities in their trading decisions. While this assumption might hold in the short run (e.g., during speculative bubble periods), it is unlikely to be a good approximation of the overall trading process. In general, individuals choose to trade with each other because their beliefs or liquidity needs differ—i.e., their trading decisions function as strategic substitutes rather than complements.

of cash flows ($\widetilde{\varpi}$) (which can be thought of as firms' public disclosures such as periodic reports, 8-Ks, etc.). The trading activity aggregates speculators' private information in share prices. In the second period, managers make investment decisions based on the central bank's public disclosures, their private information, and the endogenously determined share prices of their firms, which contain speculators' private information. In the final period, firms' cash flows realize. Key to the model is that relative to speculators, managers have more precise information about the firm-level than the aggregate-level cash flow component. This feature of the model is intuitively appealing and empirically supported by findings in prior research (Maćkowiak and Wiederholt 2009; Hutton et al. 2012; Binz et al. 2023a).

In equilibrium, more CBET (which, in the model, corresponds to a higher precision of the central bank's disclosure τ_η) decreases the proportion of private information about the aggregate-level relative to the firm-level component of cash flows reflected in stock price. It does so in two ways (see Appendix B Section A.2 and Goldstein and Yang 2019, Equation (26)).[15] First, CBET directly crowds out speculators' reliance on their private information about the aggregate-level component by providing more precise information about this component (Barron and Qu 2014).[16] Second, this crowding out decreases managers' reliance on stock prices when they are making investment decisions and thereby makes firms' cash flow less sensitive to the aggregate-level component. Anticipating this effect, speculators rely even less on their private information about the aggregate-level component, which further reduces the degree of aggregate-level information reflected in stock price, and managers' reliance on it. This discussion leads to our hypothesis:

[15] This definition directly corresponds to that of Geraats (2014), who defines monetary policy transparency as the extent to which information relevant to monetary policymaking is publicly known. Under full transparency ($\tau_\eta \to \infty$), all agents are equally well-informed about this information.

[16] In contrast, Begg (2006) argues that monetary policy transparency reduces private sector uncertainty, helping speculators to improve their forecasts. As a result, stock prices might become more rather than less informative.

Hypothesis. CBET decreases managers' reliance on stock prices when they are making investment decisions.

While the prediction that CBET impedes managerial learning is intuitively appealing, different assumptions and modeling choices can also result in the opposite prediction, whereby public information facilitates the transmission of private information (Gosselin, Lotz, and Wyplosz 2007; Duffie, Giroux, and Manso 2010). Therefore, whether CBET enhances or decreases managers' ability to learn from stock prices is an open empirical question.

3. Research Design

We test our hypothesis by estimating the following cross-sectional regression model:

$$Investment_{it} = \beta_1 MPE_{it} + \beta_2 Tobin's\ Q_{it-1} + \beta_3 CBET_{ct} \times MPE_{it} + \beta_4 CBET_{ct} \times Tobin's\ Q_{it-1} + \beta_5 CBET_{it} \times Tobin's\ Q_{it-1} + \beta_6 CBET_{ct} \times MPE_{it} \times Tobin's\ Q_{it-1} + Controls + \Gamma_i + \Phi_{ct} + \varepsilon_{it}. \quad (1)$$

Investment denotes capital expenditures scaled by total assets for firm *i* in year *t*; *Tobin's Q* is the market value of equity plus book value of liabilities scaled by total assets for firm *i* at the beginning of the year; *CBET* measures the CBET for the country where firm *i* is headquartered; *MPE* measures the monetary policy exposure of firm *i* in year *t*; *Controls* is a vector of control variables; Γ_i and Φ_{ct} are firm and country-year fixed effects.[17] We describe our measures of *CBET*, *MPE*, and *Controls* in detail below.

3.1. Central Bank Economic Transparency (CBET)

We measure CBET using the transparency score developed by Dincer et al. (2022).[18] We focus on the Dincer et al. (2022) score instead of other scoring systems because it is the most

[17] Our measure of Tobin's Q measures the average benefit from investment per unit of existing capital investment (i.e., average Q). While neoclassical theory predicts that managers adjust their investment in response to the incremental benefit from investment per unit of new capital investment (i.e., marginal Q) (Tobin 1969), Hayashi (1982) shows that average Q equals marginal Q if firms are price takers with constant returns to scale. If the incremental benefit from investment (measured as market value) is high relative to the cost of new capital investment (measured as book value), this signals to managers who track stock prices to invest more.

[18] We thank Barry Eichengreen for making the data available on his website.

detailed and covers the largest number of central banks and years (Geraats 2014, Section 3.1).[19] Dincer et al. (2022) score 112 central banks from around the world over the 1998 to 2019 period on a scoring grid grounded in the five aspects of the framework developed in Geraats (2002): political, economic, procedural, policy, and operational transparency. The aspect most pertinent to our research question is economic transparency, which measures how transparent central banks are in providing the data that underlie their monetary policy decisions.

Specifically, we focus on Dincer et al.'s (2022) questions 2.a ("Is the basic economic data relevant for the conduct of monetary policy publicly available?") and 2.c ("Does the central bank regularly publish its own macroeconomic forecasts?"). For question 2.a, central banks receive a score of 0 if quarterly time-series data on money supply growth, short- and long-term interest rates, inflation, GDP growth, and the unemployment rate are not available; a score of 0.5 if quarterly time-series data on the same variables are available; and a score of 1 if quarterly time-series data on money supply growth, short- and long-term interest rates, inflation, GDP growth, the unemployment rate, a measure of capacity utilization or the central bank's estimate of the output gap, and a timely estimate of the natural or long-run equilibrium interest rate (at least once a year) are available. For question 2.c, central banks receive a score of 0 if the central bank does not regularly publish a numerical forecast for inflation and output, a score of 0.5 if the central bank publishes a numerical forecast for inflation and/or output at less than quarterly frequency or only for the short term, and a score of 1 if the central bank publishes quarterly numerical forecasts for inflation and output for the medium term (one to two years ahead) and specifies the assumptions about the policy instrument (conditional or unconditional forecasts). Using these scores, we define our CBET measure (*CBET*) as an indicator that the firm's home country's sum of Dincer et al.'s

[19] Examples pf such alternatives are developed in Maxwell-Fry et al. (2000), Fracasso, Genberg, and Wyplosz (2003), Eijffinger and Geraats (2006), Crowe and Meade (2008), and Van der Cruijsen, Jansen, and De Haan (2010).

(2022) 2.a and 2.b scores is equal to or bigger than one in a given year.[20] Figure 1 depicts the average *CBET* score by country. Figure 2 shows that the average *CBET* scores for all countries, developed countries, and developing countries are increasing over time.

3.2. Monetary Policy Exposure (MPE)

Figures 1 and 2 document that more developed countries have higher CBET scores, which raises concerns that *CBET* confounds a country's CBET with its economic development. We address this issue by 1) including country-year fixed effects to hold the level and growth rate of countries' economic development constant (which absorbs *CBET* and prevents us from estimating the direct effect of CBET), and 2) studying within-country variation in firms' exposure to monetary policy because firms with more exposure to monetary policy are likely more sensitive to central bank disclosure and, therefore, CBET.

We measure firms' monetary policy exposure with the score introduced by Ozdagli and Velikov (2020). This score is based on observable characteristics that prior literature theoretically and empirically links to firms' stock return sensitivity to monetary policy shocks. Since the score is non-normally distributed and highly skewed, we follow prior research (e.g., Ozdagli and Velikov 2020; Dambra, Velikov, and Weber 2023) and transform it into an indicator (*MPE*) that the firm's score is above the annual sample median.[21]

3.3. Control Variables (Controls)

[20] We focus on the country in which the firm is headquartered rather than where its production facilities are located because the managers who are most likely to learn from stock price are the firm's leadership team (who are located at the firm's headquarters and whose compensation tends to be closely tied to stock price) rather than plant-level managers (who are located at the firm's production facilities and whose compensation tends to be tied to measures of plant-level operating performance) (Bushman et al. 1995).

[21] Ozdagli and Velikov (2020) estimate their monetary policy exposure score based on observable characteristics that prior literature theoretically and empirically links to firms' stock return sensitivity to monetary policy shocks using the following equation: $MPE = 0.63 \times Cash\ Flow\ Duration + 4.36 \times Cash\ Flow\ Volatility - 0.87 \times Cash - 1.60 \times Whited\ Wu\ (2006)\ Financial\ Constraints\ Index - 5.74 \times Operating\ Profitability$. See Ozdagli and Velikov's (2020) Appendix A.1 for details.

We include in our models a set of standard controls from the literature (Fazzari et al. 1988): an indicator that the firm incurred a loss (*Loss*), dividends scaled by average total assets (*Dividend Yield*), an indicator that the firm is paying a dividend (*Dividend Payer*), total debt scaled by average total assets (*Leverage*), the natural logarithm of total assets in USD (*Size*), cash flow from operations scaled by average total assets (*Cash Flow*), and the change in cash flow from operations scaled by average total assets (Δ*Cash Flow*). Following Chen et al. (2007), we extend this set of controls with two additional variables. First, we include the absolute three-day earnings announcement return (|*EA Return*|) to control for managers' private information such that the information gleaned from stock price is news to the managers. Second, we include the firms' stock return over the subsequent three years (*Future Return*) to control for the possibility that managers time their investment to periods when their firms' stocks are under- or overvalued (Loughran and Ritter 1995; Baker and Wurgler 2002; Baker, Stein, and Wurgler 2003).

3.4. Sample Construction and Description

We examine our hypotheses using a sample of 175,859 non-financial firm-year observations (all SIC codes except 6000 to 6999) from 83 countries. We restrict the sample period to 1998 through 2019, the period for which the Dincer et al. (2022) CBET scores are available, and we require non-missing values for the variables included in our analyses. We obtain annual fundamental, daily stock return, and daily exchange rate data from Compustat Global and earnings announcement dates from IBES International.

Table 1 presents our sample composition by country. The table illustrates that the sample is widely distributed, with China, India, Japan, United States, and United Kingdom as the most represented countries. Tables 2 and 3 provide descriptive statistics and a correlation matrix. We winsorize all variables at the 1st and 99th percentiles. Table 2 Panel A indicates that the average

firm invests an amount equal to 5.0% of total assets every year and generates a return on assets of 2.9% on assets, has approximately \$459 [= exp(6.132) – 1] million in total assets, has a leverage ratio of 21.3%, and has a *Tobin's Q* of 1.768. Approximately 59.5% of our firm-year observations distribute dividends, while 18.2% incur a loss. Table 2 Panel B shows that firms with high and low monetary policy exposure are statistically different along many observable characteristics. However, those differences are economically small, with a few exceptions: more exposed firms are on average 90% more likely to pay dividends, have 71% lower absolute stock returns over their earnings announcement windows, and have 73% lower stock returns over the subsequent three years. Table 3 shows that there is a negative unconditional correlation between investment and CBET, providing preliminary and indirect support to our conjecture that CBET can affect managers' investment decisions.

4. Results

4.1. Panel Data Regressions

Table 4 presents the results of estimating Equation (1), i.e., regressing the firm's investment (*Investment*) on the firm's lagged Tobin's Q (*Tobin's* Q_{t-1}) interacted with CBET in the firm's home country (*CBET*) and the firm's exposure to monetary policy (*MPE*), controls, and different combinations of firm and country-year fixed effects. We standardize all continuous variables to facilitate interpretation. We cluster standard errors by firm.

We observe that the slope coefficient of the *MPE* × *CBET* × *Tobin's* Q_{t-1} interaction term is significantly negative across all specifications, consistent with our hypothesis that firms that are headquartered in countries with higher CBET and more exposed to monetary policy display relatively lower investment-price sensitivity. According to the estimates of the model with country-year and firm fixed effects in Column (4), the effect is economically meaningful as well.

The estimate suggests that transparency lowers the investment-price sensitivity of highly exposed firms by 0.062 standard deviations. This magnitude is large not only relative to *Tobin's Q*'s unconditional effect (0.090), but also relative to the effect on the investment-price sensitivity of firms that are 1) headquartered in countries with higher CBET but less exposed to monetary policy (0.057), and 2) more exposed to monetary policy but headquartered in countries with lower CBET (0.028). These findings are consistent with the notion that when central banks are more transparent, managers learn less from stock prices and therefore rely less on those prices as signals of growth opportunities for their investment decisions.

We assess the robustness of these results to various alternative measurement and research design choices in Table 5. The table shows that our findings are robust to all of the following alternatives: measuring *CBET* with the raw version of Dincer et al.'s (2022) CBET score (Column (1)); using Peters and Taylor's (2014) Tobin's Q measure that accounts for intangible capital (Column (2)); including country-by-year-by-Tobin's Q fixed effects to account for the possibility that investment-price sensitivity varies by country-year (Sani et al. 2023) (Column (3)); clustering standard errors by firm and year (Column (4)); and dropping observations for firms headquartered in the US or Japan, the two countries with the most observations in our sample (Column (5)).

4.2. Cross-Sectional Analyses

We triangulate our main results by examining two cross-sectional predictions derived from our adaptation of the Goldstein and Yang (2019) model.

4.2.1. Management Guidance

First, Goldstein and Yang's (2019) Proposition 3 shows that raising the precision of public information about the firm-level component of cash flows makes it relatively more attractive for speculators to spend their limited resources on collecting private information about the aggregate-

level component of cash flows (see also Appendix B Section A.3). As a result, since managers do (do not) have an information advantage when it comes to the firm-level (aggregate-level) component, they learn more from prices. One way for managers to increase the precision of publicly available information about the firm-level component of cash flows is to voluntarily disclose their private information, which would counteract the effect of higher CBET. We examine this possibility by estimating Equation (1) separately for firms that do (*High Management Guidance*) and do not (*Low Management Guidance*) issue managerial guidance during the year, and we report our estimates in Table 6 Panel A.

We find that the triple interaction term among CBET, monetary policy exposure, and lagged Tobin's Q is significantly negative only in the low-guidance sample. The last row of the table (*High – Low*) tests and confirms that the difference in coefficients is statistically significant ($p = 0.000$) when we use a 1,000-repetition bootstrap. These results suggest that firms can offset the negative effect of CBET on managerial learning from price and investment efficiency by increasing their voluntary disclosures. Our findings also provide context to the results of Jayaraman and Wu (2019) and Pinto (2023), who document that firm-level disclosure crowds out private information collection: firm-level disclosure may crowd out private collection of information that is less useful to managers (firm-level information) in favor of information that is more useful to managers (aggregate-level information) and, as a result, make price more decision-useful to managers.

4.2.2. Noise Trading

Second, Goldstein and Yang's (2019) Proposition 2d shows that a necessary condition for managers to learn from stock prices is that prices are not too noisy—i.e., that the level of noise trading in the firm's stock is not so high that it makes prices uninformative to managers.

Uninformative prices would break down the indirect learning effect, leaving less learning from price for transparency to crowd out. We examine this possibility by estimating Equation (1) separately for firms with below (*High Noise Trading*) and above (*Low Noise Trading*) within-year median Amihud (2002) illiquidity and report our estimates in Table 6 Panel B.[22] While illiquidity is not a direct measure of noise trading, recent empirical evidence indicates that higher liquidity is associated with more informative and therefore less noisy stock prices (Chung et al. 2020; Kerr, Sadka, and Sadka 2020).

We find that the triple interaction term among CBET, monetary policy exposure, and lagged Tobin's Q is significantly smaller for firms with more illiquid stocks (p = 0.000). This is evidence that noise trading reduces managerial learning from stock price and thereby CBET's negative effect on managers' learning from price.

4.3. Additional Tests

4.3.1. Mechanism: Speculators' Information Acquisition

In our analytical framework, increases in CBET shift speculators' information acquisition from the aggregate-level component of cash flows toward the firm-level component. This shift in information acquisition means that stock prices reflect less information about the aggregate-level component of cash flows, from which managers could potentially learn the most. Following prior literature, we examine the presence of this mechanism using Google search intensity to measure investors' information acquisition (Da et al. 2011; Drake et al. 2012; DeHaan et al. 2015).

We measure the intensity of aggregate-level relative to firm-level information acquisition by creating a ratio of Google search intensity index of aggregate cash flow information at the country-year level over Google search intensity index of firm cash flow information at the firm-

[22] These results are robust to employing a range of alternative liquidity measures discussed in Goyenko, Holden, and Trzcinka (2009).

year level (*Aggregate/Firm Search*). With respect to the aggregate-level index, we create a dictionary of terms related to the aggregate-level variables, excluding terms related to the central bank (as we would expect interest in the central bank to increase mechanically when CBET increases). Next, we translate the dictionary into the 23 languages represented by the countries in our sample.[23] We then download the search intensity for each of these terms for each country-month and average it over the firm's fiscal year. With respect to the firm-level index, we download the monthly search intensity for the firm's ticker symbol for each firm-month and average it over the firm's fiscal year. In the download process, we include a geographic restriction parameter to accurately isolate search intensity originating from each firm's headquarters country. The Google search data required to compute *Aggregate/Firm Search* are available for a sample of 64,421 firm-year observations from 5,565 unique firms and 42 countries.

We examine whether CBET increases aggregate-level relative to firm-level information acquisition by estimating the following regression:

$$Aggregate/Firm\ Search_{it} = \beta_1 MPE_{it} + \beta_2 CBET_{ct} \times MPE_{it} + Controls + \Gamma_i + \Phi_{ct} + \varepsilon_{it}. \quad (2)$$

All variables are defined as previously. As we did for all the other variables, we standardize *Aggregate/Firm Search* to facilitate interpretation. If the mechanism underlying our analytical framework holds, we would expect that aggregate-level relative to firm-level search intensity is lower for firms that are headquartered in countries with higher CBET and more exposed to monetary policy, i.e., a negative slope coefficient on the *CBET* × *MPE* interaction term.

We present the results in Table 7. The coefficient on the interaction term is significantly negative across all columns. In terms of economic magnitude, the estimates of the full model in

[23] The search terms are: "gdp", "gnp", "inflation", "unemployment", "exchange rate", "gross domestic product", and "gross national product". We translate these terms into the following languages: Arabic, Chinese, Danish, Dutch, English, Filipino, Finnish, French, German, Greek, Indonesian, Italian, Japanese, Malay, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Thai, and Turkish.

Column (4) indicate that the aggregate-level relative to firm-level search intensity is 0.273 standard deviations lower for firms that are headquartered in countries with higher CBET and more exposed to monetary policy developments. These results are consistent with our analytical framework's prediction that CBET induces speculators to shift their information acquisition efforts from the aggregate-level component towards the firm-level component of cash flows.

4.3.2. Consequences: Managers' Investment Efficiency

The discussion and results above indicate that central bank disclosure crowds out private information collection about the aggregate-level component and thereby reduces the proportion of private information about the aggregate-level component reflected in firms' stock prices. This, in turn, deprives managers of decision-relevant information and ultimately decreases the efficiency of their investments. However, CBET also has a direct information effect on managers' investment efficiency (see Appendix B Section A.2 and Goldstein and Yang 2019, Equation (23)). Public central bank disclosure provides managers with the central bank's private information about the current and future state of the economy, which increases investment efficiency. Thus, whether CBET increases or decreases investment efficiency is ultimately an empirical question.

Following prior literature, we examine whether CBET increases or decreases investment efficiency by examining the relation between CBET and profitability (Chen et al. 2007; Jayaraman and Wu 2019). Specifically, we estimate the following regression:

$$ROA_{it} = \beta_1 MPE_{it} + \beta_2 CBET_{ct} \times MPE_{it} + Controls + \Gamma_i + \Phi_{ct} + \varepsilon_{it}. \quad (3)$$

ROA denotes net income scaled by average total assets. All variables are defined as previously. As we did for all the other variables, we standardize *ROA* to facilitate interpretation.

Table 8 presents the results of estimating Equation (3). In Column (1), we document a negative association between CBET and return on assets, consistent with the indirect learning

effect of CBET dominating the direct information effect for more exposed firms. This association is economically meaningful as well: the return on assets of firms that are headquartered in countries with higher CBET and more exposed to monetary policy is 0.048 standard deviations lower than the return on assets of other firms, which amounts to 0.5 percentage points or 10% relative to the unconditional sample median.

Next, we develop a deeper understanding of what drives these results through a DuPont decomposition that separates *ROA* into net income scaled by sales (*Profit Margin*), which measures pricing power, and sales scaled by average total assets (*Asset Turnover*), which measures the efficient use of assets to generate revenues. If CBET decreases the efficiency of managers' investment decision making, we would expect the results to derive from turnovers rather than profits margins. Table 8 Columns (2) and (3) present the results of replacing *ROA* with *Profit Margin* and *Asset Turnover* as the dependent variable, respectively. We find that CBET is not significantly associated with profit margins (Column (2)), but it is negatively associated with asset turnover (Column (3)). The latter association is economically meaningful: the asset turnover of firms that are headquartered in countries with higher CBET and more exposed to monetary policy is 0.064 standard deviations lower than the asset turnover of other firms, or 5% relative to the unconditional sample median.

Lastly, we examine how the asset turnover results vary for different types of investments. If managers' investment efficiency decreases because CBET decreases the amount of information they can learn from their firm's stock price, we would expect the turnover result to be stronger for strategic investments made by C-suite managers than for day-to-day investments made by operational managers. The reason is that the C-suite managers' compensation tends to be tied to the firm's stock price (and thus they are likely to pay more attention to it), whereas the operational

managers' compensation tends to be tied to measures of operational performance (Bushman et al. 1995). Building on this intuition, in Table 8 Columns (4) and (5), we use *PPE Turnover* (*Inventory Turnover*) as a proxy for strategic (day-to-day) investments made by C-suite (operational) managers. Consistent with the hypothesis that the effect is stronger for strategic than for day-to-day investment, the slope coefficient of the interaction term is larger for *PPE Turnover* than for *Inventory Turnover*. According to the estimates of the model with country-year and firm fixed effects in Column (4), PPE turnovers of more exposed firms headquartered in countries with higher monetary policy transparency are 0.059 standard deviations lower, while inventory turnovers are only 0.022 standard deviations lower. The difference between these two slope coefficients is statistically significant at the 1% level.

In sum, these findings suggest that higher monetary policy transparency decreases the amount of decision-relevant information available to managers and thereby reduces the efficiency of their investment decisions. Further, the effect concentrates in investments that are more directly influenced by C-suite managers, who are more likely than operational managers to learn from movements in their firm's stock price.

4.4. 2013/2014 Amendments to the Bank of England's Inflation Report

The previous sections document evidence that is broadly consistent with the predictions of and assumptions underlying our analytical framework. However, the findings are difficult to interpret causally because CBET is endogenously determined and covaries with other features of and decisions made by central banks (such as central bank independence or monetary policy actions) that are also potentially important determinants of corporate investment. To overcome these difficulties, we exploit a series of amendments made by the Bank of England (BoE) between 2013 and 2014 ("the amendments") to enhance the transparency of its Inflation Report.

The BoE releases its Inflation Report on a quarterly basis. The Inflation Report presents an assessment of the prospects for UK inflation and sets out the detailed economic analysis and inflation projections upon which the BoE's Monetary Policy Committee bases its interest rate decisions. Importantly, the Inflation Report is a vehicle for delivering the Monetary Policy Committee's views on the development of economic conditions and does not provide explicit policy discussion such as, for example, how the central bank will react to those developments (Hansen, McMahon, and Tong 2019). With publication of the Inflation Report as early as February 1993, the BoE was the first central bank to publicly disclose such data. However, a Court of the BoE evaluation in 2012 showed that by that time, other central banks, in particular the US Federal Reserve Board and the European Central Bank, had made their economic forecasts and policy expectations accompanying those forecasts more transparent than those of the BoE (e.g., Stockton, 2012). Consequently, to catch up with other central banks, the BoE implemented three amendments to its Inflation Report between February 2013 and February 2014 (Paterson and McKeown 2014). First, since February 2013, the Inflation Report has contained key judgements or key economic indicators underlying the bank's monetary policy decisions. Second, since May 2013, for each key judgement, the bank presents a monitoring table that sets out the expected path for a series of short-term indicators that would be consistent with the Monetary Policy Committee's central narrative. Third, since February 2014, the Inflation Report has provided longer-term quantitative projections such as world GDP growth, US growth, and Eurozone growth, as well as longer-term projections for key endogenous variables such as consumer spending and business investment.

Three features of the amendments make them especially suitable to test our predictions. First, the amendments considerably increased the quantity and quality of macroeconomic

information released by the BoE to the public through its Inflation Report; thus, the amendments represent a shock to publicly available information about the aggregate-level component of firms' cash flows. Second, the amendments were implemented to put "the Bank at the forefront of international practice" and not in response to idiosyncratic shocks to the UK economy (which experienced a period of relatively high economic and political stability between the 2007 financial crisis and the 2016 Brexit vote). This reduces the risk that any consequences we document are driven by confounding events rather than changes in the public availability of aggregate-level information (Paterson and McKeown 2014). Third, the amendments were not accompanied by contemporaneous modifications to other aspects of the BoE's monetary policy, which allows us to isolate the effect induced by CBET from the effects of other changes in monetary policy.

The amendments increase CBET for treated firms relative to control firms. Accordingly, we would expect treated firms to experience a relative decrease in investment-price sensitivity following the amendment. To test this prediction, we use the amendments as the basis for a difference-in-differences design during the 2009 to 2018 period (the 10-year period surrounding the amendments) by estimating the following regression:

$$Investment_{it} = \beta_1 Tobin's\ Q_{it-1} + \beta_2 Treated_i \times Tobin's\ Q_{it-1} + \beta_3 Post_t \times Tobin's\ Q_{it-1} + \beta_4 Treated_i \times Post_t \times Tobin's\ Q_{it-1} + Controls + \Gamma_i + \Phi_{ct} + \varepsilon_{it}. \quad (4)$$

All variables are as defined before. *Post* is an indicator for fiscal years between 2014 and 2018, and *Treated* is an indicator that the firm is headquartered in the UK.

We identify our control group using three separate, increasingly stringent approaches. First, we use all firms outside the UK as the control group. This approach has the benefit of generalizability but is subject to two limitations: 1) UK firms may systematically differ from firms headquartered in other countries in a way that affects their sensitivity to changes to CBET, and 2) the BoE may operate differently from other central banks in our sample. Table 9 Column (1)

presents the results. We find that UK firms' Tobin's Q sensitivity significantly falls by 0.125 standard deviations relative to that of non-UK firms following the amendments. This finding suggests that the amendments caused corporate managers to rely less on their firm's stock price as an information source when making investment decisions.

Second, to address concerns that the control firms we use in our first approach might be systematically different from our treatment firms, we identify the control group using propensity score matching. More specifically, we identify control firms as non-UK firms that are most similar to UK firms in terms of cash flows, leverage, size, and monetary policy exposure in the pre-amendments period within the same two-digit SIC industry and with the same *CBET* score. We retain only the best-matching control firm (with a maximum caliper of 0.001) for each treated firm. Table 9 Column (2) presents the results. We find that UK firms' Tobin's Q sensitivity falls by 0.193 standard deviations relative to that of matched non-UK firms following the amendments. That is, sharpening our measurement approach increases the estimated treatment effect magnitude.

Third, to address concerns that the BoE may operate differently from other central banks in our sample, we restrict the set of possible control firms to those headquartered in countries with central banks that operate similarly to the BoE, namely firms headquartered in the US or the European Monetary Union (EMU). We follow the same propensity score matching approach described above, except that we do not require these firms to be drawn from the same *CBET* score because this condition has already been met. Table 9 Column (3) presents the results. We find that UK firms' Tobin's Q sensitivity falls by 0.340 standard deviations relative to that of matched US and EMU firms following the amendments. Again, sharpening our measurement approach increases the estimated treatment effect magnitude.

Lastly, we test the parallel trends assumption underlying our difference-in-differences design by replacing *Post* in Table 8 Column (3) with fiscal year indicators and plotting the slope coefficient of the *Treated* × *Year* × *Tobin's* Q_{t-1} interaction term in Figure 3. We do not find a systematic trend in the difference between treated and control firms' investment-price sensitivities prior to the amendments, consistent with parallel trends. We also observe that the effect manifests as early as 2014 and persists until 2017 and after.

In sum, the results derived from the BoE's amendments to its Inflation Report corroborate our Table 4 findings that CBET reduces managers' investment-price sensitivity. While it is difficult to use panel data regressions to isolate the effects of CBET from the effects of aspects of central bank policy other than CBET (such as central bank independence or monetary policy actions), the amendments provide us with a setting in which other aspects of central bank policy did not change and thereby are unlikely to confound our results.

5. Conclusion

Motivated by prior evidence that transparency increases the effectiveness of monetary policy, central banks have consistently increased their transparency over the past few years. As part of this effort, central banks have increased the public disclosure of their expectations about the current and future state of the economy. We provide a theoretical framework and analytical evidence for potential costs of this shift in CBET.

We hypothesize and find that CBET leads managers of more exposed firms to rely less on their firms' stock price when making investment decisions, and that these results vary predictably with managers' voluntary disclosure policy and the liquidity of firms' stock. Consistent with the mechanism underlying our analytical framework, we provide evidence that speculators shift their information collection efforts from the aggregate-level component of cash flows towards the firm-

level component. We also find that more exposed firms' investment efficiency decreases in CBET, consistent with the loss of information contained in stock price outweighing managers' expanded information from central bank transparency. Our findings are robust to using alternative measurement approaches and to using the Bank of England's 2013 and 2014 amendments to its Inflation Report as a quasi-experimental setting that allows us to hold other aspect of monetary policy constant.

Our results should be of interest to policy makers as well as to academics studying transparency. We contribute to the literature by documenting a series of unintended and interrelated costs of CBET, investigating how these costs vary with specific firm characteristics, and suggesting how decision makers can mitigate them.

References

Ai, H., and R. Bansal. 2018. Risk Preferences and the Macroeconomic Announcement Premium. *Econometrica* 86 (4):1383-1430.

Amihud, Y. 2002. Illiquidity and Stock Returns: Cross-Section and Time-Series Effects. *Journal of Financial Markets* 5 (1):31-56.

Baker, M., J. C. Stein, and J. Wurgler. 2003. When Does the Market Matter? Stock Prices and the Investment of Equity-Dependent Firms. *The Quarterly Journal of Economics* 118 (3):969-1005.

Baker, M., and J. Wurgler. 2002. Market Timing and Capital Structure. *The Journal of Finance* 57 (1):1-32.

Ball, R., G. Sadka, and R. Sadka. 2009. Aggregate Earnings and Asset Prices. *Journal of Accounting Research* 47 (5):1097-1133.

Barner, M., F. Feri, and C. R. Plott. 2005. On the Microstructure of Price Determination and Information Aggregation with Sequential and Asymmetric Information Arrival in an Experimental Asset Market. *Annals of Finance* 1:73-107.

Barron, O. E., and H. Qu. 2014. Information Asymmetry and the Ex Ante Impact of Public Disclosure Quality on Price Efficiency and the Cost of Capital: Evidence from a Laboratory Market. *The Accounting Review* 89 (4):1269-1297.

Begg, I. 2006. *Economic Policy and Institutional Transparency: The Ecb*. Oxford: Elsevier.

Berger, H., M. Ehrmann, and M. Fratzscher. 2006. Forecasting Ecb Monetary Policy: Accuracy Is (Still) a Matter of Geography. Working paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=873590.

Binz, O. 2022. Managerial Response to Macroeconomic Uncertainty: Implications for Firm Profitability. *The Accounting Review* 97 (5):89-117.

Binz, O., E. Ferracuti, and P. R. Joos. 2023a. Investment, Inflation, and the Role of Internal Information Systems as a Transmission Channel. *Journal of Accounting and Economics* (forthcoming).

Binz, O., J. Graham, and M. Kubic. 2023b. Does Inflation Affect Value Relevance? A Century-Long Analysis
. Working paper. Available at https://bpb-us-e2.wpmucdn.com/sites.utdallas.edu/dist/c/1102/files/2023/02/Faculty-UT-Austin-Value-Relevance-and-Inflation-Feb-2023.pdf.

Binz, O., P. Joos, and M. Kubic. 2022. The Income Statement Channel of Monetary Policy. Working Paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3835653.

Binz, O., W. J. Mayew, and S. Nallareddy. 2022. Firms' Response to Macroeconomic Estimation Errors. *Journal of Accounting and Economics* 73 (2-3).

Blinder, A. S., M. Ehrmann, M. Fratzscher, J. De Haan, and D.-J. Jansen. 2008. Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence. *Journal of Economic Literature* 46 (4):910-945.

Bonsall, S. B., Z. Bozanic, and P. E. Fischer. 2013. What Do Management Earnings Forecasts Convey About the Macroeconomy? *Journal of Accounting Research* 51 (2):225-266.

Bonsall, S. B., J. Green, and K. A. Muller. 2020. Market Uncertainty and the Importance of Media Coverage at Earnings Announcements. *Journal of Accounting and Economics* 69 (1):1-23.

Brown, P., and R. Ball. 1967. Some Preliminary Findings on the Association between the Earnings of a Firm, Its Industry, and the Economy. *Journal of Accounting Research* 5:55-77.

Bushman, R. M., R. J. Indjejikian, and A. Smith. 1995. Aggregate Performance Measures in Business Unit Manager Compensation: The Role of Intrafirm Interdependencies. *Journal of Accounting Research* 33:101-128.

Carabias, J. M. 2018. The Real-Time Information Content of Macroeconomic News: Implications for Firm-Level Earnings Expectations. *Review of Accounting Studies* 23 (1):136-166.

Carlson, J. B., B. R. Craig, P. Higgins, and W. Melick. 2006. FOMC Communications and the Predictability of near-Term Policy Decisions. *Economic Commentary* (6/1/2006).

Chen, Q., I. Goldstein, and W. Jiang. 2007. Price Informativeness and Investment Sensitivity to Stock Price. *The Review of Financial Studies* 20 (3):619-650.

Chung, K. H., A. J. Lee, and D. Rösch. 2020. Tick Size, Liquidity for Small and Large Orders, and Price Informativeness: Evidence from the Tick Size Pilot Program. *Journal of Financial Economics* 136 (3):879-899.

Crowe, C., and E. E. Meade. 2008. Central Bank Independence and Transparency: Evolution and Effectiveness. *European Journal of Political Economy* 24 (4):763-777.

Da, Z., J. Engelberg, and P. Gao. 2011. In Search of Attention. *Journal of Finance* 66 (5):1461-1499.

Dambra, M., M. Velikov, and J. Weber. 2023. Disclosure, Materiality Thresholds, and the Cost of Capital: Evidence from FOMC Announcements. Management Science (forthcoming).

DeHaan, E., T. Shevlin, and J. Thornock. 2015. Market (in) Attention and the Strategic Scheduling and Timing of Earnings Announcements. *Journal of Accounting and Economics* 60 (1):36-55.

Dincer, N., B. Eichengreen, and P. Geraats. 2022. Trends in Monetary Policy Transparency: Further Updates. *International Journal of Central Banking* 18 (1):331-348.

Drake, M. S., D. T. Roulstone, and J. R. Thornock. 2012. Investor Information Demand: Evidence from Google Searches around Earnings Announcements. *Journal of Accounting Research* 50 (4):1001-1040.

Duffie, D., G. Giroux, and G. Manso. 2010. Information Percolation. *American Economic Journal: Microeconomics* 2 (1):100-111.

Ehrmann, M., S. Eijffinger, and M. Fratzscher. 2012. The Role of Central Bank Transparency for Guiding Private Sector Forecasts. *The Scandinavian Journal of Economics* 114 (3):1018-1052.

Eijffinger, S. C., and P. M. Geraats. 2006. How Transparent Are Central Banks? *European Journal of Political Economy* 22 (1):1-21.

Fazzari, S. M., R. G. Hubbard, and B. C. Petersen. 1988. Financing Constraints and Corporate Investment. *Brookings Papers on Economic Activity* 1988 (1):141-206.

Fracasso, A., H. Genberg, and C. Wyplosz. 2003. *How Do Central Banks Write?: An Evaluation of Inflation Reports by Inflation Targeting Central Banks*. Vol. 2: Centre for Economic Policy Research.

Geraats, P. M. 2002. Central Bank Transparency. *The Economic Journal* 112 (483):532-565.

———. 2014. Monetary Policy Transparency. *The Oxford Handbook of Economic and Institutional Transparency*:68-97.

Goldstein, I. 2023. Information in Financial Markets and Its Real Effects. *Review of Finance* 27 (1):1-32.

Goldstein, I., B. Liu, and L. Yang. 2023. Market Feedback: Evidence from the Horse's Mouth. Working paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3874756.

Goldstein, I., and L. Yang. 2019. Good Disclosure, Bad Disclosure. *Journal of Financial Economics* 131 (1):118-138.

Gosselin, P., A. Lotz, and C. Wyplosz. 2007. When Central Banks Reveal Their Interest Rate Forecasts: Alignment of Expectations Vs. Creative Opacity. *International Journal of Central Banking* 4:145.

Goyenko, R. Y., C. W. Holden, and C. A. Trzcinka. 2009. Do Liquidity Measures Measure Liquidity? *Journal of Financial Economics* 92 (2):153-181.

Hansen, S., M. McMahon, and A. Prat. 2018. Transparency and Deliberation within the FOMC: A Computational Linguistics Approach. *The Quarterly Journal of Economics* 133 (2):801-870.

Hansen, S., M. McMahon, and M. Tong. 2019. The Long-Run Information Effect of Central Bank Communication. *Journal of Monetary Economics* 108:185-202.

Hayashi, F. 1982. Tobin's Marginal Q and Average Q: A Neoclassical Interpretation. *Econometrica* 50 (1):213-224.

Hayek, F. 1945. The Use of Knowledge in Society. *The American Economic Review* 35 (4):519-530.

Hayford, M. D., and A. T. G. Malliaris. 2007. Transparent Monetary Policy. Working paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1020736.

Holstead, C., A. Kalay, and G. Sadka. 2022. When Micro Firms Speak Macro: Evidence on Firms' Macroeconomic Disclosures. Working paper. Available at https://www8.gsb.columbia.edu/ceasa/sites/ceasa/files/03%20Holstead%20Kalay%20Sadka%202022_01_10.pdf.

Hutton, A. P., L. F. Lee, and S. Z. Shu. 2012. Do Managers Always Know Better? The Relative Accuracy of Management and Analyst Forecasts. *Journal of Accounting Research* 50 (5):1217-1244.

IMF. 2023. Key Trends in Implementing the Fund's Transparency Policy. Washington, D.C.: International Monetary Fund.

Jackson, A. B., M. A. Plumlee, and B. R. Rountree. 2018. Decomposing the Market, Industry, and Firm Components of Profitability: Implications for Forecasts of Profitability. *Review of Accounting Studies* 23 (3):1071-1095.

Jayaraman, S., and J. S. Wu. 2019. Is Silence Golden? Real Effects of Mandatory Disclosure. *The Review of Financial Studies* 32 (6):2225-2259.

———. 2020. Should I Stay or Should I Grow? Using Voluntary Disclosure to Elicit Market Feedback. *The Review of Financial Studies* 33 (8):3854-3888.

Kerr, J., G. Sadka, and R. Sadka. 2020. Illiquidity and Price Informativeness. *Management Science* 66 (1):334-351.

Kim, K., S. Pandit, and C. E. Wasley. 2016. Macroeconomic Uncertainty and Management Earnings Forecasts. *Accounting Horizons* 30 (1):157-172.

Loughran, T., and J. R. Ritter. 1995. The New Issues Puzzle. *The Journal of Finance* 50 (1):23-51.

Maćkowiak, B., and M. Wiederholt. 2009. Optimal Sticky Prices under Rational Inattention. *American Economic Review* 99 (3):769-803.

Mariscal, I. B.-F., and P. Howells. 2007a. Monetary Policy Transparency: Lessons from Germany and the Eurozone. *Germany's Economic Performance: From Unification to Euroization*:25-41.

Mariscal, I. B. F., and P. Howells. 2007b. Monetary Policy Transparency in the UK: The Impact of Independence and Inflation Targeting. *International Review of Applied Economics* 21 (5):603-617.

Maxwell-Fry, D. J., S. R. Lavan Mahadeva, and G. Sterne. 2000. *Monetary Policy Frameworks in a Global Context*. Vol. 2. London and New York: Routledge.

Middeldorp, M. H. 2011a. Central Bank Transparency, the Accuracy of Professional Forecasts, and Interest Rate Volatility. Working paper. Available at https://www.econstor.eu/bitstream/10419/60969/1/662053753.pdf.

———. 2011b. FOMC Communication Policy and the Accuracy of Fed Funds Futures. Working paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1822335.

Middeldorp, M. H., and S. Rosenkranz. 2011. Central Bank Transparency and the Crowding out of Private Information in an Experimental Asset Market. Working paper. Available at https://www.econstor.eu/bitstream/10419/60819/1/656134550.pdf.

Morris, S., and H. S. Shin. 2005. Central Bank Transparency and the Signal Value of Prices. *Brookings Papers on Economic Activity* 2005 (2):1-66.

Ozdagli, A., and M. Velikov. 2020. Show Me the Money: The Monetary Policy Risk Premium. *Journal of Financial Economics* 135 (2):320-339.

Paterson, L., and J. McKeown. 2014. Enhancing the Transparency of the Bank of England's Inflation Report: Bank of England.

Peters, R. H., and L. A. Taylor. 2017. Intangible Capital and the Investment-Q Relation. *Journal of Financial Economics* 123 (2):251-272.

Pinto, J. 2023. Mandatory Disclosure and Learning from External Market Participants: Evidence from the Jobs Act. *Journal of Accounting and Economics* 75 (1):101528.

Rogers, J. L., D. J. Skinner, and A. Van Buskirk. 2009. Earnings Guidance and Market Uncertainty. *Journal of Accounting and Economics* 48 (1):90-109.

Romer, C. D., and D. H. Romer. 2000. Federal Reserve Information and the Behavior of Interest Rates. *American Economic Review* 90 (3):429-457.

Sani, J., N. Shroff, and H. White. 2023. Spillover Effects of Mandatory Portfolio Disclosures on Corporate Investment. *Journal of Accounting and Economics (forthcoming)*.

Savor, P., and M. Wilson. 2013. How Much Do Investors Care About Macroeconomic Risk? Evidence from Scheduled Economic Announcements. *Journal of Financial and Quantitative Analysis* 48 (2):343-375.

Swanson, E. T. 2006. Have Increases in Federal Reserve Transparency Improved Private Sector Interest Rate Forecasts? *Journal of Money, Credit and Banking* 38:791-819.

Tobin, J. 1969. A General Equilibrium Approach to Monetary Theory. *Journal of Money, Credit and Banking* 1 (1):15-29.

Van der Cruijsen, C., D.-J. Jansen, and J. De Haan. 2010. How Much Does the Public Know About the Ecb's Monetary Policy? Evidence from a Survey of Dutch Households. Working paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1701609.

Veldkamp, L. L. 2011. *Information Choice in Macroeconomics and Finance*: Princeton University Press.

Appendix A. Variable Definitions

Variable	Definition
Aggregate/Firm Search	The ratio of aggregate-level Google search intensity (search terms: "gdp", "gnp", "inflation", "unemployment", "exchange rate", "gross domestic product", "gross national product") to firm-level Google search intensity (search terms: the tickers of firms included in our sample).
Asset Turnover	Sales scaled by average total assets.
Cash Flow	Cash flow from operating activities scaled by average total assets.
Δ*Cash Flow*	Change in cash flow from operating activities scaled by average total assets.
Dividend Payer	Indicator that the firm pays a dividend.
Dividend Yield	Dividend scaled by average total assets.
|*EA Return*|	Absolute three-day earnings announcement return.
Future Return	Stock return over the three subsequent years.
Inventory Turnover	Sales scaled by average total inventory.
Investment	Capital expenditures scaled by average total assets.
Leverage	Long-term plus short-term debt scaled by average total assets.
Loss	Indicator that the firm is making a loss.
MPE	Indicator that the firm has above within-year median Ozdagli and Velikov (2020) monetary policy exposure.
CBET	Indicator set to 1 if the sum of Dincer et al. (2022) 2a ("Is the basic economic data relevant for the conduct of monetary policy publicly available?") and 2c ("Does the central bank regularly publish its own macroeconomic forecasts?") scores is larger than one. The Dincer et al. (2022) scores take a value of 0, 0.5, or 1.
Post	Indicator that the year is 2014 or later.
PPE Turnover	Sales scaled by average property, plant, and equipment.
Profit Margin	Net income scaled by sales.
ROA	Net income scaled by average total assets.
Size	Natural logarithm of one plus total assets (in USD).
Tobin's Q	Market value of equity plus book value of liabilities scaled by total assets.
Treated	Indicator that the firm is headquartered in the UK.

Appendix B. Structure of the Goldstein and Yang (2019) Model

A.1. Model Setup

In this appendix, we outline the structure of the Goldstein and Yang (2019) model and discuss how we apply it to our CBET setting. The representative firm's value is determined by the firm's cash flow. Cash flow equals output $\tilde{Q}$, which is determined by the representative manager's investment in capital K, a stochastic firm-level component $\tilde{A}$ (such that $\log[\tilde{A}] = \tilde{\alpha} \sim N[0, \tau_a^{-1}]$), and a stochastic aggregate-level component $\tilde{F}$ (such that $\log[\tilde{F}] = \tilde{f} \sim N[0, \tau_f^{-1}]$):

$$\tilde{Q}(K) = \tilde{A}\tilde{F}K. \tag{A1}$$

The model features four periods. In the first period, the central bank discloses a signal about the aggregate-level component of cash flow:

$$\tilde{\eta} = \tilde{f} + \tilde{\varepsilon}_\eta, \tag{A2}$$

where $\tilde{\varepsilon}_\eta \sim N[0, \tau_\eta^{-1}]$, and the manager discloses a signal about the aggregate-level component of cash flow:

$$\tilde{\varpi} = \tilde{\alpha} + \tilde{\varepsilon}_\varpi, \tag{A3}$$

where $\tilde{\varepsilon}_\varpi \sim N[0, \tau_\varpi^{-1}]$. We interpret the central bank's disclosure as a disclosure of some of the bank's private expectations about the current and future state of the economy. We operationalize the concept of central bank transparency as the precision of this aggregate-level disclosure τ_η. We interpret the manager's disclosure as a disclosure of some of the manager's private expectations about the firm's current or future performance, i.e., managerial guidance.

In the second stage, a continuum of speculators and noise traders trade for the claim $\tilde{V}$ of the firm's cash flow that remains after deducting a share β to compensate the manager, i.e., the firm's stock:

$$\tilde{V} = (1-\beta)\tilde{Q}. \tag{A4}$$

Speculator i can either buy or sell a share of the firm's stock $d(i)\,\epsilon\,[-1,1]$ for the endogenously determined stock price $\tilde{P}$ to maximize his trading profit:

$$max_{d(i)\,\epsilon\,[-1,1]}\, d(i)E[\tilde{V}-\tilde{P}\big|\mathcal{I}_i]. \tag{A5}$$

$\mathcal{I}_i$ denotes speculators' information set, which comprises all publicly available information as well as private information about the firm-level component ($\tilde{x}_i = \tilde{a} + \tilde{\varepsilon}_{x,i}$ where $\tilde{\varepsilon}_{x,i}\sim N[0,\tau_x^{-1}]$) as well as the aggregate-level component ($\tilde{y}_i = \tilde{f} + \tilde{\varepsilon}_{y,i}$ where $\tilde{\varepsilon}_{y,i}\sim N[0,\tau_y^{-1}]$). Noise traders exogenously supply shares via:

$$L\big(\tilde{\xi},\tilde{P}\big) = 1 - 2\Phi\big(\xi - \lambda\log[\tilde{P}]\big), \tag{A6}$$

where $\tilde{\xi}_{\varpi}\sim N[0,\tau_{\xi}^{-1}]$ denotes an exogenous demand shock, $\Phi(\cdot)$ the cumulative normal distribution, and $\lambda > 0$ noise trader supply elasticity. Thus, noise trader supply increases in price and decreases in noise trader demand. The market clears by equating aggregate speculator demand $D = \int_0^1 d(i)di$ to noise trader supply.

In the third period, the manager invests in the firm's capital to maximize her expected payoff:

$$max_K\, E\left[\beta\tilde{Q} - \frac{1}{2}cK^2\Big|\mathcal{I}_R\right]. \tag{A7}$$

$\mathcal{I}_R$ denotes the manager's information set, which comprises all publicly available information (including stock price $\tilde{P}$ that was formed in the previous period), as well as private information about the firm-level and the aggregate-level component. To maintain analytical tractability, Goldstein and Yang (2019) assume that the manager observes the firm-level component perfectly but does not have private information about the aggregate-level component. However, for the model's inferences to hold, one only needs the weaker assumption that the ratio of the precision

of the manager's private information about the firm-level component relative to the precision of the manager's private information about the aggregate-level component is larger than that of speculators. In other words, the manager needs to know more than speculators do about the firm-level relative to the aggregate-level component. This assumption is intuitively appealing and supported by findings in prior research (Maćkowiak and Wiederholt 2009; Hutton et al. 2012; Binz et al. 2023a). In the fourth and final period, the firm's cash flow realizes, and all agents consume their proceeds.

A.2. The Effect of Central Bank Economic Transparency

Given Goldstein and Yang's (2019) assumption that the manager knows the firm-level component perfectly, she only needs to infer the aggregate-level component. An increase in CBET τ_η affects the efficiency of the manager's investment ($RE = E\left[\tilde{A}\tilde{F}K^* - \frac{1}{2}cK^{*2}\right]$, where K^* is the manager's optimal choice of capital) in two ways captured by Goldstein and Yang's (2019) Equation (23):

$$\frac{\partial RE}{\partial \tau_\eta} \propto \frac{\partial\left(\tau_f + \tau_\eta + \tau_p\right)}{\partial \tau_\eta} = 1 + \frac{\partial \tau_p}{\partial \tau_\eta}, \tag{A8}$$

where τ_p is the precision of the signal about the aggregate-level component that the manager can extract from observing P. That is, CBET affects investment efficiency through a direct information effect and an indirect learning effect. With respect to the direct information effect, CBET directly increases investment efficiency by providing the manager with more information about the aggregate-level component (the 1 on the right-hand side of the equation). With respect to the indirect learning effect, CBET indirectly decreases investment efficiency through its effect on τ_p (Goldstein and Yang's (2019) Equation (26) shows that $\frac{\partial \tau_p}{\partial \tau_\eta} < 0$). Higher CBET causes speculators

to rely less on their private information about the aggregate-level component and thereby makes stock price less decision-useful to managers.

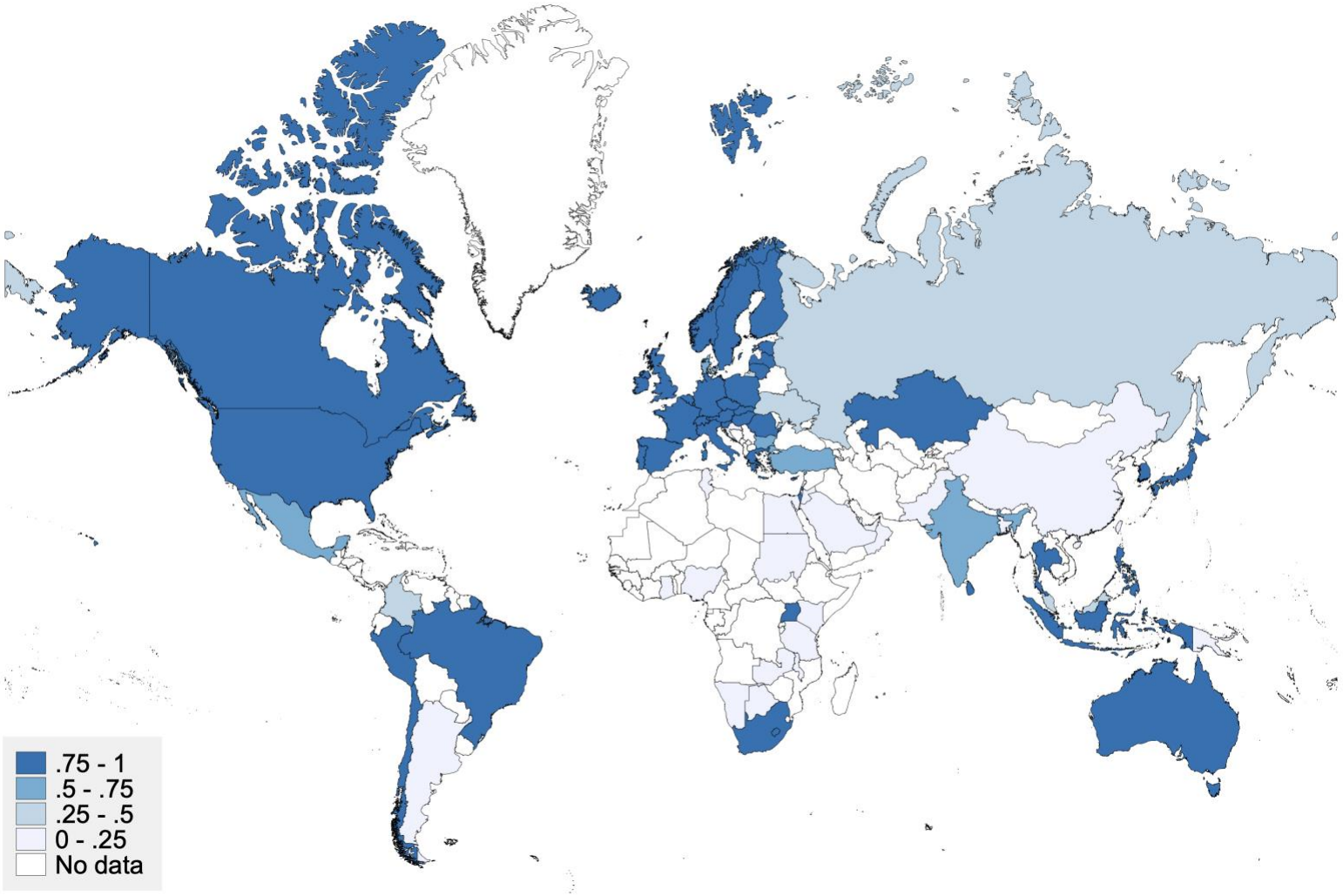
A.3. The Effect of Managerial Guidance

In contrast to more precise disclosure about the aggregate-level component (i.e., higher CBET), more precise disclosure about the firm-level component τ_{ϖ} (i.e., managerial guidance) has only an indirect effect on investment efficiency (Goldstein and Yang 2019, Equation (28)):

$$\frac{\partial RE}{\partial \tau_{\varpi}} \propto \frac{\partial \tau_p}{\partial \tau_{\varpi}} > 0. \tag{A8}$$

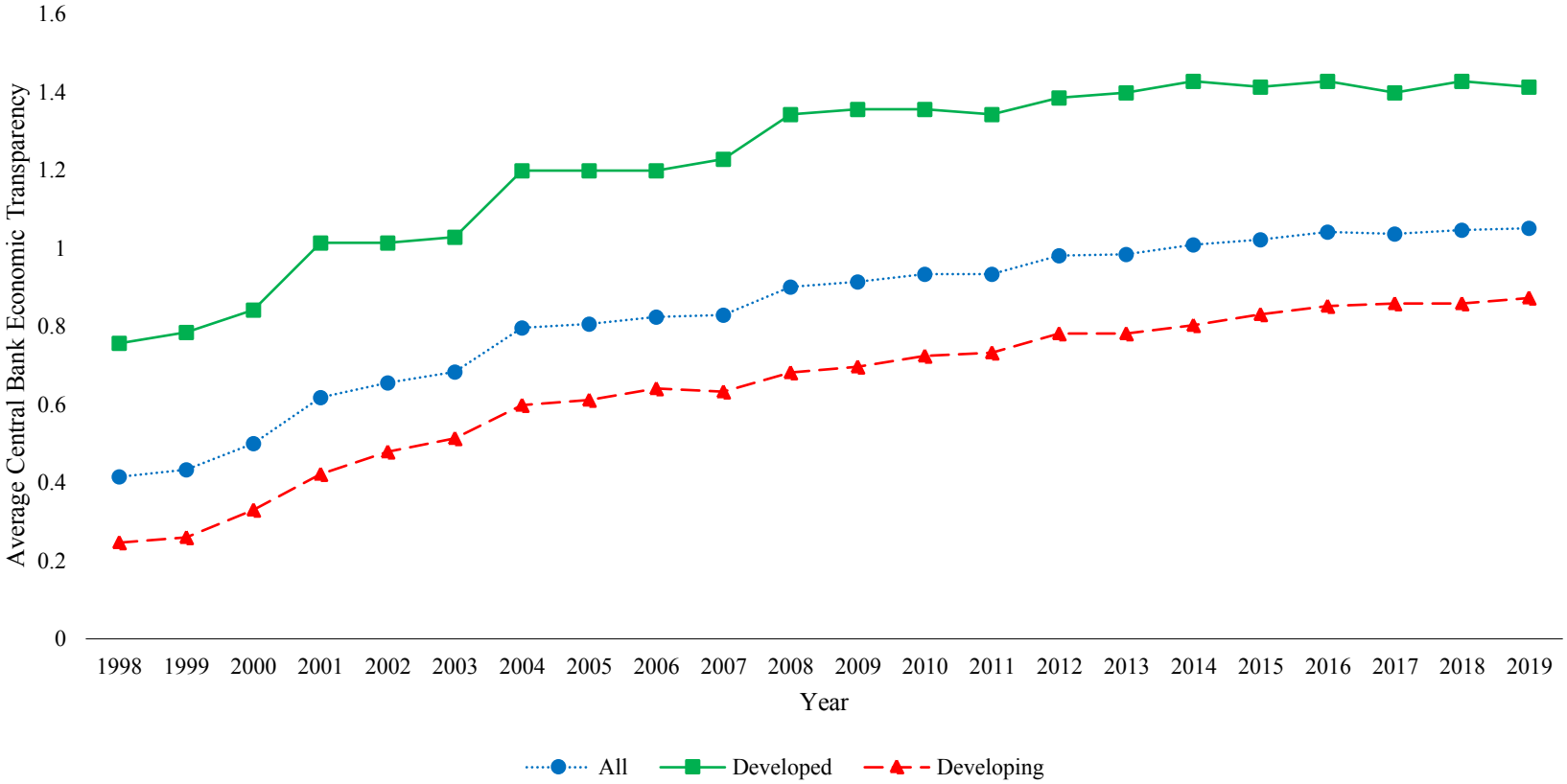
More precise managerial guidance causes the speculators to rely more on their private information about the aggregate-level component in their trading. As a result, prices become more useful to managers, and investment efficiency increases.

Figure 1. Central Bank Economic Transparency by Country



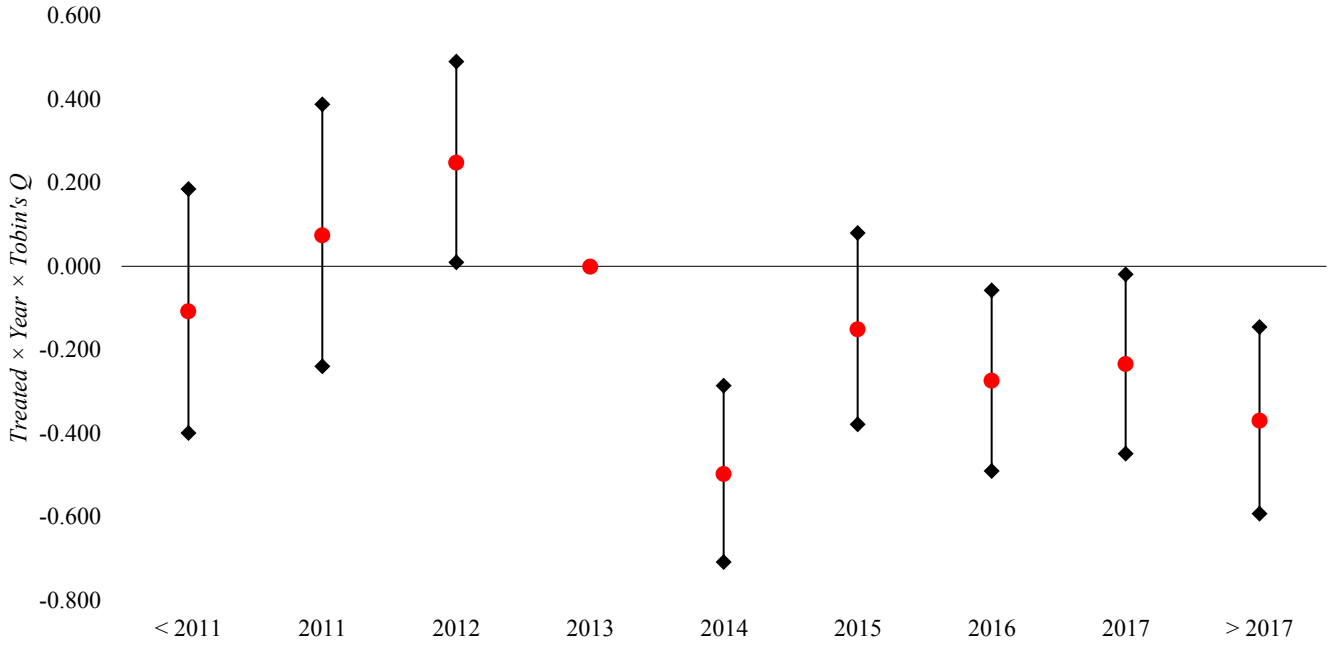
This figure depicts the average of our central bank economic transparency score (*CBET*) by country.

Figure 2. Central Bank Economic Transparency over Time



This figure plots the average of our central bank economic transparency score (*CBET*) for all, developed, and developing countries over time.

Figure 3. Parallel Trends



This figure tests the parallel trends assumption of our difference-in-differences design by regressing *Investment* on an indicator that equals one if the firm is headquartered in the UK and zero if it is a propensity-score-matched firm drawn from the US or the EMU (*Treated*) interacted with fiscal year indicators and *Tobin's Q*, controls, and firm and country-year fixed effects. The figure displays the slope coefficients and 90% confidence intervals for the interaction terms. 2013 constitutes the base year. Continuous variables are standardized to facilitate interpretation. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 1. Sample Composition

Country	Observations	Percent	Country	Observations	Percent
Argentina	224	0.13	Kuwait	212	0.12
Australia	3,640	2.07	Latvia	28	0.02
Austria	432	0.25	Lithuania	94	0.05
Bahrain	65	0.04	Luxembourg	111	0.06
Bangladesh	73	0.04	Malaysia	3,300	1.88
Belgium	613	0.35	Mauritius	70	0.04
Bermuda	1,458	0.83	Mexico	446	0.25
Botswana	17	0.01	Namibia	16	0.01
Brazil	541	0.31	Netherlands	774	0.44
British Virgin Islands	28	0.02	New Zealand	530	0.30
Bulgaria	142	0.08	Nigeria	205	0.12
Canada	4,255	2.42	Norway	798	0.45
Cayman Islands	2,336	1.33	Oman	334	0.19
Chile	525	0.30	Pakistan	888	0.50
China	25,103	14.27	Papua New Guinea	19	0.01
Colombia	126	0.07	Peru	132	0.08
Croatia	177	0.10	Philippines	351	0.20
Cyprus	110	0.06	Poland	1,628	0.93
Czech	41	0.02	Portugal	293	0.17
Denmark	568	0.32	Qatar	139	0.08
Egypt	382	0.22	Romania	152	0.09
Estonia	144	0.08	Russia	420	0.24
Finland	886	0.50	Saudi Arabia	749	0.43
France	3,712	2.11	Singapore	1,534	0.87
Germany	3,849	2.19	Slovakia	4	0.00
Ghana	50	0.03	Slovenia	94	0.05
Greece	744	0.42	South Africa	1,566	0.89
Guernsey	30	0.02	Spain	647	0.37
Hong Kong	611	0.35	Sri Lanka	592	0.34
Hungary	120	0.07	Sweden	1,490	0.85
Iceland	26	0.01	Switzerland	1,513	0.86
India	9,541	5.43	Tanzania	6	0.00
Indonesia	1,507	0.86	Thailand	2,719	1.55
Ireland	275	0.16	Tunisia	214	0.12
Isle of Man	38	0.02	Turkey	1,172	0.67
Israel	568	0.32	Uganda	14	0.01
Italy	1,486	0.84	Ukraine	31	0.02
Japan	43,210	24.57	United Arab Emirates	182	0.10
Jordan	101	0.06	United Kingdom	7,828	4.45
Kazakhstan	21	0.01	United States	29,630	16.85
Kenya	135	0.08	Zambia	35	0.02
Korea	6,989	3.97	Total	175,859	100.00

This table presents our sample composition by country.

Table 2. Descriptive Statistics

Panel A. Full Sample

Variable	Observations	Mean	Std	P25	Median	P75
Investment	175,859	0.050	0.055	0.016	0.034	0.065
Tobin's Q	175,859	1.768	2.762	0.915	1.197	1.811
ROA	175,859	0.029	0.109	0.008	0.034	0.070
Profit Margin	175,859	-0.056	1.414	0.008	0.036	0.082
Asset Turnover	175,859	1.035	0.680	0.581	0.898	1.313
CBET	175,859	0.786	0.410	1.000	1.000	1.000
MPE	175,859	0.500	0.500	0.000	0.000	1.000
Loss	175,859	0.182	0.386	0.000	0.000	0.000
Dividend Yield	175,859	0.013	0.022	0.000	0.004	0.015
Dividend Payer	175,859	0.595	0.491	0.000	1.000	1.000
Leverage	175,859	0.213	0.175	0.055	0.193	0.332
Size	175,859	6.132	1.784	4.932	6.008	7.238
Cash Flow	175,859	0.068	0.103	0.027	0.069	0.116
Δ*Cash Flow*	175,859	0.006	0.090	-0.030	0.005	0.041
|*EA Return*|	175,859	0.014	0.027	0.000	0.002	0.014
Future Return	175,859	0.118	0.491	-0.002	0.005	0.121

Panel B. Descriptive Statistics by *MPE*

	Mean	Std	Mean	Std	
			MPE		
Sample	High		Low		High – Low
Investment	0.051	0.053	0.050	0.057	0.001***
Tobin's Q	1.800	3.022	1.736	2.475	0.064***
Loss	0.141	0.349	0.223	0.416	-0.082***
Dividend Yield	0.014	0.021	0.011	0.023	0.003***
Dividend Payer	0.780	0.414	0.410	0.492	0.370***
Leverage	0.231	0.177	0.196	0.171	0.035***
Size	6.896	1.694	5.368	1.526	1.529***
Cash Flow	0.073	0.082	0.064	0.120	0.009***
Δ*Cash Flow*	0.006	0.077	0.006	0.102	0.000
|*EA Return*|	0.006	0.017	0.021	0.032	-0.015***
Future Return	0.050	0.241	0.186	0.644	-0.135***

Panel A [Panel B] presents the descriptive statistics for the full sample [by *MPE* status]. All variables are defined in Appendix A.

Table 3. Correlation Matrix

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Investment	1	1.00	0.18	0.20	0.18	0.02	-0.08	0.05	-0.13	0.07	0.03	0.12	0.14	0.29	0.03	0.05	0.03
Tobin's Q	2	0.06	1.00	0.38	0.34	0.00	-0.20	0.00	-0.13	0.11	-0.08	-0.12	0.04	0.23	0.04	0.23	0.06
ROA	3	0.10	0.05	1.00	0.88	0.20	-0.03	0.03	-0.67	0.40	0.23	-0.28	0.07	0.56	0.14	0.07	0.14
Profit Margin	4	0.00	-0.03	0.36	1.00	-0.17	-0.14	0.05	-0.67	0.35	0.20	-0.22	0.14	0.46	0.12	0.05	0.11
Asset Turnover	5	-0.04	-0.03	0.16	0.09	1.00	0.27	-0.01	-0.13	0.14	0.13	-0.09	-0.14	0.19	0.04	0.00	0.06
CBET	6	-0.08	-0.08	-0.05	-0.03	0.21	1.00	-0.03	0.09	0.09	0.13	-0.01	-0.07	0.08	-0.01	0.02	-0.01
MPE	7	0.01	0.01	0.08	0.05	-0.03	-0.03	1.00	-0.11	0.26	0.38	0.11	0.43	0.01	0.00	-0.40	-0.16
Loss	8	-0.07	-0.02	-0.60	-0.20	-0.11	0.09	-0.11	1.00	-0.31	-0.30	0.11	-0.18	-0.35	-0.10	0.07	-0.09
Dividend Yield	9	0.04	0.12	0.32	0.06	0.10	0.02	0.06	-0.19	1.00	0.88	-0.17	0.16	0.29	0.01	-0.06	0.05
Dividend Payer	10	-0.02	-0.07	0.23	0.10	0.10	0.13	0.38	-0.30	0.46	1.00	-0.07	0.22	0.16	0.00	-0.20	-0.02
Leverage	11	0.11	-0.07	-0.14	0.02	-0.11	-0.01	0.10	0.13	-0.18	-0.09	1.00	0.25	-0.13	-0.02	-0.04	-0.03
Size	12	0.05	-0.01	0.17	0.10	-0.12	-0.05	0.43	-0.18	0.03	0.23	0.23	1.00	0.12	0.00	0.02	0.04
Cash Flow	13	0.20	0.04	0.65	0.27	0.15	0.03	0.05	-0.36	0.31	0.17	-0.10	0.16	1.00	0.49	0.11	0.17
Δ*Cash Flow*	14	0.04	0.01	0.13	0.03	0.04	0.00	0.00	-0.08	0.03	-0.01	-0.02	-0.01	0.47	1.00	0.03	0.05
|EA Return|	15	0.00	0.00	-0.09	-0.06	0.07	0.17	-0.29	0.12	0.02	-0.14	-0.03	-0.04	0.00	0.01	1.00	0.25
Future Return	16	0.00	-0.02	0.06	0.04	0.06	0.07	-0.14	-0.02	0.04	-0.03	-0.02	0.00	0.10	0.03	0.18	1.00

This table presents the correlation matrix for our sample. Pearson (Spearman) correlations are below (above) the diagonal. Variables are defined in Appendix A.

Table 4. Central Bank Economic Transparency and Investment-Price Sensitivity

Variables	(1)	(2)	(3)	(4)
	Investment			
MPE	0.155***	0.070***	0.107***	0.037**
	(8.99)	(4.61)	(6.57)	(2.43)
MPE × CBET	-0.007	-0.025	-0.047**	-0.008
	(-0.36)	(-1.46)	(-2.45)	(-0.46)
Tobin's Q_{t-1}	0.052***	0.079***	0.074***	0.090***
	(3.42)	(3.63)	(4.85)	(4.18)
MPE × Tobin's Q_{t-1}	0.016	0.041**	0.004	0.028
	(0.79)	(1.97)	(0.22)	(1.35)
CBET × Tobin's Q_{t-1}	0.005	0.080***	0.013	0.057**
	(0.30)	(3.22)	(0.69)	(2.33)
MPE × CBET × Tobin's Q_{t-1}	**-0.041***	**-0.077*****	**-0.066*****	**-0.062*****
	(-1.86)	**(-3.36)**	**(-2.78)**	**(-2.75)**
Loss			-0.007	-0.108***
			(-0.76)	(-15.24)
Dividend Yield			-0.052***	-0.006
			(-8.72)	(-1.23)
Dividend Payer			0.049***	0.066***
			(4.10)	(6.49)
Leverage			0.120***	0.046***
			(23.26)	(6.63)
Size			-0.003	0.100***
			(-0.44)	(5.61)
Cash Flow			0.252***	0.075***
			(28.26)	(12.16)
Δ*Cash Flow*			-0.082***	-0.023***
			(-18.89)	(-7.41)
|*EA Return*|			0.002	-0.002
			(0.58)	(-0.94)
Future Return			-0.031***	-0.021***
			(-7.07)	(-6.67)
Observations	175,859	175,859	175,859	175,859
Adjusted R-squared	0.088	0.495	0.141	0.500
Country-Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	Yes	No	Yes

This table regresses *Investment* on central bank economic transparency (*CBET*) interacted with monetary policy exposure (*MPE*) and *Tobin's Q*, controls, and fixed effects. Continuous variables are standardized to facilitate interpretation. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Robustness Tests

Robustness Test	(1) *Raw MPT*	(2) *Adjusted Tobin's Q*	(3) *More Stringent FE*	(4) *Cluster SE by Firm and Year*	(5) *Drop US and Japan Observations*
Variables			*Investment*		
MPE	0.029***	0.039**	0.021	0.037**	0.029*
	(3.83)	(2.47)	(1.39)	(2.23)	(1.85)
MPE × *CBET*	-0.011*	-0.012	0.056***	-0.008	0.036
	(-1.75)	(-0.68)	(3.22)	(-0.43)	(1.62)
Tobin's Q_{t-1}	0.134***	0.054***		0.090***	0.097***
	(12.18)	(5.55)		(3.28)	(4.50)
MPE × *Tobin's* Q_{t-1}	-0.023***	0.004	0.073***	0.028	0.017
	(-2.75)	(0.41)	(3.24)	(1.23)	(0.81)
CBET × *Tobin's* Q_{t-1}	0.012	0.045***		0.057*	0.025
	(1.14)	(3.28)		(1.91)	(1.01)
***MPE* × *CBET* × *Tobin's* Q_{t-1}**	**-0.023****	**-0.031****	**-0.083*****	**-0.062****	**-0.050****
	(-2.40)	**(-2.36)**	**(-3.48)**	**(-2.53)**	**(-2.18)**
Observations	175,859	173,315	175,859	175,859	103,019
Adjusted R-squared	0.500	0.500	0.481	0.500	0.451
Country-Year FE	Yes	Yes	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Year-*Tobin's Q* FE	No	No	Yes	No	No
Controls	Yes	Yes	Yes	Yes	Yes

This table regresses *Investment* on central bank economic transparency (*CBET*) interacted with monetary policy exposure (*MPE*) and *Tobin's Q*, controls, and fixed effects. Continuous variables are standardized to facilitate interpretation. All variables are defined in Appendix A. Standard errors are clustered by firm [firm and year in column (4)]. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6. Cross-Sectional Analyses

Panel A. Management Guidance

	(1)		(2)
		Management Guidance	
Sample	Low		High
Variables		*Investment*	
MPE × *CBET* × *Tobin's* Q_{t-1}	-0.049**		1.452
	(-2.15)		(0.94)
Observations	125,285		49,142
Adjusted R-squared	0.467		0.635
Controls	Yes		Yes
Country-Year Fixed Effects	Yes		Yes
Firm Fixed Effects	Yes		Yes
High − Low p-value		0.000	

Panel B. Noise Trading

	(1)		(2)
		Noise Trading	
Sample	Low		High
Variables		*Investment*	
MPE × *CBET* × *Tobin's* Q_{t-1}	-0.068***		0.093**
	(-2.60)		(2.18)
Observations	86,818		86,579
Adjusted R-squared	0.522		0.503
Controls	Yes		Yes
Country-Year Fixed Effects	Yes		Yes
Firm Fixed Effects	Yes		Yes
High − Low p-value		0.000	

Panel A [Panel B] regresses *Investment* on central bank economic transparency (*CBET*) interacted with monetary policy exposure (*MPE*) and *Tobin's Q*, controls, and fixed effects separately for firms that do not or do provide firm-level management guidance (*Management Guidance*) [with below and above within-year median Amihud (2002) illiquidity (*Noise Trading*)]. The last row (*High – Low*) present the p-value of a 1,000-repetition bootstrap analysis testing whether the coefficients in Columns (1) and (2), (3) and (4), or (5) and (6) are statistically different. Continuous variables are standardized to facilitate interpretation. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7. Central Bank Economic Transparency and Information Acquisition

Variables	(1)	(2)	(3)	(4)
	Aggregate/Firm Search			
MPE	0.183*	0.241	0.173*	0.237
	(1.89)	(1.56)	(1.78)	(1.53)
MPE × CBET	**-0.188***	**-0.278***	**-0.196****	**-0.273***
	(-1.94)	**(-1.79)**	**(-2.01)**	**(-1.75)**
Loss			0.010	-0.001
			(0.81)	(-0.08)
Dividend Yield			-0.002	-0.011
			(-0.37)	(-0.91)
Dividend Payer			0.014	0.062**
			(1.00)	(2.17)
Leverage			-0.005	-0.007
			(-1.25)	(-0.43)
Size			0.013***	-0.091*
			(3.00)	(-1.65)
Cash Flow			-0.010*	-0.017
			(-1.82)	(-1.18)
Δ*Cash Flow*			0.000	0.003
			(0.05)	(0.42)
|*EA Return*|			-0.005	-0.005
			(-1.05)	(-0.99)
Future Return			0.003	0.001
			(0.49)	(0.11)
Observations	64,421	64,421	64,421	64,421
Adjusted R-squared	0.174	0.119	0.174	0.120
Country-Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	Yes	No	No

This table regresses the ratio of aggregate-level to firm-level search intensity (*Aggregate/Firm Search*) on central bank economic transparency (*CBET*) interacted with monetary policy exposure (*MPE*), controls, and fixed effects. Continuous variables are standardized to facilitate interpretation. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8. Central Bank Economic Transparency and Investment Efficiency

Variables	(1) *ROA*	(2) *Profit Margin*	(3) *Asset Turnover*	(4) *PPE Turnover*	(5) *Inventory Turnover*
MPE	0.012	0.016*	0.119***	0.071***	0.026***
	(1.56)	(1.92)	(15.14)	(8.75)	(2.87)
MPE* × *CBET	**-0.048*** **	**0.003**	**-0.064*** **	**-0.059*** **	**-0.022***
	(-4.99)	**(0.30)**	**(-7.10)**	**(-5.88)**	**(-1.92)**
Loss	-0.901***	-0.162***	-0.137***	-0.071***	-0.028***
	(-102.78)	(-21.01)	(-32.63)	(-12.88)	(-5.61)
Dividend Yield	0.089***	-0.001	0.026***	0.008**	0.010**
	(18.29)	(-0.32)	(7.28)	(1.97)	(2.06)
Dividend Payer	-0.080***	-0.010**	-0.015**	-0.015*	-0.015**
	(-12.34)	(-2.06)	(-2.49)	(-1.87)	(-2.16)
Leverage	-0.108***	0.008	-0.045***	-0.032***	-0.009*
	(-19.94)	(1.20)	(-10.49)	(-5.83)	(-1.82)
Size	0.274***	0.120***	-0.357***	-0.084***	-0.032*
	(18.30)	(5.39)	(-23.35)	(-4.27)	(-1.69)
Cash Flow	0.440***	0.123***	0.097***	0.032***	0.029***
	(31.38)	(9.25)	(23.22)	(4.51)	(5.97)
Δ*Cash Flow*	-0.119***	-0.033***	-0.014***	-0.003	-0.008***
	(-19.50)	(-4.89)	(-6.69)	(-0.87)	(-3.01)
|*EA Return*|	-0.007**	-0.003	0.007***	0.003	-0.002
	(-2.30)	(-0.77)	(4.59)	(1.37)	(-1.08)
Future Return	-0.014***	0.014***	0.004**	0.002	0.002
	(-4.44)	(2.94)	(2.10)	(0.77)	(0.72)
Observations	175,859	175,859	175,859	175,859	175,859
Adjusted R-squared	0.715	0.569	0.886	0.792	0.777
Country-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes

This table regresses various measures of investment efficiency (*ROA*, *Profit Margin*, *Asset Turnover*, *PPE Turnover*, and *Inventory Turnover*) on central bank economic transparency (*CBET*) interacted with monetary policy exposure (*MPE*), controls, and fixed effects. Continuous variables are standardized to facilitate interpretation. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 9. Amendments to the Bank of England's Inflation Report

	(1)	(2)	(3)
Sample	*All Countries*	*All Countries (PSM)*	*UK/US/EMU (PSM)*
Variables		*Investment*	
Tobin's Q_{t-1}	0.147***	0.132**	-0.096
	(9.33)	(2.46)	(-0.84)
Treated × *Tobin's* Q_{t-1}	0.096	0.345**	0.414***
	(0.97)	(2.20)	(2.93)
Post × *Tobin's* Q_{t-1}	-0.008	-0.016	0.192*
	(-0.82)	(-1.18)	(1.83)
Treated* × *Post* × *Tobin's Q_{t-1}	**-0.125***	**-0.193****	**-0.340*****
	(-1.85)	**(-2.09)**	**(-2.74)**
Loss	-0.103***	-0.013	-0.008
	(-9.58)	(-0.34)	(-0.18)
Dividend Yield	0.002	0.011	-0.076
	(0.21)	(0.49)	(-1.42)
Dividend Payer	0.060***	0.005	0.104
	(4.15)	(0.10)	(1.28)
Leverage	0.055***	0.002	0.099*
	(5.02)	(0.05)	(1.89)
Size	0.322***	0.208*	-0.071
	(10.26)	(1.65)	(-0.40)
Cash Flow	0.066***	0.077**	0.148***
	(7.76)	(2.10)	(3.16)
Δ*Cash Flow*	-0.021***	-0.038**	-0.055**
	(-4.56)	(-2.14)	(-2.33)
|*EA Return*|	0.001	0.007	0.002
	(0.31)	(0.58)	(0.10)
Future Return	-0.019***	-0.056***	-0.057**
	(-4.21)	(-3.74)	(-2.43)
Observations	90,761	6,586	2,230
Adjusted R-squared	0.500	0.550	0.659
Country-Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes

This table reports estimated coefficients from regressing *Investment* on an indicator that the firm is headquartered in the UK (*Treated*) interacted with an indicator that the year is 2014 or later and *Tobin's Q*, controls, and fixed effects. Control firms are represented alternatively by all non-UK firms in our sample (Column (1)), propensity-score-matched firms drawn from all non-UK firms (Column (2)), and propensity-score-matched firms drawn from the US or the EMU (Column (3)). Continuous variables are standardized to facilitate interpretation. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.