The Information-Leveling Role of Voluntary Disclosure Quality in Facilitating Investment Efficiency

Abstract

This study examines whether and under what conditions voluntary disclosure quality plays an information-leveling role in facilitating investment efficiency. Measuring voluntary disclosure quality as the (inverse) standard deviation of managers' prior earnings forecast errors (i.e., management forecast consistency), we document a positive association between management forecast consistency and investment efficiency that strengthens when the information environment becomes more constrained and when there are negative shocks to financial reporting quality. We also find that the management forecast consistency/investment efficiency association strengthens when firms are younger, faster growing, and financially constrained, but not when firms are weakly governed and financially unconstrained, which suggests that voluntary disclosure quality facilitates investment efficiency by mitigating adverse selection (but not moral hazard) frictions. Last, when we employ a changes-based model, we find that increases in management forecast consistency are associated with increases in investment efficiency, which mitigates concerns that voluntary disclosure quality's empirical link to investment efficiency is purely driven by managers' inherent forecasting abilities. Overall, we show that voluntary disclosure quality can facilitate investment efficiency when financial reporting and other elements of the information environment are constrained in their ability to mitigate market frictions that impede efficiency.

Keywords: management forecast properties, information environment, investment efficiency

1. Introduction

Prior research identifies information asymmetry between firms and external suppliers of capital as a key impediment to efficient capital investment. Information asymmetry impedes investment efficiency because capital suppliers are limited in their capacity to identify and monitor firms' investment activities, which creates market frictions such as adverse selection and moral hazard. Biddle and Hilary (2006) and Biddle, Hilary, and Verdi (2009) find that financial reporting quality can mitigate market frictions and increase investment efficiency by leveling the information playing field between firms and capital suppliers. However, financial reporting may be constrained in its information-leveling abilities for various reasons, including operating volatility (Bhattacharya, Desai, and Venkataraman 2013), reporting complexity (Guay, Samuels, and Taylor 2016; Balakrishnan, Blouin, and Guay 2019) and negative shocks to information quality (Gleason, Jenkins, and Johnson 2008; Kravet and Shevlin 2010). To the extent that information intermediaries and monitoring agents cannot compensate for firms' reporting deficiencies, market frictions may persist and ultimately curtail profitable investment opportunities, thereby reducing firm- and macro-level investment efficiency.

When firms operate in constrained information environments, theoretical research predicts that managers will seek to resolve information problems through voluntary disclosure (Verrecchia 1990, 2001). Empirical evidence supports this prediction and suggests that voluntary disclosure can alleviate information transparency issues (Balakrishnan et al. 2019) and improve liquidity in firms' shares (Balakrishnan, Billings, Kelly, and Ljungqvist 2014). As these outcomes are consistent with voluntary disclosure serving an information-leveling purpose, a natural question arises as to whether voluntary

disclosure plays a similar role to financial reporting in facilitating investment efficiency, particularly when the broader information environment is constrained in its ability to mitigate market frictions that impede investment efficiency. In this study, we examine this question and we predict that as the information environment becomes more constrained, voluntary disclosure quality becomes more instrumental in facilitating investment efficiency through information leveling.

While our analysis employs a conventional proxy for investment efficiency, our proxy for voluntary disclosure quality is relatively novel. Specifically, we follow Hilary, Hsu, and Wang (2014) and measure voluntary disclosure quality as the (inverse) standard deviation of managers' prior earnings forecast errors, hereafter referred to as management forecast consistency (MFC). Hilary et al. (2014) show that investors and analysts are more responsive to management forecasts when prior MFC is higher and that this effect is more economically significant and statistically robust than the effect of prior management forecast accuracy (MFA). A key advantage to using MFC as our voluntary disclosure quality proxy is that, by measuring the second moment of management forecast errors, it captures the precision of managers' disclosure signals. Precision is a defining attribute of information quality in theoretical disclosure models (Verrecchia 2001) and precision is routinely used in empirical studies when conceptualizing and operationalizing financial reporting and disclosure quality (Biddle et al. 2009; Ng 2011; Bhattacharya, Ecker, Olsson, and Schipper 2012; Roychowdhury, Shroff, and Verdi 2019).[1] Thus, there is strong

[1] Biddle et al. (2009) define financial reporting quality as "the precision with which financial reporting conveys information about the firm's operations, in particular its expected cash flows, that inform equity investors" (pp. 113). In their empirical analysis linking financial reporting quality to investment efficiency, Biddle et al. (2009) use two second moment measures (both capturing accruals quality) to proxy for financial reporting quality.

theoretical and empirical appeal to using MFC as the focal measure of voluntary disclosure quality in our study.[2]

Using a sample of U.S. publicly traded firms from 1998 to 2017, we begin our analysis by examining the baseline association between MFC and investment efficiency. We find that high MFC firms (i.e., firms with high voluntary disclosure quality) invest more efficiently in capital expenditures than low MFC firms. This result holds even after we control for a battery of variables that capture potential confounding factors such as financial reporting quality, managerial forecasting ability, and corporate governance.

After documenting a baseline association between MFC and investment efficiency, we then examine whether this association strengthens as the information environment becomes more constrained. Using a variety of cross sectional attributes to measure information environment constraints, we find that the MFC/investment efficiency association strengthens when attributes indicate poorer environments (e.g., lower accruals quality, higher earnings and cash flow volatility, smaller firm size, lower analyst following). These results suggest that voluntary disclosure quality facilitates investment efficiency when outsiders are more constrained in their ability to identify and monitor firms' investment activities, consistent with voluntary disclosure quality mitigating these constraints through information leveling.

Next, we examine whether the MFC/investment efficiency association strengthens following negative shocks to accounting quality. Gleason, Jenkins, and Johnson (2008) and Kravet and Shevlin (2010) find that investors' perceptions of a firm's accounting quality

[2] While we do not use MFA as our focal measure of voluntary disclosure quality, we control for the effect of MFA throughout our empirical analysis because MFA could capture managers' inherent forecasting abilities. We discuss the potential confounding effect of managers' inherent forecasting abilities later in the introduction.

decline when industry peer firms restate their earnings, which suggests that restatements trigger accounting contagion effects that lead investors to question the quality of financial statements throughout the industry. In such cases, voluntary disclosure quality may serve as a substitute for financial reporting quality as an information-leveling mechanism. Consistent with this idea, we find that the MFC/investment efficiency association strengthens in the two years following peer restatement events relative to the two immediately preceding years.

With evidence that the MFC/investment efficiency association strengthens in weak information settings, we next examine whether the association strengthens for firms that are prone to investment distortions because of market frictions (adverse selection or moral hazard) that arise in such settings. Biddle et al. (2009) and Cheng, Dhaliwal, and Zhang (2013) find that financial reporting quality curbs under-investment (over-investment) among firms that are financially constrained (unconstrained). These results are consistent with financial reporting quality faciliting investment efficiency by improving outsiders' ability to identify and direct capital toward good investments as well as to monitor managers with the means to pursue bad investments. If voluntary disclosure quality provides similar benefits in constrained information environments, then the MFC/investment efficiency association should strengthen for financially constrained and unconstrained firms. Using financial resource availability measures adapted from Biddle et al. (2009) and Cheng et al. (2013), we find the the MFC/investment efficiency relation strengthens for financially constrained firms, but not for financially unconstrained firms. We also perform tests that examine whether the MFC/investment efficiency association strengthens for young and growing firms (i.e., firms that rely heavily on external funding

for investment) as well as for weakly governed firms (i.e., firms with poor monitoring of investment activities). We find that the MFC/investment efficiency association strengthens for young and growing firms, but not for weakly governed firms. Collectively, these results suggest that voluntary disclosure quality is more influential in facilitating investment efficiency when firms are more likely to have high demand for external capital, but they do not suggest that voluntary disclosure quality significantly deters wasteful investment. Thus, our evidence is consistent with voluntary disclosure quality mitigating adverse selection frictions that impede investment efficiency, but not moral hazard frictions.

Goodman, Neamtiu, Shroff, and White (2014) argue that the quality of managers' public earnings forecasts is likely to capture the quality of their private forecasts of investment project payoffs. Consistent with this argument, the authors find that managers with more accurate earnings forecast track records make higher quality investment decisions. Thus, a potential alternative explanation of our results is that managers' broader forecasting abilities (rather than information leveling) drive the observed relations between MFC and investment efficiency. Although we control for the effect of accuracy in our empirical tests, we also perform two additional tests that provide further control for the effect of managers' forecasting abilities. First, we estimate a changes-based specification of our baseline model and we find that increases in MFC are associated with increases in investment efficiency. Second, we repeat all of our levels-based tests after adding the managerial ability score developed in Demerjian, Lev, and McVay (2012) as an additional control variable and our results continue to hold. Collectively, these results mitigate concerns that voluntary disclosure quality's empirical link to investment efficiency is

purely driven by managers' broader forecasting abilities.[3]

Our study contributes to the literature in a number of ways. First, we contribute to the literature on the determinants of investment efficiency by identifying a new channel through which management forecast quality links to investment efficiency. Whereas Goodman et al. (2014) show that such a link can arise because forecast quality can proxy for the quality of capital budgeting decisions, we show that such a link can also arise when forecast quality contributes to information leveling between firms and capital suppliers. Information leveling is commonly implicated as the channel linking financial reporting quality to investment efficiency (e.g., Bens and Monahan 2004; Biddle and Hilary 2006; Bushman, Piotroski, and Smith 2006; McNichols and Stubben 2008; Biddle et al. 2009; Cheng et al. 2013) and our results suggest that voluntary disclosure quality can similarly facilitate investment efficiency when the broader information environment is sufficiently constrained. Thus, our results align with disclosure incentives analyzed in theoretical studies (e.g., Fishman and Haggerty 1989; Verrecchia 2001) and they have important implications for firms that are prone to adverse selection problems (e.g., young, growing, and financially constrained firms).

Second, we contribute to a literature that examines the consequences of managers' forecasting track records (e.g., Williams 1996; Hutton and Stocken 2009; Yang 2012; Ng, Tuna, and Verdi 2013; Hilary et al. 2014). Prior studies in this area find that investors and analysts react more strongly and more quickly to management forecasts when prior forecasts are more accurate or consistent, which suggests that prior accuracy and

[3] Our analysis should not be interpreted as suggesting that forecasting skill does not improve investment efficiency (we strongly believe that it does). Nor should one view our analysis as a "horse race" between consistency and accuracy in terms of their respective abilities to "predict" investment efficiency.

consistency build forecast credibility. Indeed, some of these studies find that forecasting track records are especially influential when information uncertainty among investors is high (Hutton and Stocken 2009; Yang 2012). We extend this line of research by showing that past forecast consistency (MFC) is positively associated with investment efficiency, particularly in weaker information environments where forecast credibility is likely to matter more. Thus, our results suggest that the benefits of high quality forecast track records extend to real operational outcomes.

Third, we shed light on a specific channel through which MFC affects a firm's welfare. Hilary, Hsu, and Wang (2016) link MFC to higher profitability and firm value, but the way in which MFC facilitates these outcomes is unclear. Our results suggest that MFC may enhance performance and valuation by facilitating greater investment efficiency. We also show that the quality effect of MFC for quarterly forecasts extends to annual forecasts, which suggests MFC can be used to analyze settings where data is available on an annual (rather than quarterly) basis (e.g., audit quality, managerial incentives, segment reporting).

The remainder of this paper proceeds as follows. Section 2 provides background and develops our hypotheses. Section 3 describes our research design, sample, and data sources. Section 4 reports the main empirical results. Section 5 presents results of additional analyses and robustness tests. Section 6 concludes.

2. Background and hypothesis development

Investment frictions and financial reporting quality

Information asymmetry between firms and external suppliers of capital gives rise to market frictions that can impede capital investment efficiency (Jensen and Meckling 1976;

Myers and Majluf 1984; Jensen 1986). One type of friction, moral hazard, arises when incentive misalignment between managers and outsiders leads to suboptimal investment from the perspective of shareholders. Another type of friction, adverse selection, arises when managers are able to exploit their informational advantage over outsiders and seek capital when capital suppliers overvalue the firm. To the extent that the information environment does not allow capital suppliers to identify and monitor firms' investment activities, market frictions can lead to over-investment when managers are self-interested and/or opportunistic or under-investment when suppliers respond to informational problems by rationing capital.

One way to resolve market frictions that impede investment efficiency is to level the information playing field between firms and external suppliers of capital. Consistent with this idea, several studies find that financial reporting quality is positively associated with investment efficiency (e.g., Bens and Monahan 2004; Biddle and Hilary 2006; Bushman et al. 2006; McNichols and Stubben 2008; Biddle et al. 2009; Cheng et al. 2013). Financial reporting quality can reduce information asymmetry—and thereby promote investment efficiency—by making firms' investing activities more transparent, which helps outsiders to assess firms' investment prospects and gives managers a disincentive to invest in projects that diverge from shareholder interests.[4] Higher reporting quality is also likely to coincide with higher analyst coverage and institutional investor ownership (Lang and Lundholm 1996; Bushee and Noe 2000; De Franco, Kothari, and Verdi 2011), further enriching the information environment.

[4] Another information-leveling mechanism employed when firms seek investment capital is relationship banking, where banks demand various forms of private disclosure as a condition of lending (e.g., Biddle and Hilary 2006; Beatty, Liao, and Weber 2010).

While financial reporting quality can improve investment efficiency by reducing information asymmetry between firms and capital suppliers, prior research also suggests that financial reporting can be constrained in its information-leveling abilities. For example, the ability of accruals to map into cash flows is constrained by innate volatility in a firm's operating environment (Dechow and Dichev 2002; Francis, LaFond, Olsson, and Schipper 2005) and firms with low innate accruals quality tend to have higher information asymmetry (Bhattacharya et al. 2013). Moreover, firms with highly complex financial reports tend to issue more voluntary disclosures (Guay et al. 2016; Balakrishnan et al. 2019), which suggests that financial reporting complexity presents information-leveling challenges. Lastly, investors' perceptions of a firm's accounting quality decline when industry peer firms restate their earnings (Gleason et al. 2008; Kravet and Shevlin 2010), which suggests that restatements trigger industry-wide shocks to financial reporting quality that place outsiders at an informational disadvantage because of elevated information risk.

To summarize, while financial reporting quality can ease investment frictions by increasing the transparency of firms' investing activities, information leveling may be constrained because of financial reporting limitations that are beyond firms' immediate control. Such limitations, in turn, are likely to impair the ability of information intermediaries and monitoring agents to resolve information problems because poor transparency increases their information acquisition and processing costs and subjects them to higher information risk. In the next section, we discuss how voluntary disclosure quality could compensate for information environment deficiencies and facilitate investment efficiency through information leveling.

Voluntary disclosure as an information-leveling mechanism

Prior studies often predict that voluntary disclosure arises in an effort to reduce information asymmetry between firms and capital suppliers (Ajinkya and Gift 1984; Verrecchia 1990, 2001). Consistent with this prediction, empirical studies find that voluntary disclosure is positively associated with pre-disclosure bid-ask spreads (Coller and Yohn 1997) and financial reporting complexity (Guay et al. 2016), while it is negatively associated with pre-disclosure financial statement informativeness (Tasker 1998), analyst coverage (Balakrishnan et al. 2014) and corporate transparency (Balakrishnan et al. 2019). Many of these studies also provide evidence that suggests voluntary disclosure reduces information asymmetry, as voluntary disclosure appears to increase stock liquidity (Balakrishnan et al. 2014), decrease bid-ask spreads (Coller and Yohn 1997) and decrease analyst forecast errors (Balakrishnan et al. 2019). Moreover, higher voluntary disclosure quality is found to increase investors' and analysts' responsiveness to disclosure (Williams 1996; Hutton and Stocken 2009; Yang 2012; Ng, Tuna, and Verdi 2013; Hilary et al. 2014), which suggests that higher voluntary disclosure quality is likely to lead to greater information leveling. Thus, there is broad support in the literature for the information-leveling role of voluntary disclosure in the capital markets.

Given this support, it is natural to ask whether voluntary disclosure plays a similar role to financial reporting in facilitating investment efficiency. Compared to financial reporting, voluntary disclosure may be less effective at information leveling because voluntary disclosures are largely unaudited and thus more difficult to verify. In addition, the quality of a firm's financial reports and voluntary disclosures are likely to be similarly influenced by innate factors such as a firm's operating environment and business model,

which limits voluntary disclosure's information-leveling abilities when innate quality is high (because information asymmetry is already low) and when innate quality is low (because disclosure signals are more likely to be less precise). Nonetheless, theory suggests that verification difficulties may pose less of a constraint on information leveling when capital suppliers can assess the truthfulness of disclosures *ex post* (Stocken 2000) or when disclosures are issued in the presence of current or potential competitors (Gigler 1994). Moreover, theory predicts that firms may expend more resources on disclosure than is socially optimal to increase price efficiency and investment efficiency (Fishman and Hagerty 1989), which suggests that firms are willing to incur excessive costs to overcome low innate quality. Consequently, we expect higher voluntary disclosure quality to provide greater information leveling, which, in turns, facilitates greater investment efficiency. Thus, we form the following baseline hypothesis:

HYPOTHESIS 1. *Voluntary disclosure quality is positively associated with investment efficiency.*

While a positive association between voluntary disclosure quality and investment efficiency is consistent with disclosure facilitating investment efficiency through information leveling, it is also consistent with managerial forecasting abilities facilitating investment efficiency through effective capital budgeting (Goodman et al. 2014). Thus, we form additional hypotheses to better identify the information-leveling mechanism underlying the disclosure quality/investment efficiency association. First, we expect voluntary disclosure quality to provide greater information leveling when financial reporting and other elements of the information environment are more constrained in their information-leveling abilities. In highly constrained environments (e.g., low reporting

quality and low analyst coverage), capital suppliers are likely to have greater difficulties in identifying and monitoring firms' investment activities. Because market frictions are likely to be high in such environments, voluntary disclosure has a greater opportunity to facilitate investment efficiency through information leveling. By contrast, less constrained environments should make it easier for capital suppliers to identify and monitor firms' investment activities, so voluntary disclosure quality is less likely to incrementally contribute to information leveling. This leads to our next hypothesis:

HYPOTHESIS 2. *The positive association between voluntary disclosure quality and investment efficiency strengthens as the information environment becomes more constrained.*

Next, we expect the information-leveling role of voluntary disclosure quality to increase following negative shocks to financial reporting quality. As discussed earlier, Gleason et al. (2008) and Kravet and Shevlin (2010) find that a firm's perceived accounting quality declines when an industry peer firm restates their earnings. This suggests that peer firm restatement events provide negative accounting quality shocks that could increase a firm's (real or perceived) information advantage over outsiders. However, if firms maintain a track record of high quality voluntary disclosure, then such shocks may be less detrimental to the information environment, as voluntary disclosure can serve as a substitute for financial reporting as a means of information leveling. Consequently, the positive association between voluntary disclosure quality and investment efficiency is likely to strengthen in the aftermath of a peer firm restatement event. This leads to our third hypothesis:

HYPOTHESIS 3. *The positive association between voluntary disclosure quality and*

investment efficiency strengthens in the period following an accounting restatement by an industry peer firm relative to the immediately preceding period.

3. Baseline model and sample

Baseline model

Equation (1) below is our baseline regression model:

$$EFF\_CAP_{i,t+1} = \alpha_0 + \beta_1 * MFC_{i,t} + \sum_{j=1}^{n} \gamma_j * Controls_{i,t} + \varepsilon_{i,t+1} \quad (1)$$

The dependent variable, $EFF\_CAP_{i,t+1}$, measures the efficiency of a firm's capital expenditures. To construct $EFF\_CAP_{i,t+1}$, we follow prior studies (e.g., Biddle et al. 2009; Goodman et al. 2014; Shroff 2017; Chen, Kim, Wei, and Zhang 2018) and first estimate a model of normal capital expenditures by regressing capital expenditures (scaled by assets) on lagged Tobin's Q, cash flows from operations (scaled by assets), lagged asset growth, and lagged capital expenditures (scaled by assets) using firms in the same industry and year.[5] Next, we measure abnormal capital expenditures for each firm-year as the absolute value of the residual from its corresponding normal capital expenditure model, multipled by 100. Last, because the efficiency of capital expenditures is *decreasing* in abnormal capital expenditures, we define $EFF\_CAP_{i,t+1}$ as the *negative* of abnormal capital expenditures. Thus, we interpret increasing values of $EFF\_CAP_{i,t+1}$ as indicating increasing investment efficiency.

Our main test variable, $MFC_{i,t}$, is an indicator variable that measures management

[5] Throughout the paper, we define industries following Fama and French (1997). For each industry-year regression, we require a minimum of 30 observations.

forecast consistency, which is our proxy for voluntary disclosure quality. We set $MFC_{i,t}$ equal to one if the standard deviation of management EPS forecast errors is less than the standard deviation of consensus analyst EPS forecast errors over the most recent five years (year *t-4* to year *t*); if not, we set $MFC_{i,t}$ equal to zero. We define management forecast errors (analyst consensus forecast errors) as the difference between realized annual EPS and the management annual EPS forecast (analyst consensus annual EPS forecast), scaled by stock price as of three days prior to the management forecast date (analyst consensus forecast date). We interpret firms for which $MFC_{i,t} = 1$ as having higher management forecast consistency, and therefore higher voluntary disclosure quality, than firms for which $MFC_{i,t} = 0$. According to Hilary et al. (2014), management forcast consistency aligns with the Bayesian notion of information quality because, as a second moment measure, it captures the precision of information signals provided by management forecasts. In theoretical disclosure models, precision is widely used as a defining attribute of information quality (Verrecchia 2001) and empirical studies often use precision to conceptualize and operationalize financial reporting and disclosure quality (Biddle et al. 2009; Ng 2011; Bhattacharya et al. 2012; Roychowdhury et al. 2019). Although highly consistent forecasts can also be highly inaccurate, Rogers and Stocken (2005) find that investors can detect and filter out management forecast biases, which suggests that inaccurate forecasts can still be informative. Consistent with this, Hilary et al. (2014) estimate that analyst and investor responsiveness to consistent forecasts is two to five times greater than their responsiveness to accurate forecasts. Moreover, Hilary et al. (2014) find that consistency effects often subsume accuracy effects, so in the interest of increasing test power, we operationalize voluntary disclosure quality using forecast consistency rather

than forecast accuracy.

With our dependent variable and main test variable defined, we turn to specifying our baseline model prediction (i.e., our test of Hypothesis 1). Recall that Hypothesis 1 predicts a positive association between voluntary disclosure quality and investment efficiency. Thus, if Hypothesis 1 holds in our sample, then we expect β_1 to be positive.

Equation (1) includes a battery of control variables that prior studies show to be correlated with investment efficiency. Because several studies correlate financial reporting quality with investment efficiency (e.g., Biddle et al. 2009; Cheng et al. 2013), we include several financial reporting quality controls, including accruals quality, internal control weaknesses, earnings volatility, and earnings persistence. We also control for various management forecast attributes, including management forecast accuracy, which Goodman et al. (2014) find to be positively associated with investment efficiency, consistent with managers' forecasting skills indicating the quality of their investment decisions. In addition, because prior studies link weak corporate governance to investment inefficiencies (e.g., Jensen 1986; Bertrand and Mullainathan 2003; Gompers, Ishii, and Metrick 2003), we control for the quality of corporate governance by including the Entrenchment index developed in Bebchuk, Cohen and Ferrell (2009) and the percentage of shares owned by institutional investors. For the full set of control variables with detailed definitions, please refer to the Appendix.

[Insert Table 1]

Sample

We collect data from the intersection of the IBES Guidance, CRSP, and Compustat databases over a sample period spanning 1998 to 2017. To calculate *MFC*, which is our

main test variable, we require each firm to issue at least four annual EPS forecasts over the most recent five years on a rolling basis and that the firm's CEO does not change over this period. When calculating *MFC*, forecasts must be non-duplicate, point or range forecasts issued prior to their corresponding earnings announcement date. We also require, for each management forecast, data for the corresponding analyst consensus forecast (comprised of forecasts from at least two analysts), actual EPS realization, and stock price as of three days prior to the issuance of the management forecast. The above procedures yield an initial sample of 10,268 firm-year observations. Next, we remove financial service firms (SIC codes 6000–6999) and utility firms (SIC codes 4910-4939). After that, we remove firm-years with outlier characteristics that could present potential model estimation problems. Last, we remove firm-years that are missing data needed to estimate our baseline model. Our final baseline sample consists of 6,248 firm-year observations. Table 1 summarizes our sample selection procedures.

[Insert Table 2]

4. Main results

Baseline model descriptive statistics and regression results (Hypothesis 1)

Table 2, Panel A, provides descriptive statistics for the variables in equation (1).[6] The mean of our dependent variable, *EFF_CAP* is -1.32. The mean of our main test variable, *MFC*, is 0.65, which indicates that management forecasts exhibit higher consistency (i.e., lower forecast error volatility) than analyst forecasts about 65 percent of the time. The average firm has logged assets (*SIZE*) of $7.67 million, a return-on-assets

[6] Throughout the paper, continuous variables are winsorized at the 1 percent and 99 percent levels.

ratio (*AVG_ROA*) of 6.8 percent, a book-to-market ratio (*BTM*) of 44.0 percent, and financial leverage (*LEV*) of 51.1 percent. Statistics for analyst and management forecast characteristic variables are similar to those reported in prior studies.

Table 2, Panel B, compares variable means and medians of "consistent" firms (*MFC* = 1) with variable means and medians of "inconsistent" firms (*MFC* = 0). Consistent firms tend to have higher values of *EFF_CAP* than inconsistent firms, which suggests that consistent firms tend to invest more efficiently in capital expenditures than inconsistent firms. This provides some preliminary support for Hypothesis 1. The mean of management forecast accuracy (*MFA*) for consistent firms is 0.61, which indicates that management forecasts of consistent firms exhibit greater accuracy than analyst forecasts (when averaged over years *t-4* to *t*) roughly 60 percent of the time. Meanwhile, for inconsistent firms, management forecast accuracy is greater than analyst forecast accuracy 46 percent of the time (mean *MFA* = 0.456). Thus, while consistency does not always ensure accuracy, consistent firms tend to have higher forecast accuracy than inconsistent firms. The remaining variables are similar between consistent and inconsistent firms along all dimensions except for management forecast horizon (*MFH* is shorter for consistent firms), leverage (*LEV* is lower for consistent firms), operating cash flow volatility (*STD_CFO* is lower for consistent firms), analyst coverage (*ANACOV* is lower for consistent firms), and institutional ownership (*IO* is higher for consistent firms).

Table 2, Panel C, provides a correlation matrix. We observe a significantly positive correlation between management forecast consistency (*MFC*) and investment efficiency (*EFF_CAP*), providing more preliminary support for Hypothesis 1. Note as well that the correlation between *MFC* and *MFA* is only 0.15, which suggests that consistency and

accuracy, while related, convey different aspects of management forecast quality.

[Insert Table 3]

Table 3 presents results from estimating three different specifications of equation (1).[7] Columns 1 and 2 present results of regressions that exclude control variables. In Column 1, the coefficient on *MFC* is positive and significant at the 1 percent level (coeff = 0.136, t = 2.85). In Column 2, which presents results with industry-year fixed effects, the coefficient on *MFC* is positive and significant at the 5 percent level (coeff = 0.097, t = 2.27). In Column 3, we present results for the full baseline model with control variables and industry-year fixed effects. After adding control variables, we once again observe a positive and significant coefficient at the 1 percent level on *MFC* (coeff = 0.102, t = 2.58). To provide an economic sense of these effects, when abnormal capital expenditures are at the sample mean [1.32 (the negative of the mean of *EFF_CAP* in Table 2, Panel A)], going from an inconsistent (*MFC* = 0) to a consistent (*MFC* = 1) management forecast track record is expected to *reduce* abnormal capital expenditures by 7.8 percent [0.102 (the coefficient on *MFC* in Table 3, Column 3) divided by 1.32 (the mean of abnormal capital expenditures), with rounding].

Overall, the results in Table 3 support Hypothesis 1 in that they suggest firms with higher voluntary disclosure quality invest more efficiently in capital expenditures than firms with lower voluntary disclosure quality. While these results are consistent with voluntary disclosure quality facilitating investment efficiency through information leveling, they are also consistent with managers with superior forecasting abilities making superior investment decisions (Goodman et al. 2014). Although equation 1 controls for management

[7] Throughout the paper, we cluster standard errors at the firm level.

forecast accuracy (*MFA*, the proxy for forecasting ability in Goodman et al. 2014), it is premature to conclude that voluntary disclosure quality facilitates investment efficiency through the information-leveling channel, but, at a minimum, Table 3 confirms that the predicted baseline association between voluntary disclosure quality and investment efficiency arises in our sample.

Information environment attributes (Hypothesis 2)

Recall that Hypothesis 2 predicts that the positive association between voluntary disclosure quality and investment efficiency strengthens as the information environment becomes more constrained. We test this hypothesis using an expanded version of our baseline model that employs a variety of cross-sectional information environment attributes to proxy for the extent to which a firm's information environment is constrained. The model is as follows:

$$EFF\_CAP_{i,t+1} = \alpha_0 + \beta_1 * MFC_{i,t} + \beta_2 * MFC_{i,t} * InfoEnvAttr_{i,t} + \sum_{j=1}^{n} \gamma_j * Controls_{i,t} + \varepsilon_{i,t+1} \quad (2)$$

InfoEnvAttr captures an attribute of the information environment, and all other variables are defined as before. We use the following attributes to measure *InfoEnvAttr*: accruals quality (*AQ*), defined as the negative of the standard deviation of abnormal accruals over the most recent five years (estimated with the Dechow and Dichev (2002) accruals model using the specification suggested by McNichols (2002)), earnings volatility (*STD_ROA*), defined as the standard deviation of return on assets over the most recent five years, cash flow volatility (*STD_CFO*), defined as the standard deviation of operating cash flows (scaled by total assets) over the most recent five years, business segments (*BS*), defined as

the natural logarithm of the number of reported business segments in year *t*,[8] firm size (*SIZE*), defined as the natural logarithm of lagged total assets at the end of year *t*, and analyst coverage (*ANACOV*), defined as the number of analysts issuing EPS forecasts for the firm in year *t*. We estimate equation (2) separately for each attribute and β_2 measures the effect of the attribute on the relation between investment efficiency and management forecast consistency. For some attribute variables, the information environment becomes more constrained as the variable increases (*STD_ROA*, *STD_CFO*, *BS*), and in such cases, we expect β_2 to be positive, as more constrained environments should strengthen the positive relation between investment efficiency and management forecast consistency. For other attribute variables, the information environment becomes more constrained as the variable *decreases* (*AQ*, *SIZE, ANACOV*), so in these cases, we expect β_2 to be negative.

[Insert Table 4]

Table 4 presents the results of estimations of equation (2) using the six information environment attributes discussed above. In Panel A, where the attribute is accruals quality (*AQ*), the coefficient on *MFC*AQ* is negative and significant at the 10% level (t = -1.93). This result is consistent with Hypothesis 2, as it suggests that the positive relation between investment efficiency and management forecast consistency *strengthens* as accruals quality *declines*. In Panels B and C, where the attributes are, respectively, earnings volatility (*STD_ROA*) and cash flow volatility (*STD_CFO*), the interaction coefficients are both positive, with the coefficient on *MFC*STD_ROA* significant at the 10% level (t = 1.68) and the coefficient on *MFC*STD_CFO* significant at the 1% level (t = 2.80). These results are again consistent with Hypothesis 2, as they suggest that greater volatility in earnings

[8] Several studies use the number of business segments as a proxy for firm complexity, including Nagar, Nanda, and Wysocki (2003), Francis, Nanda, and Olsson (2008) and Chen, Miao, and Shevlin (2015).

and cash flows strengthens the positive relation between investment efficiency and management forecast consistency. In Panel D, where the attribute is the number of business segments (*BS*), the coefficient on *MFC*BS* is positive but insignificant, which does not support Hypothesis 2.[9] In Panels E and F, where the attributes are, respectively, firm size (*SIZE*) and analyst coverage (*ANACOV*), the interaction coefficients are both negative, with the coefficient on *MFC*SIZE* significant at the 1% level (t = -3.10) and the coefficient on *MFC*ANACOV* significant at the 5% level (t = -2.37). These results are consistent with Hypothesis 2, as they suggest that the positive relation between investment efficiency and management forecast consistency *strengthens* when firms are *smaller* and covered by *fewer* analysts.

Taken together, the results in Table 4 suggest that voluntary disclosure quality is more strongly associated with investment efficiency when the information environment is more constrained, consistent with voluntary disclosure linking to investment efficiency through the information-leveling channel. Nevertheless, a possible limitation of this analysis is that the potential for information leveling is measured based on cross-sectional attributes of the information environment, rather than the extent of information asymmetry. In the next section, we employ a setting where the potential for information leveling is identified based on a negative shock to a firm's public (but not private) information quality.

[9] While operating complexity is likely to be higher when firms have more segments, the quality of financial reporting may also be higher, which would weaken voluntary disclosure quality's information-leveling role in complex environments. For example, Berger and Hann (2003) find that SFAS 131, which resulted in an increase in the number of reported segments, improved the information and monitoring environment, while Berger and Hann (2007) find that decisions to report fewer segments relate to unresolved agency costs at a firm.

Peer firm restatement events (Hypothesis 3)

Recall that Hypothesis 3 predicts that the positive association between voluntary disclosure quality and investment efficiency strengthens in the period following an accounting restatement by an industry peer firm relative to the immediately preceding period. To test this hypothesis, we select a test sample from our baseline sample using the following procedures. First, we identify all restatement events over our sample period using the Audit Analytics database and we classify firms in year *t* as having a peer firm restatement event if at least one of its industry peers restates its financial statements in year *t*.[10] Next, for all firms that have peer firm restatement events in year *t*, we retain year *t+1* and year *t+2* as "treatment" years and year *t-1* and year *t* as "control" years. In cases where an industry peer restates multiple times over our sample period, we retain only observations related to the first restatement event, and if one of these observations overlaps with a subsequent event observation, we remove it from the sample. Last, we remove firms that restated their own financial statements during the treatment or control years to ensure our sample consists of non-restating firms. These steps leave us with a final test sample of 1,077 firm-years to estimate the following model:

$$EFF\_CAP_{i,t+1} = \alpha_0 + \beta_1 * MFC_{i,t} + \beta_2 * MFC_{i,t} * PEER\_RS_{i,t} + \sum_{j=1}^{n} \gamma_j * Controls_{i,t} + \varepsilon_{i,t+1} \quad (3)$$

PEER_RS is an indicator variable that equals one for "treatment" firm-years, and zero for "control" firm-years. All other variables are defined as before. β_2 measures the effect of a peer firm restatement event on the relation between investment efficiency and

[10] We use restatements of annual reporting where the restatement period is at least one year and the restatement corrects "fraudulent" reporting (i.e., RES_FRAUD = 1 in Audit Analytics' Non-Reliance Restatements database).

management forecast consistency. If, consistent with Hypothesis 3, peer firm restatement events strengthen that relation, then we expect β_2 to be positive. Notice that we use the firm as its own control when testing Hypothesis 3, as all firms appear in equation (3) with treatment (*PEER_RS* = 1) and control (*PEER_RS* = 0) observations. By using the firm as its own control, this test helps alleviate endogeneity concerns from potential specification errors in our baseline model.[11]

[Insert Table 5]

Table 5 presents the results of our estimation of equation (3). The coefficient on *MFC*PEER_RS* is positive and significant at the 1 percent level (t = 2.66), which suggests that the relation between investment efficiency and management forecast consistency is significantly more positive in the treatment period relative to the control period. This result supports Hypothesis 3, as it suggests that voluntary disclosure quality's association with investment efficiency strengthens following a peer firm restatement event.[12] Because peer firm restatement events are likely to decrease the (real or perceived) quality of a firm's financial reporting, such a strengthening aligns with the idea that voluntary disclosure can substitute for financial reporting as an information-leveling mechanism that facilitates investment efficiency.

[11] In section 5, we further address potential endogeneity concerns by examining a changes-based specification of our baseline model.

[12] When we estimate the baseline model (i.e., equation 1) with the peer firm restatement sample, we find that the coefficient on *MFC* is significantly positive (untabulated). Thus, we also find support for Hypothesis 1 using our peer firm restatement sample.

5. Additional analyses and robustness tests

Firms prone to investment distortions in constrained information environments

When firms operate in constrained information environments, the potential for investment distortions is likely to vary with firm-level attributes such as financial resource availability, growth opportunities, and corporate governance quality. Thus, if voluntary disclosure quality facilitates investment efficiency through information leveling, then disclosure quality should bestow greater efficiency benefits for firms that are more prone to investment distortions in constrained information environments. To explore this conjecture, we identify a series of firm-level attributes that are likely to indicate a higher propensity for investment distortions in constrained information environments and we test whether the positive association between voluntary disclosure quality and investment efficiency strengthens with these attributes. Whether we observe stronger associations in certain settings may depend on the particular market friction (adverse selection or moral hazard) contributing to investment distortions. For example, we may not see stronger associations in settings prone to moral hazard frictions because voluntary disclosures are not used in contracts for monitoring purposes, or because voluntary disclosure quality is achieved through myopic behaviors that ensure reported earnings meet targets set by managers. While we do not form hypotheses regarding voluntary disclosure quality's ability to mitigate specific market frictions, we derive inferences from our collective findings about which frictions are likely to decrease with higher voluntary disclosure quality in a discussion section that follows our empirical analyses.[13]

[13] In their review of the effects of financial reporting and disclosure on corporate investment, Roychowdhury et al. (2019) note that it is difficult to distinguish adverse selection mitigation from moral hazard mitigation in empirical settings and that financial reporting's effect on investment efficiency is often consistent with

Financial resource availability

Biddle et al. (2009) and Cheng et al. (2013) argue that financially constrained (unconstrained) firms are more prone to under-invest (over-invest) because of market frictions that arise with information asymmetry. For example, financially constrained firms may under-invest because investors ration capital in response to high information risk, while financially unconstrained firms may over-invest because managers have incentives to empire build when it is difficult to monitor their activities. Consistent with financial reporting quality mitigating these types of distortions, Biddle et al. (2009) and Cheng et al. (2013) show that financially constrained (unconstrained) firms under-invest (over-invest) less when their financial reporting quality is higher. These findings also imply that a given increase in financial reporting quality is likely to improve investment efficiency more for firms with either scarce or abundant financial resources than for firms with modest financial resources.[14] Therefore, if voluntary disclosure quality similarly facilitates investment efficiency through the information-leveling channel, then the efficiency benefits of voluntary disclosure quality should be greater for financially constrained and unconstrained firms relative to firms with modest financial resources. To test this possibility, we employ the following model:

$$EFF\_CAP_{i,t+1} = \alpha_0 + \beta_1 * MFC_{i,t} + \beta_2 * MFC_{i,t} * FinanciallyConstrained_{i,t} + \beta_3 * MFC_{i,t} * FinanciallyUnconstrained_{i,t} + \sum_{j=1}^{n} \gamma_j * Controls_{i,t} + \varepsilon_{i,t+1} \quad (4)$$

financial reporting mitigating both frictions.

[14] Relative to firms with scarce resources, firms with modest resources are less likely to under-invest because they can more readily substitute internal funds for external funds to pursue good investments. Relative to firms with abundant resources, firms with modest resources are less likely to over-invest because lower resource availability restricts their flexibility to pursue bad investments.

Following Biddle et al. (2009) and Cheng et al. (2013), we estimate financial resource availability based on a firm's cash balance and financial leverage. Specifically, we measure financial resource availability as the average rank of a ranked (deciles) measure of cash and *negative* leverage (we rank *negative* leverage so that liquidity is increasing in ranks, as it is with cash). We then define *FinanciallyConstrained* (*FinanciallyUnconstrained*) as an indicator variable equal to one if the ranked financial resource availability measure is in the bottom (top) tercile for year *t*, and zero otherwise. β_2 (β_3) measures the incremental relation between investment efficiency and management forecast consistency for financially constrained (unconstrained) firms. If the positive association between voluntary disclosure quality and investment efficiency strengthens for financially constrained (unconstrained) firms, then we expect β_2 (β_3) to be positive.

[Insert Table 6]

Table 6 presents the results of our estimation of equation (4). The coefficient on *MFC*FinanciallyConstrained* is positive and significant at the 10% level (t = 1.81), which suggests that the positive association between investment efficiency and management forecast consistency strengthens when firms are financially constrained. Meanwhile, the coefficient on *MFC*FinanciallyUnconstrained* is negative and insignificant. Thus, the results in Table 6 are consistent with voluntary disclosure quality facilitating incrementally higher investment efficiency for financially constrained firms, but not for financially unconstrained firms.

Growth opportunities

Prior literature suggests that young and growing firms have higher disclosure propensities because of deficiencies in their financial reporting (e.g., Tasker 1998; Frankel,

Johnson, and Skinner 1999; Core 2001). Because GAAP financial reports convey historical numbers with a conservative bias, young and growing firms often have a hard time conveying their growth prospects to outside capital suppliers through mandatory reporting. While such deficiencies make young and growing firms naturally prone to market frictions, investment distortions may be especially pronounced for these firms (in the absence of disclosure) because they are likely to rely heavily on external capital to keep up with their growth opportunities. Thus, voluntary disclosure quality may be especially influential in facilitating investment efficiency for young and growing firms, which prompts us to estimate the following model:

$$EFF\_CAP_{i,t+1} = \alpha_0 + \beta_1 * MFC_{i,t} + \beta_2 * MFC_{i,t} * GrowthOp_{i,t} + \sum_{j=1}^{n} \gamma_j * Controls_{i,t} + \varepsilon_{i,t+1} \quad (5)$$

GrowthOp captures variation in a firm's growth opportunities, which we measure using the following variables: firm age (*AGE*), defined as year *t* minus the year that the firm first appears in the CRSP database, firm life cycle stage (*LIFECYCLE*), which equals 1 for "introduction" stage firms, 2 for "growth" stage firms, 3 for "mature" stage firms, 4 for "shake-out" stage firms and 5 for "decline" stage firms based on the cash flow statement methodology used in Dickinson (2011), dividend payout ratio (*PAYOUT_RATIO*), defined as cash dividends per share divided by primary earnings per share before extraordinary items, and sales growth (*SALES_GROWTH*), defined as the change in sales over year *t* divided by lagged total assets. If the positive association between voluntary disclosure quality and investment efficiency strengthens for young and growing firms, then we expect β_2 to be positive when *GrowthOp* is *SALES_GROWTH* and negative when *GrowthOp* is

AGE, *LIFECYCLE*, and *PAYOUT_RATIO*.[15]

[Insert Table 7]

Table 7 presents the results of our estimations of equation (5) using the four growth opportunity proxy variables discussed above. We find that *MFC*AGE* (Panel A) and *MFC*PAYOUT_RATIO* (Panel C) are both significantly negative at the 5% level (t = -2.13 in Panel A and t = -2.32 in Panel C). In addition, we find that *MFC*LIFECYCLE* (Panel B) is significantly negative, and *MFC*SALES_GROWTH* (Panel D) is significantly positive, both at the 10% level (t = -1.74 in Panel B and t = 1.87 in Panel D). All of these results are consistent with the idea that voluntary disclosure quality's information-leveling link to investment efficiency strengthens for firms that are likely to have higher growth prospects.

Corporate governance

Prior research finds that investment efficiency declines in settings of weak corporate governance (e.g., Jensen 1986; Bertrand and Mullainathan 2003; Gompers et al. 2003). Such a relation arises because managers are less inclined to act in shareholders' best interests when governance is weaker, which can lead to over-investment when managers have incentives to empire build (Jensen 1986) or under-investment when managers have incentives to lead a quiet life (Bertrand and Mullainathan 2003). However, prior research also finds that financial reporting quality can compensate for weaknesses in various corporate governance structures by facilitating better monitoring of managers' activities (e.g., Bushman, Chen, Engel, and Smith 2004; Francis and Martin 2010; Armstrong,

[15] Gul (1999) shows that dividend payout ratios are negatively related to firms' investment opportunities. This finding aligns with the idea that more earnings are reinvested in the firm when growth prospects are higher.

Balakrishnan, and Cohen 2012). Thus, if voluntary disclosure quality can similarly compensate for weak governance, then voluntary disclosure quality's ability to facilitate investment efficiency may strengthen as the quality of corporate governance declines. We test this conjecture with the below model:

$$EFF\_CAP_{i,t+1} = \alpha_0 + \beta_1 * MFC_{i,t} + \beta_2 * MFC_{i,t} * WeakGov_{i,t} + \sum_{j=1}^{n} \gamma_j * Controls_{i,t} + \varepsilon_{i,t+1} \quad (6)$$

WeakGov captures the weakness of a firm's corporate governance, which we measure using the following variables: the Governance Index developed by Gompers et al. (2003) (*GINDEX*), defined as the number of shareholder rights-decreasing provisions (ranging from 0 to 24) listed in the database compiled by the Investor Responsibility Resource Center (IRRC), the Entrenchment Index developed by Bebchuk, Cohen, and Ferrell (2009) (*EINDEX*), defined as the number of entrenchment items listed in the database compiled by the IRRC, and a corporate governance measure developed by Gillan, Hartzell, and Stark (2011) (*CGPCA*), defined as the first principal component derived from an analysis (using data from BoardEx) of: board size, CEO duality, the presence of a lead independent director, the presence of a governance committee, and the percentage of independent directors sitting on the board. As each of these variables increases, corporate goverance is expected to become weaker. Thus, if weaker governance strengthens voluntary disclosure quality's information-leveling role in facilitating investment efficiency, then we expect β_2 to be positive.

[Insert Table 8]

Table 8 presents the results of our estimations of equation (6) using the three

corporate governance proxy variables discussed above.[16] In all three panels, the coefficient on *MFC*WeakGov* (*WeakGov* = *GINDEX* in Panel A, *EINDEX* in Panel B, and *CGPCA* in Panel C) is never significantly positive. Therefore, our results are inconsistent with weaker corporate governance strengthening voluntary disclosure quality's information-leveling role in facilitating investment efficiency.

Discussion

The results in Tables 6 and 7 suggest that the positive association between voluntary disclosure quality and investment efficiency strengthens when firms are young, growing, and financially constrained. Firms that are young, growing, and financially constrained are likely to have higher demand for external capital to pursue good investment opportunities. Thus, observing a stronger association between voluntary disclosure quality and investment efficiency for these firms aligns with the idea that disclosure quality improves the allocation of external capital to good investment opportunities by improving capital suppliers' ability to identify them. Our evidence therefore suggests that voluntary disclosure quality mitigates adverse selection frictions that impede investment efficiency.

Meanwhile, in Tables 6 and 8, we do not find evidence that the positive association between voluntary disclosure quality and investment efficiency strengthens for firms that are weakly governed or financially unconstrained. Such firms are likely to have higher propensities to suboptimally invest, either because there are fewer disincentives for such behavior or because the means to pursue suboptimal investments are greater. Thus, our findings do not support the idea that voluntary disclosure quality facilitates investment efficiency by improving outsiders' abilities to monitor managers with incentives and

[16] Because of missing data, we lose 494 observations when estimating equation (6) with *CGPCA*.

abilities to pursue bad investment opportunities. Consequently, we fail to find evidence consistent with voluntary disclosure quality mitigating moral hazard frictions that impede investment efficiency. While we argue that voluntary disclosure quality has information-leveling abilities, such abilities may be insufficient to resolve moral hazard issues if voluntarily disclosed numbers cannot be used in contractual settings for monitoring purposes. Alternatively, firms with moral hazard issues may be inherently less likely to provide high quality disclosures, as doing so would increase the likelihood that managers' self-serving behavior would be detected. We leave a further exploration of these issues for future research.

Robustness tests

Changes-based specification of the baseline model

As noted earlier, a positive association between voluntary disclosure quality and investment efficiency is consistent not only with voluntary disclosure facilitating investment efficiency through information leveling, but also with managerial forecasting abilities facilitating investment efficiency through effective capital budgeting (Goodman et al. 2014). While our baseline model includes control variables that are likely to capture managers' forecasting abilities (e.g., *MFA, ICW*[17]), and our empirical tests attempt to identify cross-sectional variation consistent with information leveling, we cannot completely rule out the influence of forecasting abilities on our earlier results. Nevertheless, a changes-based specification of our baseline model allows us to minimize the influence

[17] Goodman et al. (2014) note that weak information systems are likely to reflect weak managerial abilities because managers help to design and implement information systems to facilitate their decision making. Thus, internal control weaknesses may capture weak forecasting abilities in addition to poor financial reporting quality.

of managers' inherent forecasting abilities on the relation between voluntary disclosure quality and investment efficiency. To the extent that managers' forecasting abilities are fixed traits, they would exert little influence on changes in voluntary disclosure quality, so a positive changes-based association is unlikely to reflect better capital budgeting decisions leading to more efficient investment outcomes. This motivates us to estimate the following model:

$$CHG\_EFF\_CAP_{i,t+1} = \alpha_0 + \beta_1 * CHG\_MFC_{i,t} + \sum_{j=1}^{n} \gamma_j * CHG\_Controls_{i,t} + \varepsilon_{i,t+1} \quad (7)$$

$CHG\_EFF\_CAP_{i,t+1}$ is the first difference of $EFF\_CAP_{i,t+1}$ (i.e., $EFF\_CAP_{i,t+1}$ - $EFF\_CAP_{i,t}$), $CHG\_MFC_{i,t}$ is the first difference of $MFC_{i,t}$ (i.e., $MFC_{i,t}$ - $MFC_{i,t-1}$), and $CHG\_Controls_{i,t}$ represents first differences of all control variables from the baseline model. If increases in management forecast consistency are associated with increases in investment efficiency, then we expect β_1 to be positive.

[Insert Table 9]

Table 9 presents the results of our estimation of equation (7).[18] The coefficient on *CHG_MFC* is positive and significant at the 5% level (t = 2.19), which suggests that increases in management forecast consistency are associated with increases in investment efficiency. Thus, to the extent that managers' forecasting abilities are fixed over consecutive years, the results in Table 9 suggest that the positive association between voluntary disclosure quality and investment efficiency is unlikely to be solely driven by these abilities.

[18] Because a changes-based specification requires an additional year of data relative to a levels-based specification, we lose 1,370 baseline model observations when estimating equation (7).

Explicit control for managerial ability

Demerjian, Lev, and McVay (2012) develop a measure of managerial ability (MA-Score) from financial statement variables and subsequent studies find that the MA-Score predicts a wide range of capital market outcomes, including CEO turnover, earnings quality, and tax avoidance (Demerjian, Lev, Lewis, and McVay 2013; Koester, Shevlin, and Wangerin 2016). Thus, to provide further control for managerial ability in our tests, we repeat the analyses in Tables 3 through 9 after including MA-Score as an additional explanatory variable. In untabulated analyses, we find that our results remain significant in all cases except for Table 7, Panel B, where the coefficient on *MFC*LIFECYCLE* is no longer signficiant using a two-tailed test (p-value = 0.12). Overall, these findings provide further support for our position that voluntary disclosure quality's empirical link to investment efficiency is unlikely to be solely attributable to managers' inherent forecasting abilities.

Selection bias

Because the decision to issue management earnings forecasts is an endogenous choice, it is possible that our earlier coefficient estimates are biased. To address this concern, we follow Goodman et al. (2014) and implement the Heckman two-stage procedure to adjust for potential self-selection bias. In stage one, we estimate the likelihood of issuing management forecasts, using a sample that includes both forecast and non-forecast firms. Specifically, we estimate a Probit regression where the dependent variable is an indicator of forecast provision (*Forecast*) and the independent variables are a set of documented determinants of forecast provision (e.g., Lennox and Park 2006; Bamber, Jiang, and Wang 2010; Goodman et al. 2014). These determinants include firm size, growth

opportunities, leverage, earnings volatility, earnings performance, analyst following, the percentage of shares held by institutional investors, R&D intensity, and a pair of indicator variables identifying firms reporting losses and restructuring charges**.** In stage two, we repeat our earlier regressions (Tables 3 through 9) with the inverse Mills ratio (*Mills*) derived from the Probit regression as an additional regressor. In untabulated analyses, we find that our inferences are unaffected by the inclusion of *Mills* in our regressions.

Other robustness tests

In addition to the above tests, we performed the following robustness tests (all untabulated). First, we repeated our earlier tests with standard errors clustered by firm and by year, following the two-way clustering procedure in Petersen (2009). All of our results are robust to two-way clustering. Second, we repeated our earlier tests after truncating our sample at the 1 percent and 99 percent level (rather than winsorizing at these levels). We find that the tenor of our results holds with truncation, but the following coefficients lose significance: *MFC*STD_ROA* (Table 4, Panel B), *MFC*FinanciallyConstrained* (Table 6), and *MFC*LIFECYCLE* (Table 7, Panel B). Last, recall that when calculating *EFF_CAP*, we first estimate "normal" capital expenditures using industry-year regressions with a minimum of 30 observations. We repeated our tests after lowering the minimum number of observations to 25 and 20, respectively, and we find that our results hold in both cases.

6. Conclusion

This study examines whether voluntary disclosure quality facilitates investment efficiency by playing an information-leveling role that mitigates market frictions that

impede efficiency. Our results are consistent with voluntary disclosure quality playing such a role. In particular, after documenting a baseline relation between voluntary disclosure quality and investment efficiency, we find that this relation strengthens when cross sectional attributes indicate weaker information environments and when there are negative shocks to financial reporting quality. We also find that the relation strengthens when firms are financially constrained, young, and growing, but not when firms are financially unconstrained and weakly governed. Thus, our evidence is more consistent with voluntary disclosure quality mitigating adverse selection (rather than moral hazard) frictions that impede investment efficiency. We also find that changes in voluntary disclosure quality are associated with changes in investment efficiency, which suggests that the empirical link between voluntary disclosure quality and investment efficiency is not purely driven by managers' inherent forecasting abilities.

Our findings contribute to our understanding of the determinants of investment efficiency by showing that voluntary disclosure quality facilitates investment efficiency in a similar manner to how financial reporting quality facilitates efficiency (i.e., through information leveling). Voluntary disclosure quality's information-leveling role is particularly important when firms operate in constrained information environments, as such environments can inhibit investment efficiency because of difficulties in identifying and monitoring firms' investment acitivities. Our findings also contribute to our understanding of the benefits of establishing a track record for high quality voluntary disclosure by showing that these benefits extend to real operational outcomes (i.e., greater investment efficiency). Further exploration of management forecasting track records and their benefits appears to be a fruitful area for future research.

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Appendix: Baseline Model Variable Definitions

Dependent Variable	
$EFF\_CAP_{i,t+1}$	Capital investment efficiency, defined as -100 multiplied by the absolute value of a firm-year's residual from an industry-year regression of capital expenditures (scaled by assets) on lagged Tobin's Q, cash flow from operations (scaled by total assets), lagged asset growth, and lagged capital expenditures (scaled by assets). We define industries following Fama and French (1997) and we require a minimum of 30 observations per industry-year regression. We interpret larger values of $EFF\_CAP_{i,t+1}$ as capturing greater investment efficiency.
Main Test Variable	
$MFC_{i,t}$	Management forecast consistency (our proxy for voluntary disclosure quality), defined as an indicator variable that equals one if the standard deviation of management earnings per share (EPS) forecast errors is less than the standard deviation of the consensus analyst EPS forecast errors over the past five years (*t-4* to *t*), and zero otherwise. Management forecast errors (analyst consensus forecast errors) are defined as the difference between realized EPS and the management EPS forecast (analyst consensus EPS forecast), scaled by stock price three days prior to the date of the management forecast (analyst consensus forecast). All forecasts are for annual EPS. We interpret firms with $MFC_{i,t}$ = 1 as having higher management forecast consistency (higher voluntary disclosure quality) than firms with $MFC_{i,t}$ = 0.
Control Variables	
$MFA_{i,t}$	Management forecast accuracy, defined as an indicator variable that equals one if absolute management forecast errors are smaller than absolute consensus analyst forecast errors over 50% of the time during the past five years (*t-4* to *t*), and zero otherwise. All forecasts are for annual EPS.

$MFH_{i,t}$	Management forecast horizon, defined as the natural logarithm of one plus the average management forecast horizon over the past five years (*t-4* to *t*). Forecast horizon is measured as the number of days between the forecast issuance date and the fiscal-year end date. All forecasts are for annual EPS.
$MFP_{i,t}$	Management forecast precision, defined as the average precision of all management EPS forecasts issued over the past five years (*t-4* to *t*). For range forecasts, we measure precision as the absolute value of the difference between the upper bound and the lower bound of the forecast range, scaled by stock price as of three days prior to the management forecast date. For point forecasts, precision equals zero. We multiply precision by negative one so that increasing values capture higher precision. All forecasts are for annual EPS.
$SIZE_{i,t}$	Firm size, defined as the natural logarithm of lagged total assets at the end of fiscal year *t*.
$AVG\_ROA_{i,t}$	Average return on assets (ROA) in year t. ROA is defined as income before extraordinary items divided by total assets.
$BTM_{i,t}$	Book-to-market ratio, defined as the book value of equity divided by the market value of equity at the end of year *t*.
$LEV_{i,t}$	Leverage, defined as average total liabilities divided by average total assets in year *t*.
$RET_{i,t}$	Past stock returns, defined as the buy-and-hold monthly stock return over fiscal year *t*.
$STD\_ROA_{i,t}$	Earnings volatility, defined as the standard deviation of return on assets over the past five years (*t-4* to *t*). Return on assets is measured as income before extraordinary items divided by lagged total assets.
$STD\_INV_{i,t}$	Investment volatility, defined as the standard deviation of the ratio of capital expenditures to lagged total assets over the past five years (*t-4* to *t*).
$STD\_RET_{i,t}$	Stock return volatility, defined as the standard deviation of monthly stock returns over fiscal year *t*.
$STD\_CFO_{i,t}$	Operating cash flow volatility, defined as the standard deviation of operating cash flows (scaled by total assets) over the past five

	years (*t*-4 to *t*).
$EP_{i,t}$	Earnings persistence, defined as the first-order autocorrelation (i.e., AR (1)) in quarterly EPS over the past three years (*t*-2 to *t*).
$ICW_{i,t}$	Internal control weakness, defined as an indicator variable equal to one if there is a material weakness disclosure in Section 404 of the audit report in year *t*, and zero otherwise.
$AQ_{i,t}$	Accruals quality, defined as -1 multiplied by the standard deviation of abnormal accruals over the past five years, estimated with the Dechow and Dichev (2002) accruals model using the specification suggested by McNichols (2002).
$ANACOV_{i,t}$	Analyst coverage, defined as the number of analysts issuing EPS forecasts for the firm in year *t*.
$EINDEX_{i,t}$	The Entrenchment index (E-index), as developed in Bebchuk, Cohen, and Ferrell (2009). The E-index increases by one for each of the following corporate governance features: a staggered board, limits to shareholder bylaw amendments, poison pill/shareholder rights plan, golden parachute, and a supermajority requirement for mergers and for charter amendments. Higher values of $EINDEX_{i,t}$ capture weaker corporate governance.
$EDUMMY_{i,t}$	A missing E-Index indicator variable equal to one if $EINDEX_{i,t}$ is missing, and zero otherwise.
$IO_{i,t}$	Institutional ownership, defined as the percentage of shares held by institutional investors at the end of year *t* (reported by Thomson Reuters).
$ALTMANZ_{i,t}$	Altman Z score, defined as 3.3*(earnings before interest and taxes / total assets) + 0.99*(sales / total assets).) + 0.6*(market value of equity / total liabilities)) + 1.2*× (working capital / total assets) + 1.4*(retained earnings / total assets).

Table 1: Sample Selection

Firm-years from 1998 to 2017 that meet the following criteria necessary to compute management forecast consistency (*MFC*): issued at least four non-duplicate, point or range annual earnings per share (EPS) forecasts over the most recent five years (*t-4* to *t*), no change in CEO over the most recent five years, and, for each forecast included in *MFC*, data for the corresponding analyst consensus EPS forecast (minimum two analysts), actual EPS realization, and stock price as of three days prior to the management forecast issuance date.	10,268
Less:	
Belongs to financial services sector (SIC codes: 6000-6999) or utility sector (SIC codes: 4910-4939).	(1,687)
Book-to-market is missing, negative book value, market value less than $75 million, stock price less than $1 per share, or institutional ownership greater than 100%.	(805)
Missing data necessary to estimate baseline model.	(1,528)
Final Baseline Sample	6,248

Table 2, Panel A: Descriptive Statistics (N=6,248)

Variable*	Mean	Std.	Q1	Median	Q3.
EFF_CAP	-1.3188	1.3649	-1.6480	-0.9301	-0.4644
MFC	0.6514	0.4766	0.0000	1.0000	1.0000
MFA	0.5570	0.4968	0.0000	1.0000	1.0000
MFH	4.7361	0.3683	4.5240	4.6868	4.9516
MFP	-0.0024	0.0032	-0.0028	-0.0014	-0.0007
SIZE	7.6723	1.5382	6.5455	7.6090	8.6643
AVG_ROA	0.0679	0.0672	0.0362	0.0667	0.1021
BTM	0.4400	0.2823	0.2424	0.3715	0.5676
LEV	0.5108	0.1774	0.3909	0.5161	0.6315
RET	0.1320	0.3662	-0.0935	0.1075	0.3156
STD_ROA	0.0395	0.0424	0.0140	0.0250	0.0462
STD_INV	0.0162	0.0171	0.0053	0.0103	0.0201
STD_RET	0.0903	0.0435	0.0595	0.0800	0.1109
STD_CFO	0.0366	0.0277	0.0181	0.0289	0.0460
EP	0.1484	0.3162	-0.0907	0.0654	0.3226
ICW	0.0432	0.2034	0.0000	0.0000	0.0000
AQ	-0.1067	0.1508	-0.1088	-0.0570	-0.0322
ANACOV	19.6124	11.8064	10.0000	17.0000	27.0000
EINDEX	1.5280	1.5104	0.0000	1.0000	3.0000
EDUMMY	0.3318	0.4709	0.0000	0.0000	1.0000
IO	0.5841	0.3417	0.4037	0.7199	0.8367
ALTMANZ	4.5525	3.2524	2.5971	3.6827	5.5079

*All baseline model variables are defined in the Appendix.

Table 2, Panel B: Descriptive Statistics Comparing Consistent (*MFC* = 1) and Inconsistent (*MFC* = 0) Firms

	***N*=4,070**	***N*=2,178**		***N*=4,070**	***N*=2,178**	
	MFC=1	***MFC=0***		***MFC=1***	***MFC=0***	
	Mean	**Mean**	**DIF**	**Median**	**Median**	**DIF**
EFF_CAP	-1.2713	-1.4075	0.1362***	-0.9124	-0.9731	0.0607***
MFA	0.6108	0.4564	0.1544***	1.0000	0.0000	1.0000***
MFH	4.7096	4.7856	-0.0760***	4.6672	4.7274	-0.0602***
MFP	-0.0025	-0.0024	-0.0001	-0.0014	-0.0015	0.0001
SIZE	7.6492	7.7154	-0.0662	7.5638	7.6675	-0.1037*
AVG_ROA	0.0674	0.0689	-0.0015	0.0666	0.0670	-0.0004
BTM	0.4431	0.4341	0.0090	0.3754	0.3657	0.0097
LEV	0.5062	0.5192	-0.0130**	0.5157	0.5181	-0.0024**
RET	0.1349	0.1266	0.0083	0.1107	0.1044	0.0063
STD_ROA	0.0384	0.0416	-0.0032***	0.0252	0.0248	0.0004
STD_INV	0.0160	0.0164	-0.0004	0.0102	0.0107	-0.0005*
STD_RET	0.0899	0.0909	-0.0010	0.0798	0.0803	-0.0005
STD_CFO	0.0359	0.0378	-0.0019**	0.0284	0.0296	-0.0012**
EP	0.1478	0.1494	-0.0016	0.0633	0.0690	-0.0057
ICW	0.0437	0.0422	0.0015	0.0000	0.0000	0.0000
AQ	-0.1051	-0.1096	0.0045	-0.0564	-0.0582	0.0018
ANACOV	19.2017	20.3797	-1.1780***	17.0000	18.0000	-1.0000***
EINDEX	1.5111	1.5597	-0.0486	1.0000	1.0000	0.0000
EDUMMY	0.3396	0.3173	0.0223*	0.0000	0.0000	0.0000*
IO	0.5945	0.5647	0.0298***	0.7209	0.7173	0.0036*
ALTMANZ	4.5825	4.4964	0.0861	3.6764	3.7027	-0.0263

All baseline model variables are defined in the Appendix.*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 2, Panel C: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
EFF_CAP	1.00																					
MFC	0.05***	1.00																				
MFA	0.07***	0.15***	1.00																			
MFH	-0.10***	-0.10***	-0.06***	1.00																		
MFP	0.04***	-0.01	-0.09***	-0.17***	1.00																	
SIZE	0.15***	-0.02	0.12***	-0.22***	0.18***	1.00																
AVG_ROA	-0.08***	-0.01	-0.22***	-0.12***	0.37***	0.03**	1.00															
BTM	0.02	0.02	0.05***	0.10***	-0.30***	-0.11***	-0.41***	1.00														
LEV	0.07***	-0.03***	0.09***	-0.09***	-0.06***	0.43***	-0.19***	-0.16***	1.00													
RET	-0.05***	0.01	-0.06***	-0.02	0.05***	-0.04***	0.10***	-0.35***	0.02	1.00												
STD_ROA	-0.04***	-0.04***	0.07***	0.13***	-0.27***	-0.29***	-0.20***	0.04***	-0.13***	-0.04***	1.00											
STD_INV	-0.29***	-0.01	-0.10***	0.13***	-0.06***	-0.27***	0.09***	0.04***	-0.18***	0.01	0.19***	1.00										
STD_RET	-0.05***	-0.01	-0.03**	0.14***	-0.32***	-0.38***	-0.27***	0.35***	-0.08***	-0.11***	0.36***	0.22***	1.00									
STD_CFO	-0.10***	-0.03**	-0.05***	0.15***	-0.24***	-0.39***	-0.02*	0.02	-0.14***	0.01	0.50***	0.24***	0.32***	1.00								
EP	-0.05***	0.00	0.03**	0.16***	-0.14***	-0.17***	-0.16***	0.08***	-0.07***	0.09***	0.33***	0.10***	0.25***	0.22***	1.00							
ICW	0.00	0.00	0.02*	0.09***	-0.05***	-0.08***	-0.08***	0.06***	-0.01	-0.05***	0.09***	0.03**	0.06***	0.08***	0.08***	1.00						
AQ	0.00	0.01	-0.02	-0.10***	0.01	-0.01	-0.03**	0.04***	0.03**	0.02	-0.15***	-0.04***	-0.03**	-0.16***	-0.08***	-0.07***	1.00					
ANACOV	0.06***	-0.05***	0.05***	-0.14***	0.23***	0.64***	0.15***	-0.25***	0.08***	-0.03**	-0.04***	-0.02*	-0.21***	-0.14***	-0.09***	-0.07***	-0.04***	1.00				
EINDEX	0.06***	-0.02	-0.02	-0.13***	0.07***	0.14***	0.02*	0.02*	0.05***	-0.05***	-0.13***	-0.11***	-0.03**	-0.16***	-0.07***	-0.03**	0.08***	0.02	1.00			
EDUMMY	-0.11***	0.02*	-0.07***	0.21***	-0.09***	-0.28***	-0.06***	0.05***	-0.09***	0.03***	0.16***	0.19***	0.18***	0.21***	0.15***	0.05***	-0.10***	-0.13***	-0.71***	1.00		
IO	0.01	0.04***	0.04***	0.08***	0.05***	-0.03**	-0.05***	-0.04***	0.01	0.01	0.05***	-0.06***	-0.02*	-0.02	0.10***	0.00	-0.05***	-0.03**	0.06***	-0.01	1.00	
ALTMANZ	-0.12***	0.01	-0.16***	-0.01	0.20***	-0.29***	0.51***	-0.33***	-0.58***	0.16***	0.06***	0.17***	-0.03**	0.14***	0.01	-0.05***	-0.08***	0.05***	-0.07***	0.06***	-0.03***	1.00

All baseline model variables are defined in the Appendix. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 3: The Relation Between Capital Investment Efficiency and Management Forecast Consistency

$Y = EFF\_CAP_{t+1}$	*Pred. Sign*	(1)	(2)	(3)
MFC	+	0.1362***	0.0965**	0.1020***
		(2.85)	(2.27)	(2.58)
MFA				-0.0500
				(-1.24)
MFH				-0.1594**
				(-2.17)
MFP				6.7877
				(0.84)
SIZE				0.0421
				(1.53)
AVG_ROA				-0.3731
				(-0.76)
BTM				0.0861
				(0.81)
LEV				-0.0103
				(-0.05)
RET				0.0098
				(0.15)
STD_ROA				0.1383
				(0.20)
STD_INV				-14.1229***
				(-7.31)
STD_RET				-0.1432
				(-0.25)
STD_CFO				-0.6990
				(-0.65)
EP				-0.0721
				(-1.01)
ICW				0.0345
				(0.43)

AQ			0.2945
			(0.96)
ANACOV			0.0000
			(0.00)
EINDEX			-0.0068
			(-0.33)
EDUMMY			-0.1584*
			(-1.90)
IO			-0.1131*
			(-1.71)
ALTMANZ			-0.0373***
			(-3.37)
Intercept	-1.4075***	-1.3817***	-0.3172
	(-27.63)	(-32.06)	(-0.68)
IND-YR Fixed Effects	NO	YES	YES
Standard Errors Clustered at Firm Level	YES	YES	YES
N	6248	6248	6248
adj. R^2	0.002	0.165	0.226

All baseline model variables are defined in the Appendix. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, under a two-tailed t-test. t-statistics are reported in parentheses below coefficient estimates. Standard errors are clustered at the firm level.

Table 4: The Effect of Information Environment Constraints on the Relation Between Capital Investment Efficiency and Management Forecast Consistency.

Panel A: Accruals Quality (*AQ*)		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.0210
		(0.41)
MFC*AQ	-	-0.7461*
		(-1.93)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248
Adj. R^2		0.228
Panel B: Earnings Volatility (*STD_ROA*)		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.0424
		(0.82)
MFC*STD_ROA	+	1.4827*
		(1.68)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248
Adj. R^2		0.227
Panel C: Cash Flow Volatility (*STD_CFO*)		
Y=EFF_CAP$_{t+1}$		
MFC	+	-0.0518
		(-0.83)

MFC* STD_CFO	+	4.1494***
		(2.80)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248
Adj. R^2		0.228
Panel D: Business Segments (*BS*)		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.1046
		(0.76)
MFC* BS	+	0.0019
		(0.03)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		5499
Adj. R^2		0.223
Panel E: Firm Size (*SIZE*)		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.6624***
		(3.38)
MFC* SIZE	-	-0.0728***
		(-3.10)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248

Adj. R^2		0.227
Panel F: Analyst Coverage (*ANACOV*)		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.2406***
		(3.25)
MFC* ANACOV	-	-0.0069**
		(-2.37)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248
Adj. R^2		0.227

Accruals quality (*AQ*) is defined as (-1)*the standard deviation of abnormal accruals over the most recent five years (estimated with the Dechow and Dichev (2002) accruals model using the specification suggested by McNichols (2002)). Earnings volatility (*STD_ROA*) is defined as the standard deviation of return on assets over the most recent five years. Cash flow volatility (*STD_CFO*) is defined as standard deviation of operating cash flows (scaled by total assets) over the most recent five years. Business segments (*BS*) is the natural logarithm of the number of business segments reported in year *t*. Firm size (*SIZE*) is defined as the natural logarithm of lagged total assets in year *t*. Analyst coverage (*ANACOV*) is defined as the number of analysts issuing EPS forecasts for the firm in year *t*. All baseline model variables are defined in the Appendix. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, under a two-tailed *t*-test. *t*-statistics are reported in parentheses below coefficient estimates. Standard errors are clustered at firm level.

Table 5: The Effect of Peer Firm Restatement Events on the Relation Between Capital Investment Efficiency and Management Forecast Consistency.

$Y=EFF\_CAP_{t+1}$		
MFC	+	-0.1476 (-1.06)
MFC*PEER_RS	+	0.4774*** (2.66)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		1077
Adj. R^2		0.152

The peer firm restatement event sample consists of observations in "treatment" years (*PEER_RS*=1), which are defined as years *t+1* and *t+2* relative to a peer firm restatement event in year *t* (*EFF_CAP* is measured in years *t*+2 and *t*+3 respectively) and observations in "control" years (*PEER _RS*=0), which are defined as years *t* and *t-1* relative to a peer firm restatement event in year *t* (*EFF_CAP* is measured in years *t+1* and *t*, respectively). The peer firm restatement sample is selected from the Audit Analytics' Non-Reliance Restatement database using "fraudulent" (RES_FRAUD=1) restatements of annual reporting over at least one year. In cases where an industry peer restates multiple times over the sample period, only observations related to the first restatement event are used and if one of these observations overlaps with a subsequent event observation, it is excluded from the sample. All baseline model variables are defined in the Appendix. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, under a two-tailed *t*-test. *t*-statistics are reported in parentheses below coefficient estimates. Standard errors are clustered at the firm level.

Table 6: The Effect of Financial Resource Availability on the Relation Between Capital Investment Efficiency and Management Forecast Consistency.

$Y=EFF\_CAP_{t+1}$	
MFC	0.0491
	(0.79)
MFC* FinanciallyConstrained	0.1562*
	(1.81)
MFC*FinanciallyUnconstrained	-0.0319
	(-0.32)
Controls	YES
IND-YR Fixed Effects	YES
Standard Errors Clustered at Firm Level	YES
N	6248
Adj. R^2	0.227

FinanciallyConstrained (*FinanciallyUnconstrained*) is an indicator variable equal to one if a firm's financial resource availability ranking is in the bottom (top) tercile in year *t*, and zero otherwise. We determine a firm's financial resource availability ranking by taking the average rank of (decile) ranked measures of a firm's cash balance and *negative* leverage (we rank *negative* leverage so that liquidity is increasing in ranks, as it is with cash). All baseline model variables are defined in the Appendix. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, under a two-tailed *t*-test. *t*-statistics are reported in parentheses below coefficient estimates. Standard errors are clustered at firm level.

Table 7: The Effect of Firm Growth Opportunities on the Relation Between Capital Investment Efficiency and Management Forecast Consistency.

Panel A: Firm Age		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.18869***
		(3.06)
MFC* AGE	-	-0.00335**
		(-2.13)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248
Adj. R^2		0.226
Panel B: Operating Life Cycle		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.36548**
		(2.21)
MFC* LIFECYCLE	-	-0.09448*
		(-1.74)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6245
Adj. R^2		0.226
Panel C: Dividend Payout Ratio		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.13729***
		(3.15)
MFC* PAYOUT_RATIO	-	-0.18250**
		(-2.32)

Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6240
Adj. R^2		0.224
Panel D: Sales Growth		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.08012**
		(1.99)
MFC* SALES_GROWTH	+	0.23082*
		(1.87)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248
Adj. R^2		0.226

AGE is firm age, defined as year *t* minus the year that the firm first appears in the CRSP database. *LIFECYCLE* is the firm's operating life cycle stage, defined as 1 if the firm is in the "introduction" stage, 2 if the firm is in the "growth" stage, 3 if the firm is in the "mature" stage, 4 if the firm is in the "shake-out" stage, and 5 if the firm is in the "decline" stage based on the cash flow statement methodology used in Dickinson (2011). *PAYOUT_RATIO* is the dividend payout ratio, defined as cash dividends per share devided by primary earnings per share before extraordinary items (Gul 1999). *SALES_GROWTH* is firm sales growth, defined as the change in sales in year *t* divided by lagged total assets**.** All baseline variables are defined in the Appendix. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, under a two-tailed *t*-test. *t*-statistics are reported in parentheses below coefficient estimates. Standard errors are clustered at the firm level.

Table 8: The Effect of Weak Corporate Governance on the Relation Between Capital Investment Efficiency and Management Forecast Consistency.

Panel A: Governance Index		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.1456**
		(2.42)
MFC GINDEX*	+	-0.0073
		(-1.11)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248
Adj. R^2		0.226
Panel B: Entrenchment Index		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.1409**
		(2.58)
MFC EINDEX*	+	-0.0252
		(-1.11)
Controls		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		6248
Adj. R^2		0.226
Panel C : Corporate Governance Principal Component		
Y=EFF_CAP$_{t+1}$		
MFC	+	0.0919**
		(2.24)
MFC CGPCA*	+	0.0379

	(0.62)
Controls	YES
IND-YR Fixed Effects	YES
Standard Errors Clustered at Firm Level	YES
N	5754
Adj. R^2	0.224

GINDEX is the Governance Index developed by Gompers, Ishii, and Metrick (2003), defined as the number of shareholder rights-decreasing provisions (ranging from 0 to 24) listed in the database compiled by the Investor Responsibility Resource Center (IRRC). *EINDEX* is the Entrenchment Index developed by Bebchuk, Cohen, and Ferrell (2009), defined as the number of entrenchment items listed in the database compiled by the IRRC. *CGPCA* is the corporate governance measure developed by Gillan, Hartzel, and Stark (2011), defined as the first principal component derived from an analysis of board size, CEO duality, the presence of a lead independent director, the presence of a governance committee, and the percentage of independent directors sitting on the board. As each corporate governance variable increases, corporate goverance is expected to become weaker. All baseline variables are defined in the Appendix. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, under a two-tailed *t*-test. *t*-statistics are reported in parentheses below coefficient estimates. Standard errors are clustered at the firm level.

Table 9: The Relation Between Changes in Capital Investment Efficiency and Changes in Management Forecast Consistency.

$Y=CHG\_EFF\_CAP_{t+1}$		
CHG_MFC_t	+	0.1255** (2.19)
Controls in first difference		YES
IND-YR Fixed Effects		YES
Standard Errors Clustered at Firm Level		YES
N		4878
Adj- R^2		0.084

$CHG\_EFF\_CAP_{t+1}$ *is* the first difference of capital investment inefficiency ($EFF\_CAP_{t+1} - EFF\_CAP_t$). CHG_MFC_t *is* the first difference of management forecast consistency ($MFC_t - MFC_{t-1}$). All baseline model control variables are defined analogously. See the Appendix for baseline model variable definitions in levels. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, under a two-tailed *t*-test. *t*-statistics are in parentheses below coefficient estimates. Standard errors are clustered at the firm level.