

How Does Financial Reporting Quality Relate to Investment Efficiency?

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Abstract:

Prior evidence suggests that higher quality financial reporting improves capital investment efficiency by reducing information asymmetries that give rise to frictions such as moral hazard and adverse selection. Unaddressed is whether higher quality financial reporting is associated with lower capital over-investment, under-investment, or both. This study documents a negative (positive) association between financial reporting quality and investment for firms operating in settings more prone to over-investment (under-investment). Firms with higher financial reporting quality are also less likely to deviate from their predicted level of investment. Overall, we contribute to the literature by exploring the mechanisms that link financial reporting quality to investment efficiency.

1. Introduction

This study investigates the relation between financial reporting quality and capital investment efficiency. Prior studies suggest that higher quality financial reporting increases investment efficiency (e.g., Healy and Palepu, 2001; Bushman and Smith, 2001; Lambert, Leuz, and Verrecchia, 2007). Consistent with this argument, Biddle and Hilary (2006) find that higher quality financial reporting lowers investment-cash flow sensitivity (a proxy for investment inefficiency) both across countries and within countries when the financing is done at arm's length. However, because investment-cash flow sensitivities can reflect either financing constraints or an excess of cash (e.g., Kaplan and Zingales, 1997, 2000; Fazzari, Hubbard, and Petersen, 2000), the findings in Biddle and Hilary (2006) raise the further question of whether higher quality financial reporting is associated with higher investment efficiency due to the reduction in over- and/or under-investment.

We argue that higher financial reporting quality is associated with higher investment efficiency by reducing information asymmetry between firms and external suppliers of capital. For example, higher financial reporting quality could allow constrained firms to attract capital by making their positive net present value (NPV) projects more visible to investors and by reducing adverse selection in the issuance of securities. Alternatively, higher financial reporting quality could curb managerial incentives to engage in value destroying activities such as empire building in firms with ample capital. This could be achieved, for example, if higher financial reporting facilitates writing better contracts that prevent inefficient investment and/or increases investors' ability to monitor managerial investment decisions.

Based on this reasoning, we hypothesize that high-quality financial reporting is associated with lower over- and under-investment. We use three approaches to investigate these

hypotheses. First, we examine whether financial reporting quality is associated with a lower investment among firms more prone to over-invest and higher investment for firms more likely to under-invest. To do so, we partition the sample by firm-specific characteristics – cash and leverage – shown to be associated with over- and under-investment (e.g., Myers, 1977; Jensen, 1986). Second, we directly model the expected level of investment based on a firm’s investment opportunities to examine the relation between financial reporting quality and the distance from this expected level. Third, as sensitivity analysis, we identify settings where firms are more likely to either over- or under-invest for exogenous reasons using as partitioning variables aggregate investment at the economy and industry levels.

The two key constructs in the analysis are investment efficiency and financial reporting quality. We conceptually define a firm as investing efficiently if it undertakes projects with positive net present value (NPV) under the scenario of no market frictions such as adverse selection or agency costs. Thus, under-investment includes passing up investment opportunities that would have positive NPV in the absence of adverse selection. Correspondingly, over-investment is defined as investing in projects with negative NPV.

We define financial reporting quality as the precision with which financial reporting conveys information about the firm’s operations, in particular its expected cash flows, in order to inform equity investors. This definition is consistent with the Financial Accounting Standards Board Statement of Financial Accounting Concepts No. 1 (1978), which states that one objective of financial reporting is to inform present and potential investors in making rational investment decisions and in assessing the expected firm cash flows. We follow prior literature and we use a measure of accruals quality derived in Dechow and Dichev (2002) as our first proxy for financial reporting quality. This measure is based on the idea that accruals improve the informativeness of

earnings by smoothing out transitory fluctuations in cash flows and has been used extensively in the prior literature. Second, we use a measure of accruals quality proposed by Wysocki (2008). Wysocki highlights that the Dechow and Dichev measure might not appropriately capture accruals quality and suggests an alternative measure that better captures this construct. Finally, in order to capture a more forward-looking aspect of financial reporting quality, we use a measure of readability of financial statements proposed by Li (2008) called the FOG Index. Li shows that the FOG Index is associated with earnings persistence and with future firm profitability.

The analysis yields three key findings. First, we find that higher reporting quality is associated with both lower under- and over-investment. Specifically, reporting quality is positively associated with investment among firms that are cash constrained and highly levered, and negatively associated with investment among cash rich and unlevered firms. This finding suggests that the relation between financial reporting quality and investment is conditional on the likelihood that a firm is in a setting more prone to over- or under-investment. Second, firms with higher reporting quality are less likely to deviate from their predicted level of investment (one of our proxies for under- and over-investment). Third, firms with higher reporting quality invest less when the aggregate investment is high, and invest more when aggregate investment is low. These results are consistent with the intuition that firms with higher financial reporting quality are less affected by aggregate macro-economic shocks than firms with lower quality financial reporting.

Our findings are both economically and statistically significant, and are robust to controlling for different variables, including volatility of investment, cash flow, sales, and/or returns. Further, one could argue that we could be capturing the effect of different corporate

governance mechanisms that are correlated with reporting quality. To address this concern, we explicitly control for alternative governance mechanisms that could affect investment efficiency such as institutional ownership, analyst coverage, and anti-takeover protections, which proxies for the effectiveness of the market for corporate control.

Our findings contribute to a fast-growing body of literature that studies the relation between financial reporting quality and investment. Since Biddle and Hilary (2006), a few concurrent papers have shown, consistent with our findings, that firms with higher reporting quality are less likely to over-invest (e.g., Bens and Monahan, 2004; Bushman, Piotroski and Smith, 2006; Beatty, Liao and Weber, 2008; Francis and Martin, 2008; Hope and Thomas, 2008; McNichols and Stubben, 2008). Our results contribute to these papers by showing that firms with higher financial reporting quality are also less likely to under-invest. While the evidence on the link between reporting quality and over-investment seems somewhat established, the findings regarding under-investment, to the best of our knowledge, are new.

The remainder of the paper proceeds as follows. Section 2 develops the testable hypotheses. Section 3 describes the research design. Section 4 presents the main results. Section 5 presents some sensitivity analyses. Section 6 concludes.

2. Hypothesis development

In this section, we first review the determinants of capital investment efficiency. Then we discuss how financial reporting quality can affect investment efficiency. Finally, we develop predictions on the relation between financial reporting quality and investment efficiency.

2.1. *Determinants of capital investment efficiency*

In the neo-classical framework (e.g., Yoshikawa, 1980; Hayashi, 1982; Abel, 1983), the marginal Q ratio is the sole driver of capital investment policy. Firms invest until the marginal benefit of capital investment equals the marginal cost, subject to adjustment costs of installing the new capital; managers obtain financing for positive net present value projects at the prevailing economy-wide interest rate and return excess cash to investors. However, the literature has also recognized the possibility that firms may depart from this optimal level and either under- or over-invest. For example, prior research has identified two primary imperfections – moral hazard and adverse selection – both caused by the existence of information asymmetry between managers and outside suppliers of capital, which can affect the efficiency of capital investment.

Managers maximizing their personal welfares are sometimes inclined to make investments that are not in the best interests of shareholders (Berle and Means, 1932; Jensen and Meckling, 1976). Models of moral hazard use this intuition and suggest that managers will invest in negative net present value projects when there is divergence in principal-agent incentives. For example, Jensen (1986) predicts that managers have incentives to consume perquisites and grow their firms beyond the optimal size. These predictions receive empirical support from Blanchard, Lopez-de-Silanes, and Shleifer (1994), among others. Moral hazard can lead to both under- or over-investment depending on the availability of capital. On one hand, the natural tendency to over-invest will produce excess investment *ex post* if firms have resources to invest. On the other hand, suppliers of capital are likely to recognize this problem and to ration capital *ex ante*, which may lead to under-investment *ex-post* (e.g., Stiglitz and Weiss, 1981; Lambert *et al.*, 2007).

Models of adverse selection suggest that if managers are better informed than investors about a firm's prospects, they will try to time capital issuances to sell overpriced securities (i.e., a lemon's problem). If they are successful, they may over-invest these proceeds (e.g., Baker, Stein, and Wurgler, 2003). However, investors may respond rationally by rationing capital, which may lead to *ex post* under-investment. For example, Myers and Majluf (1984) show that when managers act in favor of existing shareholders and the firm needs to raise funds to finance an existing positive net present value project, managers may refuse to raise funds at a discounted price even if that means passing up good investment opportunities.

The discussion above suggests that information asymmetries between firms and suppliers of capital can reduce capital investment efficiency by giving rise to frictions such as moral hazard and adverse selection that can each lead to produce over- and under-investment. In the next section, we discuss how financial reporting quality can enhance investment efficiency by mitigating these information asymmetries.

2.2. The effect of financial reporting quality on sub-optimal investment levels

Prior studies have suggested that higher quality financial reporting enhance capital investment efficiency by mitigating information asymmetries that cause economic frictions such as moral hazard and adverse selection (e.g., Leuz and Verrecchia, 2000; Bushman and Smith, 2001; Verrecchia, 2001). For example, it is well established that financial reporting information is used by shareholders to monitor managers (e.g., Bushman and Smith, 2001; Lambert, 2001) and constitutes an important source of firm-specific information for investors (e.g., Bushman and Indjejikian, 1993; Holmstrom and Tirole, 1993; Kanodia and Lee, 1998). If higher quality financial reporting serves to reduce moral hazard, it can improve investment efficiency by

increasing shareholder ability to monitor managerial investment activities. Consistent with this view, Bens and Monahan (2004) find a positive association between AIMR disclosure ratings and the excess value of diversification as defined by Berger and Ofek (1995). Correspondingly, Hope and Thomas (2008) find that firms that cease to disclose geographical information post-SFAS 131 (their proxy for lower financial reporting quality) experience an abnormal increase in sales and a decrease in firm value (suggesting that these firms over-invest). Bushman *et al.* (2006) find a positive relation between country measures of timely loss recognition and country propensity to liquidate bad projects (i.e., mitigate over-investment). These findings suggest that high-quality financial reporting operates to reduce moral hazard.

However, the existence of information asymmetry between the firm and investors could also lead suppliers of capital to infer that a firm raising capital is of a bad type and to discount the stock price (Myers and Majluf, 1984). If financial reporting quality reduces adverse selection costs, it can improve investment efficiency by reducing the cost of external financing and by reducing the likelihood that a firm obtains excess funds because of temporary mispricing. Consistent with this view, Chang, Dasgupta and Hilary (2009) propose a model of dynamic adverse selection and show empirically that firms with better auditing have more flexibility to issue capital. These findings suggest that high-quality financial reporting also operates to reduce adverse selection.

Based on the discussion above, we hypothesize that higher quality financial reporting is associated with investment efficiency by mitigating over- and/or under-investment. Specifically, we form the following two hypotheses:

H1a: Financial reporting quality is negatively associated with over-investment.

H1b: Financial reporting quality is negatively associated with under-investment.

Both of these hypotheses are consistent with Biddle and Hilary (2006), who find that higher quality accounting lowers investment-cash flow sensitivity (a proxy for investment inefficiency) both across countries and within countries when the financing is done at arm's length. However, because investment-cash flow sensitivities can reflect the effects of either excess capital and/or capital constraints, their study leaves unanswered the further questions of whether higher quality financial reporting operates by reducing capital over- and/or under-investment.

The above hypotheses suggest a link between financial reporting quality and investment efficiency. However, it is important to note that other governance mechanisms could also represent a way to increase investment efficiency. For instance, Ferreira and Matos (2008) show that firms with higher institutional ownership have lower capital expenditures and higher valuations, suggesting that institutional ownership mitigates over-investment. Similarly, Chang, Dasgupta and Hilary (2006) show that greater analyst coverage improves the flexibility in the financial policy, which may help to mitigate under-investment. Finally, Jensen (1986) argues that the market for corporate control can serve as a monitoring mechanism that mitigates over-investment. Consistent with this prediction, Gompers, Ishii and Metrick (2003) show that firms with stronger shareholder rights have higher firm value, lower capital expenditures, and make fewer corporate acquisitions. Given these possibilities, our empirical tests explicitly control for these alternative governance mechanisms when studying the relation between financial reporting quality and under- and over-investment.

3. Research design

We test these hypotheses by examining the relation between financial reporting quality and the level of capital investment conditional on whether the firm is more likely to over- or under-invest. We use firm-specific characteristics to identify firms with higher likelihood of over- or under-investment (in Section 5, we also consider measures of over- and under-investment based on economy-wide and industry-specific partitions). In addition, we directly model the expected level of capital investment based on the firm's investment opportunities, and test the association between financial reporting quality and deviations from this expected level.

3.1. Conditional relation of financial reporting quality on investment

First, we test whether higher financial reporting quality is negatively (positively) associated with investment when firms are more likely to over-invest (under-invest) using the following specification.

$$\begin{aligned} Investment_{i,t+1} = & \alpha + \beta_1 FRQ_{i,t} + \beta_2 FRQ_{i,t} * OverI_{i,t+1} + \beta_3 OverI_{i,t+1} + \\ & \sum_j \gamma_j Control_{j,i,t} + \varepsilon_{i,t+1} \end{aligned} \quad (1)$$

As described in detail below, our main measure of investment (*Investment*) includes both capital and non capital investment. *FRQ* is one of the three different measures of financial reporting quality. *OverI* is a ranked variable used to distinguish between settings where over- or under- investment is more likely, and *Control* is a set of control variables.

We estimate model (1) using Ordinary Least Squares (OLS). We adjust the standard errors for heteroskedasticity, serial-, and cross-sectional correlation using a two-dimensional cluster at the firm and year level. This technique is proposed by Petersen (2009) as a preferred method for estimating standard errors in corporate finance applications using panel data. We

also include industry fixed-effects using the Fama and French (1997) 48-industry classification to control for industry-specific shocks to investment.

Hypothesis *H1b* predicts that financial reporting quality is negatively associated with under-investment. We test this prediction by examining if the coefficient on reporting quality is greater than zero (i.e., *H1b*: $\beta_1 > 0$). That is, given that *OverI* is increasing (decreasing) in the likelihood of over-investment (under-investment), the coefficient β_1 measures the relation between reporting quality and investment when under-investment is most likely. Alternatively, Hypothesis *H1a* predicts that financial reporting quality is negatively associated with over-investment. Since the coefficient β_2 measures the incremental relation between reporting quality and investment as over-investment becomes more likely, the sum of the coefficients on the main and interaction effects ($\beta_1 + \beta_2$) measures the relation between reporting quality and investment when over-investment is most likely. We thus use the joint effect of these coefficients to test the association predicted by the hypothesis *H1a* (i.e., *H1a*: $\beta_1 + \beta_2 < 0$). A corollary of hypotheses *H1a* and *H1b* is that the coefficient on the interaction term between reporting quality and over-investment is less than zero (i.e., $\beta_2 < 0$). We also test this corollary.

We use an accounting-based framework to estimate total investment as the difference between total investment and asset sales (Richardson, 2006). *Investment* in a given firm-year is the sum of capital expenditures, R&D expenditures, and acquisitions minus sales of PPE, and scaled by lagged total assets. In addition, in Section 5 we discuss the results for the sub-components of investment.

We use three different proxies for financial reporting quality. The first measure considers accruals quality. It is derived from prior work (Dechow and Dichev, 2002; McNichols, 2002) and has been used extensively in the prior literature (e.g., Aboody, Hughes and Liu, 2005;

Francis, LaFond, Olsson and Schipper, 2004, 2005). The measure of accruals quality is based on the idea that accruals are estimates of future cash flows, and earnings will be more predicative of future cash flows when there is lower estimation error embedded in the accruals process. We estimate discretionary accruals using the Dechow and Dichev (2002) model augmented by the fundamental variables in the Jones (1991) model as suggested by McNichols (2002). The model is a regression of working capital accruals on lagged, current, and future cash flows plus the change in revenue and PPE. Following Francis *et al.* (2005), we estimate the Dechow and Dichev model cross-sectionally for each industry with at least 20 observations in a given year based on the Fama and French (1997) 48-industry classification. Accruals quality, AQ , at year t is defined as the standard deviation of the firm-level residuals from the Dechow and Dichev model during the years $t-5$ to $t-1$ (lagged by an extra year due to the inclusion of one-year ahead cash flow in the DD model), assuring that all explanatory variables are measured before period t for the computation of AQ in that year. We multiply by negative one so that AQ is increasing in financial reporting quality.

The second measure is a modification of the accruals quality measure proposed by Wysocki (2008). Wysocki argues that the measure derived from the Dechow and Dichev (2002) study does not reliably capture “high quality accruals” and he proposes a modified version of the Dechow and Dichev (2002) measure that aims to capture the incremental association between current accruals and past and future cash flows over and above the association between current accruals and current cash flows. This measure is estimated in two steps. First, we estimate two variations of the Dechow and Dichev (2002) model. The first model is a regression of working capital accruals on current cash flows. The second model is the original Dechow and Dichev model: a regression of working capital accruals on lagged, current, and future cash flows. We then compute the standard deviation of the residuals of each model during the years $t-5$ to $t-1$. Our

second measure of financial reporting quality ($AQWi$) is the ratio of the standard deviation of the residuals from the simpler model to the full model (i.e., $STD(Resid_1) / STD(Resid_2)$).¹

Given the debate regarding the appropriate way of measuring accruals quality, we also consider a measure of financial disclosure transparency. Li (2008) computes the *FOG* index as a measure of readability of financial reports. The idea is that managers can obfuscate the financial report by making it harder for investors to understand and to infer the future cash flow implications of current accounting information. In fact, Li shows that firms with a large *FOG* index are associated with a lower earnings persistence and lower future profitability. We use this variable as a third measure of reporting quality. Similarly to *AQ*, we multiply the *FOG* measure by minus one so that it is increasing in reporting quality. Finally, we form a summary statistic for financial reporting by normalizing these three proxies (*AQ*, *AQWi* and *FOG*) and taking the average of these three measures.² We use this summary measure (*FRQ Index*) as our main measure of reporting quality.

In order to test the conditional relation between financial reporting quality and investment (equation (1)), we need a proxy for over- and under-investment. We use ex-ante firm-specific characteristics that are likely to affect the likelihood that a firm will over- or under-invest. In our first test, we focus on firm liquidity proxied by cash balance and leverage. We use firm cash balance as a partitioning variable based on the argument that firms without cash are more likely to be financially constrained. Alternatively, firms with large cash balances are more likely to face agency problems and to over-invest (e.g., Jensen, 1986; Blanchard *et al.*, 1994; Opler,

¹ Wysocki (2008) proposes two other alternative measures of accruals quality which require a firm-specific time-series estimation of the accruals model and thus cannot be estimated cross-sectionally. We use the measure proposed by Wysocki that most closely builds on our measure of accruals quality.

² We also estimate a principal-component analysis and the factor solution consists of one factor with eigenvalue larger than one (1.22). We obtain similar results if we use the principal factor as the aggregate measure of accounting quality. We present the results using the standardized averages because they are common practice in the literature (Grice and Harris, 1998).

Pinkowitz, Stulz, and Williamson, 1999).³ We also use firm leverage as another proxy for firm liquidity. Firms with high leverage are more likely to suffer a debt overhang problem that will force them to under-invest (e.g., Myers, 1977). We first rank firms into deciles based on their cash balance and their leverage (we multiply leverage by minus one before ranking so that, consistently with cash, it is increasing with the likelihood of over-investment) and re-scale them to range between zero and one. We then create a composite score measure, *OverFirm*, which is computed as the average of ranked values of the two partitions variables. We do so because each measure is likely to capture the liquidity of the firm with error and by aggregating these variables we expect to reduce measurement error in the individual variables.

In the context of Equation 1, the estimated coefficient (β_1) measures the association between financial reporting quality and investment for firms with the lowest amount of cash and highest level of leverage (i.e., firms in the bottom decile). Likewise, the sum of the coefficients ($\beta_1 + \beta_2$) measures the association between reporting quality and capital investment for firms with the highest amount of cash and lowest amount of debt (i.e., firms in the top decile).

We also introduce controls for effects that could confound our findings. First, we control for alternative corporate governance mechanisms, namely the presence of institutional investors, financial analysts, and the market for corporate control. As discussed in Section 2, these governance mechanisms could substitute for the effect of financial reporting quality in mitigating over- or under-investment. Institutional ownership (*Institutions*) is the percentage of institutional investors in the firm provided by *Thomson Financial* and analysts (*Analysts*) is the number of financial analysts following the firm as reported by IBES. Following prior literature (e.g., Chang

³ We note that it is possible that firms accumulate cash in anticipation for financing constraints. However, the empirical finding in the literature (e.g., Blanchard *et al.*, 1994; Opler *et al.*, 1999) is that, on average, firms with high cash are more likely to face agency problems that lead to inefficient use of the excessive cash such as empire building and perquisite consumption. We also concede that it is possible that leverage and liquidity are affected by accounting quality.

et al., 2006) we assume that firms not covered by IBES have zero analyst coverage. We control for the market for corporate control by using *G-Score*, the corporate governance index used in Gompers *et al.* (2003), as a measure of anti-takeover protection. Firms with large G-scores have more anti-takeover provisions that reduce the ability of a takeover to act as a monitoring device for managers. We also add interactions between *OverFirm* and *Institutions*, *Analysts*, and *G-Score* to control for the possible effect of these governance mechanisms on under- and over-investment. Finally, because G-scores are missing for many firms, we set observations with missing G-scores to zero. We then include an indicator variable that takes the value of one if the data is missing and zero otherwise.

Second, we control for a series of variables to mitigate concerns that the investment behavior we document is not merely extracting innate factors influencing both accruals quality and investment behavior. Liu and Wysocki (2007) suggest that a combination of cash-flow and sales volatilities subsumes the relation between accruals quality and proxies for the cost of capital. Thus, we also control for sales volatility (in addition to cash flow volatility discussed above). We control for investment volatility to ensure that the results are not simply capturing a relation between over- and under-investment and investment volatility. Finally, as discussed in Dechow, 1994; Dechow, Kothari, and Watts, 1998; and Dechow and Dichev, 2002), firms in different stages of the business cycle may have different (discretionary) accruals arising from differences in their business models that are unrelated to earnings management activities. We thus include as controls a measure of age, the length of the operating cycle, and the frequency of losses.

Finally, following Biddle and Hilary (2006), we control for firm size, the market-to-book ratio, the CFO volatility, bankruptcy risk, tangibility, industry leverage, and dividend payout ratio since these were found previously to be related to capital investment.⁴

3.2 *Deviation from the optimal level of investment*

The analysis described in Section 3.1 has focused on the conditional role of financial reporting quality on investment under the assumption that the conditioning variable (i.e., the likelihood that a firm is in a setting prone to over- or under-investment) is exogenous with respect to individual firms. We also investigate whether higher financial reporting quality reduces the likelihood that a firm deviates from the expected investment level. That is, whereas Section 3.1 investigates if high financial reporting quality brings the investment level closer to the optimal one given that the firm is in a situation more prone to either over- or under-investment, here we directly model if higher financial reporting quality reduces the likelihood that a firm over- or under-invests.

We proceed by first estimating a firm-specific model of investment as a function of growth opportunities (as measured by sales growth) and use the residuals as a firm-specific proxy for deviations from expected investment.⁵ The model is described below:

$$Investment_{i,t+1} = \beta_0 + \beta_1 * Sales\ Growth_{i,t} + \varepsilon_{i,t+1} \quad (2)$$

⁴ We drop R&D from this set given that R&D activity is part of our measure of total investment. In addition, leverage and cash are also omitted because they are used to compute *OverFirm*, which is included in the model. Untabulated results indicate that including this variable does not affect our conclusions.

⁵ The literature in corporate finance often uses Tobin's Q as a proxy for growth (Hubbard, 1998). We use sales growth because Tobin's Q can arguably be affected by financial reporting quality and because marginal Q is notoriously hard to measure. In untabulated analysis, we find that results are similar if we estimate the model using Q as a proxy for growth or if we include both sales growth and Q in the investment model.

$Investment_{t+1}$ is the total investment and $Sales\ Growth_t$ is the percentage change in sales from year $t-1$ to t . Equation 2 is estimated for each industry year based on the Fama and French 48-industry classification for all industries with at least 20 observations in a given year.

We then classify firms into three groups – firms that are more likely to under-invest, firms that are more likely to over-invest, and the remaining firms – based on the magnitude of the residuals (i.e., deviations from predicted investment) and use these groups as the dependent variable. Specifically, we sort firms yearly based on the residuals from the firm-specific model into quartiles. Firm-year observations in the bottom quartile (i.e., the most negative residuals) are classified as under-investing, observations in the top quartile (i.e., the most positive residuals) are classified as over-investing, and observations in the middle two quartiles are classified as the benchmark group. We estimate a multinomial logit model that predicts the likelihood that a firm will be in one of the extreme quartiles as opposed to the middle quartiles. $H1a$ and $H1b$ predict that firms with higher financial reporting quality will be less likely to be in the top (bottom) quartile of unexplained investment. Our control variables are the same we use in model (1) but we also control for leverage and financial slack (as described in footnote 4, these variables are omitted above because they are used to compute $OverFirm$, which is included in the model).

4. Main Empirical Results

4.1. Sample and descriptive statistics

Our main sample consists of 34,791 firm-year observations from 1993 to 2005. We start in 1993 because the FOG measure is only available post-1993 (and $G-Score$ is only available post-1991). We collect financial reporting data from Compustat and price and return data from

CRSP. Consistent with previous practice in the literature, financial firms (i.e., SIC codes in the 6000 and 6999 range) are excluded because of the different nature of investment for these firms. In order to mitigate the influence of outliers, we winsorize all continuous variables at the 1% and 99% levels by year at the firm-year level.

Table 1 presents descriptive statistics for the variables used to estimate equation (1). The mean (median) *Investment* across all firm-years equals 14.14% (9.28%) of prior years' assets. The mean (median) firm in the sample has an *AQ* of -0.06 (-0.04). These values are consistent with prior research (e.g., Francis *et al.*, 2005). Table 2 presents correlations among our main variables. The four measures of reporting quality are positively and significantly related. The correlation between *FOG* and the two accruals quality measures is lower, likely because *FOG* captures other dimensions of accounting quality unrelated to accruals. On a univariate basis, all four measures of reporting quality are negatively correlated with *Investment*. However, as shown below, the relation between financial quality and investment is conditional on the firm propensity to over- or under-invest.

4.2. *Conditional tests*

Table 2 reports the results for our tests of hypotheses *H1a* and *H1b*. We find evidence that reporting quality is positively associated with investment among firms with higher likelihood of under-investing. That is, the estimated coefficient on reporting quality is positive and statistically significant in all four columns. The t-statistics range from 1.89 to 2.60. The economic effect is such that increasing *AQ* (*FRQ Index*) by one standard deviation increases *Investment* by approximately 0.71% (0.67%) among firms that are under-investing. Given that the mean investment equals 14.14%, this effect represents an increase of 5.0% (4.7%). These

findings provide support for hypothesis *H1b*. In terms of the interaction between reporting quality and over-investment, we find that the estimated coefficient is negative and significant in all four specifications (with t-statistics ranging from -2.67 to -4.46). Further, the overall effect of reporting quality on investment among firms that are over-investing (as measured by the sum of the coefficients on reporting quality and on the interaction between reporting quality and *OverFirm*) is negative and significant in all cases. The t-statistics range from -2.84 to -4.78. In terms of economic significance, increasing *AQ (FRQ Index)* by one standard deviation decreases *Investment* among firms that are over-investing by approximately 1.0% (1.7%). This effect represents a decrease in investment of about 7.3% (12.2%) on a relative basis. Thus, the findings in Table 2 also provide support for hypothesis *H1a*.⁶

In our main test, we use an aggregated measure of cash balance and leverage to classify firms into the likelihood that they will over- or under-invest. We do so to mitigate the random error component in both measures. Our conclusions are largely robust to the use of disaggregated measures. When we use cash and leverage as separate portioning variables, untabulated results indicate, for example, that the interaction between our overall measure of reporting quality and either variable is significant (with t-statistics equal to -4.30 and -3.72). The coefficient associated with *FRQ* is also positive in both cases (with t-statistics equal to 2.11 and 1.40 for cash and leverage, respectively).

⁶ Due to the interaction with accounting quality, the coefficients on *OverFirm* measure the effect of over-investment on investment when accounting quality is zero, which is never the case in our sample. In untabulated regressions, we re-estimate the models in Table 2 after centering accounting quality to zero. In this case, the coefficients on *OverFirm* are positive and significant as predicted.

4.3 Unconditional tests

So far, our analysis has been conditional on the firm being in a setting where over- or under-investment is more likely. We now directly model if financial reporting quality has an effect on the likelihood of over- or under-investing. We form a variable (*Inv_state*) that takes the value of one if the residual from the *Investment* regression (model (2)) is in the bottom quartile of the distribution, the value of two if it is in the middle two quartiles, and the value of three if it is in the top quartile. Before using a multivariate analysis, we present some evidence of the univariate relation between the investment residuals across three groups of accounting quality. Figure 1, Panel A (Panel B) presents the analyses for firms that are more likely to under-invest (over-invest).

In Panel A, we find a positive association between reporting quality and the investment residuals. For example, the investment residual increases from -14.5% to -13.7% as *AQ* increases across terciles. Similarly, investment residual increases from -14.2% to -13.3% as the aggregate reporting quality index (*FRQ Index*) increases. Panel B presents the analysis for firms that are classified as over-investing. In this case, there is a negative association between reporting quality and the investment residuals. For example, investment residual decreases from -19.4% to -14.9% as the aggregate reporting quality index (*FRQ Index*) increases from the bottom to the top tercile. Overall, the results in Figure 1 suggest that, among firms that are under-investing, firms with higher reporting quality invest approximately 1% more than firms with lower reporting quality. On the other hand, when firms are over-investing, firms with higher reporting quality invest approximately 3% less than firms with lower reporting quality.

We then estimate a multinomial logistic regression that tests the likelihood that a firm might be in the extreme investment residual quartiles as a function of financial reporting quality.

This specification considers simultaneously, but separately, the likelihood of over- and under-investing. Results of this estimation are reported in Table 3 (the case when *Inv_state* equals 2 – i.e., the middle quartile is used as the benchmark). They indicate that the coefficient associated with *AQ*, *FOG* or the *FRQ Index* is significantly negative in both Panel A and B. That is, firms with higher accruals quality are less likely to be in the extreme quartiles, suggesting that these firms are less likely to over- and under-invest. The absolute value of the t-statistics ranges from 1.80 and 3.62. The estimated coefficients on *AQWi* are negative as predicted, but generally insignificant at conventional levels. Overall, the results provide additional support for hypotheses *H1a* and *H1b* by showing that firms with higher financial reporting quality are less likely to over- and under-invest.

5. Robustness checks

Before concluding the paper, we consider three additional sets of tests. First, we divide our overall measure of investment between capital expenditure (*Capex*) and non-capital expenditure investment (*Non-Capex*). Second, we examine two alternative partitioning variables based on aggregate and industry data. To avoid repetition, we use the aggregated reporting quality factor (*FRQ Index*) as the proxy for financial reporting quality in these tests. Finally, we discuss some results that complement the multinomial logit analysis on the relation between financial reporting quality and the distance to the predicted investment.

5.1. *Capex versus non-capex investment*

When we calculate our measure of investment, we consider both capital expenditures and non-capital expenditures. This approach follows Richardson (2006). In a robustness check, we

decompose the overall investment into two components. We compute *Capex* as the capital expenditures, scaled by lagged property, plant, and equipment. We also compute a measure of non-capex investments (*Non-Capex*). This variable is computed as the sum of R&D expenditures and acquisitions, scaled by lagged total assets. (Results are unchanged if we include advertising expenses in the measure of non-capex investment.) We re-estimate our main model using these two measures. Results reported in Table 4 indicate that the sign of the different coefficients is not affected by the decision to use Capex or Non-Capex as dependent variables. The statistical significance of the interaction term between *OverFirm* and *FRQ Index* is maintained (-2.52 for Capex and -8.11 for Non-Capex) and the p-value of the joint-significance remains 0.00 in both cases. The effect on under-investment is less robust. The t-statistic for the coefficient on the *FRQ Index* is 6.26 for the non-capex investment, but only 0.80 for Capex. These results suggest that, whereas the effect of accounting quality on over-investment is robust across components of investment, the effect on under-investment seems to be particularly important for R&D expenses and acquisitions.

5.2. *Partitioning variables at the aggregate and industry level*

In the analysis above, we use firm characteristics – cash and leverage – to proxy for the likelihood that a firm might over- or under-invest. Ideally, one would develop an exogenous firm-specific measure that would identify these situations. This is empirically challenging since our hypotheses predict an association between investment and financial reporting quality. As sensitivity analysis, we aggregate investment at the economy and industry levels as proxies for the likelihood of over- and under-investment based on the idea that aggregate investment is less likely to be affected by firm-specific financial reporting quality. Specifically, we estimate

Equation 2 using aggregated data and use the residuals as proxies for over-investment. We then rank the residuals from these models into deciles (re-scaled from zero to one) to form a measure of aggregate over-investment. Specifically, we create a variable, *OverAggregate*, when the model is estimated using aggregated data for the whole economy in a given year. Similarly, we create *OverIndustry* when the model is estimated using data aggregated at the industry-year level. We then re-estimate Equation 1 using these two different partitioning variables as a proxy for *OverI*.

Results are presented in Table 5. We use the industry partition in Columns 1 and 2, and the aggregated partition in Column 3. Column 1 uses data from our main sample period (1993 to 2005). However, this relatively short period of time provides little time-series variation, which is especially important for the partition aggregated at the whole economy. Thus, we also present the results on an expanded sample period of 1975 to 2005 (this leads us to drop the controls for alternative governance mechanisms because this data is not available in the earlier periods) for the industry and aggregate-economy partitions (Columns 2 and 3). Our results confirm our previous conclusions. The coefficient on the *FRQ Index* variable is positive and significant in all three columns (the t-statistics range from 1.67 to 4.12) confirming the relation between reporting quality and under-investment using this alternative methodology. Similarly, the interaction between *FRQ Index* and the partitioning variables, and the joint effect are significantly negative in all three specifications, suggesting that the negative relation between reporting quality and investment among firms more likely to over-invest is also robust to these alternative specifications.

5.3. *Reporting quality and the distance to predicted investment*

In Table 3, we present a multinomial logit model which tests the likelihood that a firm will be either in the under- or over-investment group. Here we discuss some supporting evidence for this test. Specifically, we regress the absolute value of the investment residuals on the accounting quality measures and find that accounting quality is negatively associated with the distance between actual and predicted investment. We also estimate a logistic regression where the dependent variable takes the value of one if the residual is the bottom or top quartile of the distribution and zero otherwise. Results indicate that the coefficient associated with accounting quality is negative and statistically significant. These results confirm findings in Table 3 that firms with higher financial reporting quality are less likely to be extreme investors. However, these findings cannot distinguish over- or under-investment as the mechanism linking financial reporting quality to the deviation from optimal investment and are thus just discussed as sensitivity analyses.

6. Conclusion

Prior studies suggest that higher quality financial reporting increases investment efficiency. We extend this research by investigating whether quality financial reporting is associated with investment efficiency due to the reduction in over- and/or under-investment. We argue that higher financial reporting quality reduces the information asymmetry that causes frictions such as moral hazard and adverse selection, and thus is positively associated with investment efficiency. Thus, we hypothesize that higher financial reporting quality is associated with lower investment for firms that are more likely to over-invest, and associated with higher investment for firms that are more likely to under-invest.

Our results are consistent with these hypotheses when tested in several ways. First, higher financial reporting quality is associated with higher investment among firms that are cash constrained and highly levered, and lower investment among firms that are cash rich and unlevered. In addition, firms with high financial reporting quality invest less when aggregate investment is high, and invest more when aggregate investment level is low. These results are consistent with the argument that financial reporting quality facilitates investment for constrained firms, and curbs investment for firms that are more likely to over-invest. Finally, firms with higher financial reporting quality are less likely to deviate from their predicted level of investment (one of our proxies for under- and over-investment). Overall, our findings are consistent with the idea that financial reporting quality serves a role in mitigating information frictions that ultimately hamper investment efficiency.

References

- Abel, A., 1983. Optimal investment under uncertainty. *American Economic Review* 73 (1), 228-233.
- Aboody, D., J. Hughes, J. Liu, 2005. Earnings quality, insider trading, and cost of capital. *Journal of Accounting Research* 43, 651-673.
- Baker, M., J. Stein, and J. Wurgler, 2003. When does the market matter? Stock prices and the investment of equity-dependent firms. *Quarterly Journal of Economics* 118 (3), 969-1005.
- Beatty, A., S. Liao, and J. Weber, 2008. Financial reporting quality, private information, monitoring and the lease-versus-buy decision. Working Paper, Ohio State University.
- Bens, D., and S. Monahan, 2004. Disclosure quality and the excess value of diversification. *Journal of Accounting Research* 42 (4), 691-730.
- Berger, P., and E. Ofek, 1995. Diversification's effect on firm value. *Journal of Financial Economics* 37, 39-65.
- Berle, A., and G. Means, 1932. *The modern corporation and private property* (Macmillan, New York).
- Biddle, G., and G. Hilary, 2006. Accounting quality and firm-level capital investment. *The Accounting Review* 81 (5), 963-982.
- Blanchard, O., F. Lopez-de-Silanes, and A. Shleifer, 1994. What do firms do with cash windfalls? *Journal of Financial Economics* 36 (3) 337-360.
- Bushman, R., R. Indjejikian, 1993. Shareholder demand for "distorted" accounting disclosures. *The Accounting Review* 68 (4), 765-782.
- Bushman, R., J. Piotroski, and A. Smith, 2006. Capital allocation and timely accounting recognition of economic losses: international evidence, Working Paper, University of Chicago.
- Bushman, R., and A. Smith, 2001. Financial accounting information and corporate governance. *Journal of Accounting and Economics* 31, 237-333.
- Chang, X., S. Dasgupta, and G. Hilary, 2006. Analyst coverage and financing decisions. *Journal of Finance* 61 (6), 3009-3048.
- Chang, X., S. Dasgupta, and G. Hilary, 2009. The effect of auditor quality on financing decisions. Forthcoming, *The Accounting Review*.

- Dechow, P., 1994. Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. *Journal of Accounting and Economics* 18 (July), 3-42.
- Dechow, P., and I. Dichev, 2002. The quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review* 77 Supplement, 35-59.
- Dechow, P., S. P. Kothari, and R. L. Watts. 1998. The relation between earnings and cash flows. *Journal of Accounting and Economics* 25 (May), 133-168.
- Fama, E., and K. French, 1997. Industry costs of equity. *Journal of Finance* 43, 153-193.
- FASB, 1978. Statement of Financial Accounting Concepts No. 1. Objectives of Financial Reporting by Business Enterprises.
- Fazzari, S., G. Hubbard, and B. Petersen, 2000. Investment-cash flow sensitivities are not useful: A comment on Kaplan and Zingales. *Quarterly Journal of Economics* 115 (2), 695-705.
- Ferreira, M., and Matos, P., 2008. The colors of investors' money: The role of institutional investors around the world. *Journal of Financial Economics* 88 (3), 499-533.
- Francis, J., R. LaFond, P. Olsson, and K. Schipper, 2004. Cost of equity and earnings attributes. *The Accounting Review* 79 (4), 967-1010.
- Francis, J., R. LaFond, P. Olsson, and K. Schipper, 2005. The market pricing of accruals quality. *Journal of Accounting and Economics* 39 (2), 295-327.
- Francis, R., Martin, X., 2008. Timely loss recognition and acquisition profitability. Working Paper, University of Missouri.
- Gompers, P., J. Ishii, and A. Metrick, 2003. Corporate governance and equity prices. *Quarterly Journal of Economics* 118 (1), 107-155.
- Grice, J., and R. Harris, 1998. A comparison of regression and loading weights for the computation of factor scores. *Multivariate Behavioral Research* 33 (2), 221-247.
- Hayashi, F., 1982. Tobin's marginal q and average q: A neoclassical interpretation. *Econometrica* 50 (1), 213-224.
- Healy, P., and K. Palepu, 2001. Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics* 31 (1-3), 405-440.
- Holmstrom, B., and J. Tirole, 1993. Market liquidity and performance monitoring. *Journal of Political Economy* 101, 678-709.

- Hope, O., and W. Thomas, 2008. Managerial empire building and firm disclosure. *Journal of Accounting Research* 46 (3), 591-626.
- Hubbard, R., 1998. Capital-market imperfections and investment. *Journal of Economic Literature* 36, 193-225.
- Jensen, M., 1986. Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review* 76 (2), 323-329.
- Jensen, M., and W. Meckling, 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360.
- Jones, J., 1991. Earnings management during import relief investigations. *Journal of Accounting Research* 29 (2), 193-228.
- Kanodia, C., and D. Lee, 1998. Investment and disclosure: the disciplinary role of periodic performance reports. *Journal of Accounting Research* 36, 33-55.
- Kaplan, S., and L. Zingales, 1997. Do financing constraints explain why investment is correlated with cash-flows? *Quarterly Journal of Economics* 112 (2), 169-215.
- Kaplan, S., and L. Zingales, 2000. Investment-cash flow sensitivities are not valid measures of financing constraints. *Quarterly Journal of Economics* 115 (2), 707-712.
- Lambert, R., 2001. Contracting theory and accounting. *Journal of Accounting and Economics* 32, 3-87.
- Lambert, R., C. Leuz, and R. Verrecchia, 2007. Accounting information, disclosure, and the cost of capital. *Journal of Accounting Research* 45, 385-420.
- Leuz, C., and R. Verrecchia, 2000. The economic consequences of increased disclosure. *Journal of Accounting Research* 38, 91-124.
- Li, F., 2008. Annual report readability, current earnings, and earnings persistence. *Journal of Accounting and Economics* 45 (2-3), 221-247.
- Liu, M., and P. Wysocki, 2007. Cross-sectional determinants of information quality proxies and cost of capital measures. MIT Sloan School of Management, Working Paper.
- McNichols, M., 2002. Discussion of the quality of accruals and earnings: the role of accrual estimation errors. *The Accounting Review* 77, 61-69.
- McNichols, M., and S. Stubben, 2008. Does earnings management affect firms' investment decisions? *The Accounting Review* 83 (6), 1571-1603.

- Myers, S., 1977. Determinants of corporate borrowing. *Journal of Financial Economics* 5, 147-175.
- Myers, S. and N. Majluf, 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13 (2), 187-221.
- Opler, T., L. Pinkowitz, R. Stulz, and R. Williamson, 1999. The determinants and implications of corporate cash holdings. *Journal of Financial Economics* 52, 3-46.
- Petersen, M., 2009. Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies* 22, 435-480.
- Richardson, S., 2006. Over-investment of free cash flow. *Review of Accounting Studies* 11, 159-189.
- Stiglitz, J., Weiss, A., 1981. Credit rationing in markets with imperfect information. *American Economic Review* 71 (3), 393-410.
- Verrecchia, R., 2001. Essays on disclosure. *Journal of Accounting and Economics* 32, 91-180.
- Wysocki, P., 2008. Assessing earnings and accruals quality: U.S. and international evidence. Working Paper, MIT Sloan School of Management.
- Yoshikawa, H., 1980. On the “q” theory of investment. *American Economic Review* 70 (4), 739-43.

Appendix 1 – Variable Definitions

Dependent Variables

- Investment* = the sum of research and development expenditure (item 46), capital expenditure (item 128), and acquisition expenditure (item 129) less cash receipts from sale of property, plant, and equipment (item 107) multiplied by 100 and scaled by lagged total assets (item 6).
- Capex* = capital expenditure (item 128) multiplied by 100 and scaled by lagged PPE (item 8).
- Non-Capex* = the sum of research and development expenditure (item 46) and acquisition expenditure (item 129) multiplied by 100 and scaled by lagged total assets (item 6).

Financial Reporting Quality

- AQ* = is the standard deviation of the firm-level residuals from the Dechow and Dichev model during the years $t-5$ to $t-1$ and multiplied by negative one. The model is a regression of working capital accruals on lagged, current, and future cash flows plus the change in revenue and PPE. All variables are scaled by average total assets. The model is estimated cross-sectionally for each industry with at least 20 observations in a given year based on the Fama and French (1997) 48-industry classification.
- AQWi* = a modified version of the accruals quality measure as proposed by Wysocki (2008). It equals the ratio of the standard deviation of the residuals from the simpler accruals quality model to the full model (i.e., $STD(Resid_1) / STD(Resid_2)$). The simpler model is a regression of working capital accruals on current cash flows. The full model is a regression of working capital accruals on lagged, current, and future cash flows. We then compute the standard deviation of the residuals of each model during the years $t-5$ to $t-1$.
- FOG* = A measure of financial statement readability computed by Li (2008).
- FRQ Index* = A continuous variable computed as the standardized average of *AQ*, *AQWi*, and *FOG*.

Over-investment Proxies

- OverFirm* = a ranked variable based on the average of a ranked (deciles) measure of cash and leverage. Leverage is multiplied by minus one before ranking so that both variables are increasing in the likelihood of over-investment.
- OverAggregate* = a ranked variable based on the unexplained aggregate investment rate for all firms in the economy. Specifically, in each year we measure the average investment in the economy for *Investment*, *Capex*, and *Non-Capex*, and regress aggregate investment on aggregate sales growth. We then rank the residual from this model into deciles and re-scale from zero to one.
- OverIndustry* = a ranked variable based on the unexplained industry-year investment. Specifically, in each industry-year we measure aggregate investment for *Investment*, *Capex*, and *Non-Capex*, and regress industry-year investment on industry-year sales growth. We then rank the residual from this model into deciles and re-scale from zero to one.

Control Variables

- LogAsset* = the log of total assets (item 6).
- Mkt-to-Book* = the ratio of the market value of total assets (item 6 + (item 25 * item 199) – item 60 – item 74) to book value of total assets (item 6).
- $\sigma(CFO)$ = standard deviation of the cash flow from operations deflated by average total assets from years t-5 to t-1.
- $\sigma(Sales)$ = standard deviation of the sales deflated by average total assets from years t-5 to t-1.
- $\sigma(I)$ = standard deviation of investment (*Investment*, *Capex*, and *Non-Capex*) from years t-5 to t-1.
- Z-Score* = $3.3 * (\text{item } 170) + (\text{item } 12) + 0.25 * (\text{item } 36) + 0.5 * ((\text{items } 4 - \text{item } 5) / \text{item } 6)$.
- Tangibility* = the ratio of PPE (item 8) to total assets (item 6).
- K-structure* = the ratio of long-term debt (item 9) to the sum of long-term debt to the market value of equity (item 9 + item 25*item199).
- Ind. K-structure* = Mean *K-structure* for firms in the same SIC 3-digit industry.
- CFOSale* = The ratio of *CFO* to sales (item 12).
- Slack* = The ratio of cash (item 1) to PPE (item 8).
- Dividend* = an indicator variable that takes the value of one if the firm paid a dividend (i.e., if item 21 > 0 or 127 > 0), and zero otherwise.
- Age* = the difference between the first year when the firm appears in CRSP and the current year.
- OperatingCycle* = the log of receivables to sales (item 2/item 12) plus inventory to COGS (item 3 / item 41) multiplied by 360.
- Loss* = an indicator variable that takes the value of one if net income before extraordinary items (item 18) is negative, and zero otherwise.
- Cash* = the ratio of cash (item 1) to total assets (item 6).
- Institutions* = The percentage of firm shares held by institutional investors.
- Analysts* = The number of analysts following the firm as provided by *IBES*.
- G-Score* = The measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003).
- G-Score dummy* = an indicator variable that takes the value of one if *G-Score* is missing, and zero otherwise.

Table 1 – Firm-Year Investment – Descriptive Statistics*Panel A – Descriptive Statistics*

OBS	OBS	Mean	STD	Min	Median	Max
<i>Investment_{t+1} (%)</i>	34,791	14.14	16.32	-4.00	9.28	121.50
<i>AQ</i>	34,791	-0.06	0.05	-0.29	-0.04	0.00
<i>AQWi</i>	34,791	1.18	0.37	0.41	1.12	3.11
<i>FOG</i>	20,443	-19.31	1.42	-25.65	-19.15	-16.16
<i>FRQ Index</i>	20,443	0.01	0.62	-2.55	0.04	2.36
<i>LogAsset</i>	34,791	5.55	2.19	0.97	5.46	11.03
<i>Mkt-to-Book</i>	34,791	1.92	1.51	0.51	1.42	14.01
<i>σ(CFO)</i>	34,791	0.09	0.09	0.01	0.07	0.80
<i>σ(Sales)</i>	34,791	0.19	0.17	0.01	0.14	0.95
<i>σ(I)</i>	34,791	11.29	13.91	0.51	6.63	98.20
<i>Z-score</i>	34,791	1.28	1.42	-7.58	1.38	4.83
<i>Tangibility</i>	34,791	0.31	0.24	0.01	0.25	0.91
<i>K-structure</i>	34,791	0.19	0.21	0.00	0.12	0.94
<i>Ind. K-struct.</i>	34,791	0.19	0.12	0.00	0.17	0.76
<i>CFOsale</i>	34,791	-0.08	0.96	-13.10	0.06	0.80
<i>Slack</i>	34,791	1.98	5.63	0.00	0.27	66.01
<i>Dividend</i>	34,791	0.44	0.50	0.00	0.00	1.00
<i>Age</i>	34,791	19.13	15.01	1.00	14.00	79.00
<i>Oper. Cycle</i>	34,791	4.68	0.72	1.86	4.75	6.53
<i>Losses</i>	34,791	0.28	0.45	0.00	0.00	1.00
<i>Institutions</i>	34,791	0.37	0.28	0.00	0.35	1.00
<i>Analysts</i>	34,791	5.59	7.54	0.00	2.00	38.00
<i>G-Score</i>	34,791	3.54	4.78	0.00	0.00	15.00
<i>G-Score Dummy</i>	34,791	0.38	0.49	0.00	0.00	1.00

Table 1 – Cont'd

Panel B – Correlation matrix

	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>	<i>VI</i>	<i>VII</i>	<i>VIII</i>	<i>IX</i>	<i>X</i>	<i>XI</i>	<i>XII</i>	<i>XIII</i>	<i>XIV</i>	<i>XV</i>	<i>XVI</i>	<i>XVII</i>	<i>XVIII</i>	<i>XIX</i>	<i>XX</i>	<i>XXI</i>	<i>XXI</i>	<i>XXI</i>	<i>XXI</i>	
<i>Investment</i>	1.00																								
<i>AQ</i>	-0.13	1.00																							
<i>AQWi</i>	-0.07	0.19	1.00																						
<i>FOG</i>	-0.05	0.08	0.04	1.00																					
<i>FRQ Index</i>	-0.13	0.66	0.64	0.60	1.00																				
<i>LogAsset</i>	-0.12	0.44	0.06	0.00	0.26	1.00																			
<i>Mkt-to-Book</i>	0.36	-0.18	-0.07	-0.04	-0.15	-0.07	1.00																		
$\sigma(CFO)$	0.20	-0.66	-0.07	-0.08	-0.42	-0.41	0.26	1.00																	
$\sigma(Sales)$	0.00	-0.44	-0.03	-0.05	-0.27	-0.27	0.04	0.38	1.00																
$\sigma(I)$	0.15	-0.19	-0.04	-0.07	-0.16	-0.07	0.09	0.34	0.15	1.00															
<i>Z-score</i>	-0.21	0.21	0.11	0.12	0.23	0.15	-0.19	-0.37	0.05	-0.30	1.00														
<i>Tangibility</i>	0.00	0.37	0.04	0.04	0.23	0.26	-0.19	-0.29	-0.25	-0.03	-0.05	1.00													
<i>K-structure</i>	-0.24	0.17	0.04	-0.03	0.09	0.21	-0.37	-0.16	-0.07	0.13	-0.07	0.34	1.00												
<i>Ind. K-struct.</i>	-0.24	0.31	0.11	0.05	0.25	0.29	-0.31	-0.28	-0.14	-0.07	0.09	0.52	0.52	1.00											
<i>CFOsale</i>	-0.20	0.18	0.06	0.05	0.15	0.19	-0.24	-0.33	-0.01	-0.18	0.47	0.13	0.07	0.14	1.00										
<i>Slack</i>	0.13	-0.24	-0.08	-0.06	-0.20	-0.20	0.23	0.30	0.12	0.08	-0.21	-0.36	-0.24	-0.26	-0.30	1.00									
<i>Dividend</i>	-0.11	0.35	0.13	0.10	0.30	0.42	-0.10	-0.34	-0.24	-0.18	0.18	0.26	0.06	0.26	0.14	-0.19	1.00								
<i>Age</i>	-0.12	0.25	0.08	0.07	0.21	0.44	-0.10	-0.26	-0.17	-0.19	0.09	0.16	0.08	0.19	0.11	-0.16	0.43	1.00							
<i>Op. Cycle</i>	-0.01	-0.10	0.02	0.06	-0.01	-0.09	0.06	0.05	-0.06	-0.05	-0.10	-0.41	-0.17	-0.31	-0.03	0.02	-0.05	0.04	1.00						
<i>Losses</i>	0.03	-0.29	-0.10	-0.09	-0.25	-0.29	0.04	0.33	0.14	0.18	-0.51	-0.12	0.10	-0.12	-0.30	0.15	-0.30	-0.19	0.02	1.00					
<i>Institutions</i>	0.02	0.29	0.03	-0.01	0.16	0.65	0.05	-0.28	-0.18	-0.03	0.16	0.02	-0.06	0.03	0.12	-0.05	0.19	0.16	0.00	-0.26	1.00				
<i>Analysts</i>	0.05	0.24	0.00	-0.01	0.12	0.69	0.18	-0.20	-0.16	-0.04	0.05	0.14	-0.07	0.01	0.10	-0.07	0.22	0.25	-0.03	-0.18	0.50	1.00			
<i>G-Score</i>	-0.06	0.30	0.06	0.02	0.20	0.68	-0.01	-0.28	-0.21	-0.14	0.11	0.14	0.05	0.15	0.12	-0.14	0.39	0.43	-0.03	-0.21	0.56	0.52	1.00		
<i>G-Score Dum</i>	-0.06	0.30	0.05	0.03	0.20	0.69	0.02	-0.28	-0.21	-0.13	0.11	0.12	0.03	0.13	0.12	-0.13	0.35	0.36	-0.03	-0.21	0.59	0.54	0.93	1.00	

Table 1 – Cont'd

Panel A presents descriptive statistics for the variables used in the analyses. Panel B presents Pearson correlations for these variables. *Investment* is a measure of total investment scaled by lagged total assets. *AQ* is a measure of accruals quality proposed by Dechow and Dichev (2002) and modified by Francis et al. (2005). *AQWi* is a modified version of the accruals quality measure proposed by Wysocki (2008). *FOG* is a measure of financial statement readability computed by Li (2006). The *FRQ Index* is computed as the standardized average of *AQ*, *AQWi*, and *FOG*. *OverFirm* is a ranked variable based on the average of a ranked (deciles) measure of cash and leverage (multiplied by minus one). *LogAsset* is the log of total assets. *Mkt-to-Book* is the ratio of the market value to the book value of total assets. $\sigma(CFO)$ is the standard deviation of CFO. $\sigma(Sales)$ is the standard deviation of the sales. $\sigma(I)$ is the standard deviation of *Investment*. For $\sigma(CFO)$, $\sigma(Sales)$, and $\sigma(I)$, the numerators are deflated by average total assets and are computed over years t-5 to t-1. *Z-Score* is a measure of distress computed following the methodology in Altman (1968). *Tangibility* is the ratio of PPE to total assets. *K-structure* is a measure of market leverage computed as the ratio of long-term debt to the sum of long-term debt to the market value of equity. *Ind. K-structure* is the mean *K-structure* for firms in the same SIC 3-digit industry. *CFOsale* is the ratio of *CFO* to sales. *Slack* is the ratio of cash to PPE. *Dividend* is an indicator variable that takes the value of one if the firm paid a dividend. *Age* is the difference between the first year when the firm appears in CRSP and the current year. *OperatingCycle* is a measure of the operating cycle of the firm. *Loss* is an indicator variable that takes the value of one if net income before extraordinary items is negative, zero otherwise. *Institutions* is the percentage of firm shares held by institutional investors. *Analysts* is the number of analysts following the firm. *G-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003). *G-Score dummy* is an indicator variable that takes the value of one if *G-Score* is missing, and zero otherwise.

Table 2 – Investment rate – Firm-Specific - Over-Investment

<i>Predictors</i>	<i>Financial Reporting Quality Proxy</i>			
	<i>AQ</i>	<i>AQWi</i>	<i>FOG</i>	<i>FRQ Index_{t+1} (%)</i>
<i>FRQ</i>	14.106** (2.12)	0.718* (1.89)	0.251** (1.98)	1.082*** (2.60)
<i>FRQ*OverFirm</i>	-34.796*** (-3.50)	-2.386*** (-2.67)	-1.235*** (-2.96)	-3.862*** (-4.46)
<i>Joint significance</i>	0.0004	0.0051	0.0029	0.0000
<i>OverFirm</i>	6.784*** (6.87)	12.047*** (10.17)	-14.769* (-1.84)	8.515*** (8.50)
<i>LogAsset</i>	-0.645*** (-7.24)	-0.641*** (-6.96)	-1.048*** (-7.24)	-1.049*** (-7.33)
<i>Mkt-to-Book</i>	2.285*** (12.44)	2.310*** (12.48)	2.209*** (12.45)	2.183*** (12.53)
<i>σ(CFO)</i>	5.396** (2.23)	7.070*** (3.40)	10.971*** (4.13)	8.794*** (3.26)
<i>σ(Sales)</i>	-3.490*** (-3.68)	-3.241*** (-3.42)	-3.402*** (-3.22)	-3.779*** (-3.64)
<i>σ(I)</i>	0.117*** (6.23)	0.116*** (6.18)	0.084*** (4.27)	0.084*** (4.27)
<i>Z-score</i>	-1.173*** (-5.68)	-1.191*** (-5.77)	-1.082*** (-7.12)	-1.035*** (-6.69)
<i>Tangibility</i>	12.457*** (12.10)	12.497*** (12.74)	13.638*** (13.49)	13.730*** (13.49)
<i>Mean K-structure</i>	-19.575*** (-14.27)	-19.274*** (-14.09)	-19.395*** (-9.69)	-19.598*** (-9.80)
<i>CFOsale</i>	-0.982*** (-5.25)	-0.965*** (-5.24)	-1.256*** (-6.54)	-1.270*** (-6.54)
<i>Dividend</i>	-0.601*** (-2.61)	-0.593*** (-2.59)	-0.237 (-1.02)	-0.220 (-0.94)
<i>Age</i>	-0.034*** (-4.34)	-0.034*** (-4.28)	-0.027*** (-3.13)	-0.026*** (-3.07)
<i>Operating Cycle</i>	-0.440** (-2.17)	-0.452** (-2.20)	-0.451* (-1.89)	-0.440* (-1.82)
<i>Losses</i>	-3.578*** (-11.84)	-3.593*** (-11.91)	-3.845*** (-10.20)	-3.838*** (-10.23)
<i>Institutions</i>	6.342*** (6.04)	6.659*** (6.44)	7.904*** (5.15)	7.647*** (4.92)
<i>Analysts</i>	0.054 (1.19)	0.063 (1.35)	0.077 (1.16)	0.073 (1.07)
<i>G-Score</i>	0.193*** (3.21)	0.210*** (3.46)	0.205*** (2.74)	0.188** (2.51)
<i>G-Score Dummy</i>	-2.594*** (-3.70)	-2.576*** (-3.71)	-1.859** (-2.22)	-1.850** (-2.21)
<i>Institutions*OverFirm</i>	-2.146 (-1.07)	-2.850 (-1.45)	-4.700* (-1.87)	-3.957 (-1.52)
<i>Analysts*OverFirm</i>	0.001 (0.01)	-0.021 (-0.24)	0.037 (0.35)	0.049 (0.44)

<i>G-Score*OverFirm</i>	-0.045 (-0.49)	-0.081 (-0.89)	-0.111 (-0.94)	-0.080 (-0.67)
<i>Industry FE</i>	Yes	Yes	Yes	Yes
<i>Firm/Year Cluster</i>	Yes	Yes	Yes	Yes
<i>OBS</i>	34,791	34,791	20,443	20,443
<i>R-square (%)</i>	21.42	21.38	22.67	22.74

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Investment*. *Investment* is a measure of total investment scaled by lagged total assets. *AQ* is measure of accruals quality proposed by Dechow and Dichev (2002) and modified by Francis et al. (2005). *AQWi* is a modified version of the accruals quality measure proposed by Wysocki (2008). *FOG* is a measure of financial statement readability computed by Li (2006). *FRQ Index* is computed as the standardized average of *AQ*, *AQWi*, and *FOG*. *OverFirm* is a ranked variable based on the average of a ranked (deciles) measure of cash and leverage (multiplied by minus one). *LogAsset* is the log of total assets. *Mkt-to-Book* is the ratio of the market value to the book value of total assets. $\sigma(CFO)$ is the standard deviation of CFO. $\sigma(Sales)$ is the standard deviation of the sales. $\sigma(I)$ is the standard deviation of *Investment*. For $\sigma(CFO)$, $\sigma(Sales)$, and $\sigma(I)$, the numerators are deflated by average total assets and are computed over years t-5 to t-1. *Z-Score* is a measure of distress computed following the methodology in Altman (1968). *Tangibility* is the ratio of PPE to total assets. *K-structure* is a measure of market leverage computed as the ratio of long-term debt to the sum of long-term debt to the market value of equity. *Ind. K-structure* is the mean *K-structure* for firms in the same SIC 3-digit industry. *CFOsale* is the ratio of CFO to sales. *Slack* is the ratio of cash to PPE. *Dividend* is an indicator variable that takes the value of one if the firm paid a dividend. *Age* is the difference between the first year when the firm appears in CRSP and the current year. *OperatingCycle* is a measure of the operating cycle of the firm. *Loss* is an indicator variable that takes the value of one if net income before extraordinary items is negative, zero otherwise. *Institutions* is the percentage of firm shares held by institutional investors. *Analysis* is the number of analysts following the firm. *G-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003). *G-Score dummy* is an indicator variable that takes the value of one if *G-Score* is missing and zero otherwise. The model includes industry fixed-effects based on the Fama-French (1997) 48 industry classifications. *T-statistics* are presented in parenthesis below the coefficients and are corrected for heteroskedasticity, and cross-sectional and time-series correlation using a two-way cluster at the firm and year level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 3 – Firm-Year Investment rate – Investment Partitions

Panel A – Under-investment versus normal investment

<i>Predictors</i>	<i>Financial Reporting Quality Proxy</i>			
	<i>AQ</i>	<i>AQWi</i>	<i>FOG</i>	<i>FRQ Index_{t+1} (%)</i>
<i>FRQ</i>	-1.810*** (-3.00)	-0.039 (-0.81)	-0.042** (-2.40)	-0.103** (-2.32)
<i>LogAsset</i>	-0.031 (-1.47)	-0.035* (-1.66)	0.010 (0.28)	0.012 (0.37)
<i>Mkt-to-Book</i>	-0.035 (-1.62)	-0.033 (1.55)	-0.014 (-0.52)	-0.015 (-0.56)
$\sigma(CFO)$	-1.446*** (-4.74)	-0.980*** (-3.50)	-1.796*** (-4.69)	-1.969*** (-5.06)
$\sigma(Sales)$	0.387*** (2.91)	0.469*** (3.59)	0.676*** (4.09)	0.643*** (3.89)
$\sigma(I)$	0.009*** (5.53)	0.009*** (5.43)	0.012*** (5.82)	0.012*** (5.88)
<i>Z-score</i>	-0.130*** (-5.78)	-0.131*** (-5.85)	-0.113*** (-4.06)	-0.112*** (-4.01)
<i>Tangibility</i>	-0.069 (-0.47)	-0.113 (-0.79)	-0.306 (-1.64)	-0.294 (-1.58)
<i>K-structure</i>	0.776*** (6.00)	0.781*** (6.03)	0.669*** (4.18)	0.668*** (4.17)
<i>Mean K-structure</i>	-5.812*** (-18.68)	-5.834*** (-18.70)	-5.829*** (-15.19)	-5.793*** (-15.12)
<i>CFOsale</i>	0.096*** (3.40)	0.101*** (3.59)	0.150*** (3.66)	0.149*** (3.62)
<i>Slack</i>	0.012*** (2.80)	0.012*** (2.71)	0.016*** (2.60)	0.015*** (2.59)
<i>Dividend</i>	-0.063 (-1.13)	-0.068 (-1.21)	-0.053 (-0.76)	-0.048 (-0.69)
<i>Age</i>	0.002 (1.05)	0.002 (1.04)	0.005* (1.77)	0.005* (1.77)
<i>Operating Cycle</i>	-0.145*** (-3.93)	-0.144*** (-3.88)	-0.160*** (-3.27)	-0.160*** (-3.28)
<i>Losses</i>	0.105** (2.37)	0.111** (2.49)	0.157*** (2.76)	0.153*** (2.70)
<i>Institutions</i>	-0.497*** (-4.19)	-0.511*** (-4.30)	-0.461*** (-2.96)	-0.451*** (-2.90)
<i>Analysts</i>	-0.001 (-0.12)	-0.001 (-0.14)	-0.014** (-2.15)	-0.014** (-2.17)
<i>G-Score</i>	-0.018 (-1.04)	-0.017 (-1.00)	-0.021 (-1.08)	-0.021 (-1.07)
<i>G-Score Dummy</i>	-0.022 (-0.14)	-0.028 (-0.17)	-0.002 (-0.01)	-0.006 (-0.03)
<i>Firm Cluster</i>	Yes	Yes	Yes	Yes
<i>Obs</i>	34,791	34,791	20,443	20,443
<i>Pseudo R² (%)</i>	8.43	8.46	8.78	8.79

Table 3 – continued

Panel B – Over-investment versus normal investment

<i>Predictors</i>	<i>Financial Reporting Quality Proxy</i>			
	<i>AQ</i>	<i>AQWi</i>	<i>FOG</i>	<i>FRQ Index_{t+1} (%)</i>
<i>FRQ</i>	-2.049*** (-3.62)	-0.036 (-0.78)	-0.027* (-1.80)	-0.107*** (-2.60)
<i>LogAsset</i>	-0.133*** (-7.53)	-0.137*** (-7.78)	-0.162*** (-6.11)	-0.160*** (-6.06)
<i>Mkt-to-Book</i>	0.173*** (12.11)	0.175*** (12.16)	0.186*** (10.20)	0.185*** (10.17)
<i>σ(CFO)</i>	0.079 (0.28)	0.587** (2.31)	0.834** (2.46)	0.657* (1.90)
<i>σ(Sales)</i>	-0.092 (-0.73)	0.002 (0.01)	0.145 (0.93)	0.107 (0.69)
<i>σ(I)</i>	0.013*** (8.74)	0.012*** (8.64)	0.011*** (6.08)	0.011*** (6.15)
<i>Z-score</i>	-0.141*** (-7.36)	-0.142*** (-7.44)	-0.128*** (-5.44)	-0.125*** (-5.35)
<i>Tangibility</i>	1.240*** (11.45)	1.189*** (11.09)	1.409*** (10.24)	1.424*** (10.34)
<i>K-structure</i>	-1.683*** (-13.34)	-1.680*** (-13.32)	-1.777*** (-11.12)	-1.777*** (-11.12)
<i>Mean K-structure</i>	-1.140*** (-5.13)	-1.159*** (-5.20)	-1.077*** (-3.90)	-1.038*** (-3.75)
<i>CFOsale</i>	-0.013 (-0.66)	-0.009 (-0.43)	-0.003 (-0.11)	-0.005 (-0.19)
<i>Slack</i>	0.003 (0.90)	0.003 (0.76)	0.004 (0.83)	0.004 (0.79)
<i>Dividend</i>	-0.133*** (-2.83)	-0.139*** (-2.96)	-0.117** (-1.98)	-0.109* (-1.84)
<i>Age</i>	-0.008*** (-4.49)	-0.008*** (-4.51)	-0.005*** (-2.66)	-0.005*** (-2.64)
<i>Operating Cycle</i>	-0.173*** (-6.11)	-0.171*** (-6.05)	-0.178*** (-4.98)	-0.175*** (4.92)
<i>Losses</i>	-0.315*** (-6.84)	-0.308*** (-6.70)	-0.311*** (-5.18)	-0.316*** (-5.27)
<i>Institutions</i>	0.767*** (8.12)	0.752*** (7.97)	0.898*** (7.17)	0.903*** (7.21)
<i>Analysts</i>	0.011*** (2.82)	0.011*** (2.78)	0.009* (1.85)	0.009* (1.82)
<i>G-Score</i>	0.017 (1.38)	0.017 (1.44)	0.013 (1.00)	0.013 (1.01)
<i>G-Score Dummy</i>	-0.262** (-2.25)	-0.267** (-2.29)	-0.156 (-1.22)	-0.157 (-1.23)
<i>Firm Cluster</i>	Yes	Yes	Yes	Yes
<i>Obs</i>	34,791	34,791	20,443	20,443
<i>Pseudo R² (%)</i>	8.43	8.46	8.78	8.79

This table presents results from multinomial logit pooled regressions. The dependent variable is based on the level of unexplained investment. Firm-year observations in the bottom quartile of unexplained investment are classified as under-investing ('Low'), observations in the top quartile are classified as over-investing ('High'), and observations in the middle two quartiles are classified as the benchmark group ('Mid'). Panel A (B) presents the results for a model predicting the likelihood that a firm will be in 'Low' ('High') group. Panel A presents descriptive statistics for the variables used in the analyses. Panel B presents Pearson correlations for these variables. *Investment* is a measure of total investment scaled by lagged total assets. *AQ* is a measure of accruals quality proposed by Dechow and Dichev (2002) and modified by Francis et al. (2005). *AQWi* is a modified version of the accruals quality measure proposed by Wysocki (2008). *FOG* is a measure of financial statement readability computed by Li (2006). *FRQ Index* is computed as the standardized average of *AQ*, *AQWi*, and *FOG*. *OverFirm* is a ranked variable based on the average of a ranked (deciles) measure of cash and leverage (multiplied by minus one). *LogAsset* is the log of total assets. *Mkt-to-Book* is the ratio of the market value to the book value of total assets. $\sigma(CFO)$ is the standard deviation of CFO. $\sigma(Sales)$ is the standard deviation of the sales. $\sigma(I)$ is the standard deviation of *Investment*. For $\sigma(CFO)$, $\sigma(Sales)$, and $\sigma(I)$, the numerators are deflated by average total assets and are computed over years t-5 to t-1. *Z-Score* is a measure of distress computed following the methodology in Altman (1968). *Tangibility* is the ratio of PPE to total assets. *K-structure* is a measure of market leverage computed as the ratio of long-term debt to the sum of long-term debt to the market value of equity. *Ind. K-structure* is the mean *K-structure* for firms in the same SIC 3-digit industry. *CFOsale* is the ratio of CFO to sales. *Slack* is the ratio of cash to PPE. *Dividend* is an indicator variable that takes the value of one if the firm paid a dividend. *Age* is the difference between the first year when the firm appears in CRSP and the current year. *OperatingCycle* is a measure of the operating cycle of the firm. *Loss* is an indicator variable that takes the value of one if net income before extraordinary items is negative, zero otherwise. *Institutions* is the percentage of firm shares held by institutional investors. *Analysts* is the number of analysts following the firm. *G-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003). *G-Score dummy* is an indicator variable that takes the value of one if *G-Score* is missing and zero otherwise. T-statistics are presented in parenthesis below the coefficients and are corrected for heteroskedasticity, and clustering of observations by firm. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 4 – Alternative Dependent Variables – Capex and Non-Capex

<i>Predictors</i>	<i>Dependent Variable =</i>	
	<i>Capex</i>	<i>Non-Capex</i>
<i>FRQ</i>	2.319*** (3.38)	1.563*** (5.95)
<i>FRQ*OverFirm</i>	-8.508*** (-5.91)	-4.555*** (-8.02)
<i>Joint significance</i>	0.0000	0.0000
<i>OverFirm</i>	12.376*** (7.06)	4.902*** (6.28)
<i>LogAsset</i>	-0.168 (-0.69)	-0.797*** (-6.13)
<i>Mkt-to-Book</i>	4.092*** (16.34)	1.454*** (9.32)
$\sigma(\text{CFO})$	25.318*** (4.09)	2.482 (1.20)
$\sigma(\text{Sales})$	0.719 (0.41)	-3.150*** (-3.08)
$\sigma(I)$	0.037*** (3.24)	0.103*** (5.05)
<i>Z-score</i>	2.029*** (10.57)	-1.601*** (-10.53)
<i>Tangibility</i>	-16.703*** (-7.57)	-4.204*** (-7.48)
<i>Mean K-structure</i>	-6.561** (-2.36)	-14.201*** (-9.01)
<i>CFOsale</i>	0.276 (0.58)	-1.372*** (-7.23)
<i>Dividend</i>	-2.379*** (-4.43)	0.184 (0.82)
<i>Age</i>	-0.074*** (-5.34)	-0.010 (-1.36)
<i>Operating Cycle</i>	-1.457*** (-2.92)	-0.577*** (-3.19)
<i>Losses</i>	-6.237*** (-11.48)	-2.241*** (-5.85)
<i>Institutions</i>	-1.940 (-0.99)	3.383*** (2.88)
<i>Analysts</i>	0.229** (2.49)	-0.013 (-0.27)
<i>G-Score</i>	0.467*** (4.09)	0.247*** (4.19)
<i>G-Score Dummy</i>	-2.734** (-2.47)	-1.134** (-1.98)
<i>Institutions*OverFirm</i>	16.299*** (4.08)	-0.577 (-0.24)
<i>Analysts*OverFirm</i>	-0.327* (-1.73)	0.111 (1.42)

<i>G-Score*OverFirm</i>	-1.423*** (-5.84)	-0.166* (-1.65)
<i>Industry FE</i>	Yes	Yes
<i>Firm/Year Cluster</i>	Yes	Yes
<i>OBS</i>	20,443	20,443
<i>R-square (%)</i>	24.22	25.45

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Capex* and *Non-Capex* investment. *Investment* is a measure of total investment scaled by lagged total assets. *AQ* is a measure of accruals quality proposed by Dechow and Dichev (2002) and modified by Francis et al. (2005). *AQWi* is a modified version of the accruals quality measure proposed by Wysocki (2008). *FOG* is a measure of financial statement readability computed by Li (2006). *FRQ Index* is computed as the standardized average of *AQ*, *AQWi*, and *FOG*. *OverFirm* is a ranked variable based on the average of a ranked (deciles) measure of cash and leverage (multiplied by minus one). *LogAsset* is the log of total assets. *Mkt-to-Book* is the ratio of the market value to the book value of total assets. $\sigma(CFO)$ is the standard deviation of CFO. $\sigma(Sales)$ is the standard deviation of the sales. $\sigma(I)$ is the standard deviation of *Investment*. For $\sigma(CFO)$, $\sigma(Sales)$, and $\sigma(I)$, the numerators are deflated by average total assets and are computed over years t-5 to t-1. *Z-Score* is a measure of distress computed following the methodology in Altman (1968). *Tangibility* is the ratio of PPE to total assets. *K-structure* is a measure of market leverage computed as the ratio of long-term debt to the sum of long-term debt to the market value of equity. *Ind. K-structure* is the mean *K-structure* for firms in the same SIC 3-digit industry. *CFOsale* is the ratio of CFO to sales. *Slack* is the ratio of cash to PPE. *Dividend* is an indicator variable that takes the value of one if the firm paid a dividend. *Age* is the difference between the first year when the firm appears in CRSP and the current year. *OperatingCycle* is a measure of the operating cycle of the firm. *Loss* is an indicator variable that takes the value of one if net income before extraordinary items is negative, zero otherwise. *Institutions* is the percentage of firm shares held by institutional investors. *Analysts* is the number of analysts following the firm. *G-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003). *G-Score dummy* is an indicator variable that takes the value of one if *G-Score* is missing and zero otherwise. *Capex* is a measure of capital expenditure scaled by lagged PPE. *Non-Capex* is a measure of R&D expenditure and acquisition scaled by lagged total assets. The model includes industry fixed-effects based on the Fama-French (1997) 48-industry classifications. *T-statistics* are presented in parenthesis below the coefficients and are corrected for heteroskedasticity, and cross-sectional and time-series correlation using a two-way cluster at the firm and year level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5 – Aggregate Over-Investment partitions

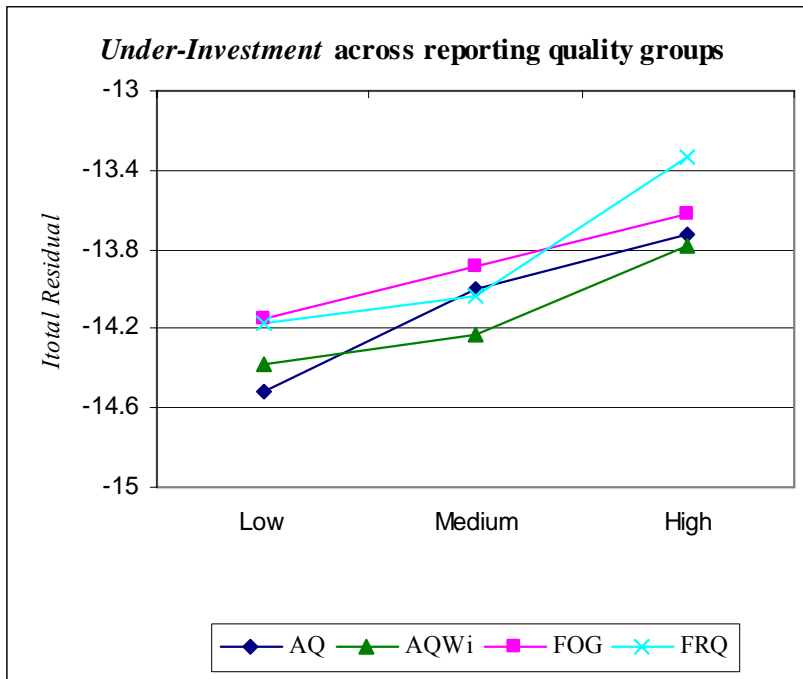
	(1)	(2)	(3)
<i>FRQ</i>	0.393 (1.21)	0.490*** (2.66)	0.779*** (4.12)
<i>FRQ*OverIndustry</i>	-1.883*** (-2.91)	-1.196*** (-4.09)	
<i>FRQ*OverAggregate</i>			-1.881*** (-6.14)
<i>Joint significance</i>	0.0009	0.0001	0.0000
<i>OverIndustry</i>	7.335*** (6.68)	7.360*** (18.80)	
<i>OverAggregate</i>			0.402 (0.57)
<i>LogAsset</i>	-0.912*** (-5.67)	0.021 (0.19)	-0.002 (-0.02)
<i>Mkt-to-Book</i>	2.256*** (13.18)	2.462*** (15.99)	2.557*** (15.37)
$\sigma(CFO)$	11.272*** (4.49)	7.887*** (4.77)	6.371*** (3.71)
$\sigma(Sales)$	-3.856*** (-3.72)	-2.214*** (-3.77)	-2.471*** (-4.16)
$\sigma(I)$	0.075*** (3.81)	0.111*** (7.31)	0.118*** (7.66)
<i>Z-score</i>	-0.913*** (-6.18)	-0.297 (-1.49)	-0.624*** (-3.04)
<i>Tangibility</i>	10.194*** (8.31)	8.679*** (9.85)	10.756*** (11.41)
<i>K-structure</i>	-7.455*** (-7.52)	-7.607*** (-14.81)	-8.022*** (-15.71)
<i>Mean K-structure</i>	-8.451*** (-4.05)	-4.067*** (-3.17)	-12.542*** (-9.10)
<i>CFOsale</i>	-1.336*** (-6.41)	-1.522*** (-6.85)	-1.390*** (-6.69)
<i>Slack</i>	-0.047 (-1.03)	-0.010 (-0.39)	0.032 (1.21)
<i>Dividend</i>	-0.358* (-1.68)	-0.476** (-2.09)	-0.729*** (-3.06)
<i>Age</i>	-0.032*** (-3.41)	-0.046*** (-6.85)	-0.048*** (-6.72)
<i>Operating Cycle</i>	-0.840** (-2.41)	-0.228 (-0.91)	-0.157 (-0.63)
<i>Losses</i>	-3.321*** (-9.11)	-3.442*** (-15.57)	-3.679*** (-15.59)
<i>Institutions</i>	5.689*** (8.29)		
<i>Analysts</i>	0.031 (0.71)		

<i>G-Score</i>	0.245***		
	(2.89)		
<i>G-Score Dummy</i>	-1.715**		
	(-2.03)		
<i>Institutions*OverIndustry</i>	-0.818		
	(0.56)		
<i>Analysts* OverIndustry</i>	0.069		
	(1.31)		
<i>G-Score* OverIndustry</i>	-0.193**		
	(-2.56)		
<i>Industry FE</i>	Yes	Yes	Yes
<i>Firm/Year Cluster</i>	Yes	Yes	Yes
<i>OBS</i>	20,443	71,036	71,036
<i>R-square (%)</i>	23.79	21.54	19.40

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Investment*. *Investment* is a measure of total investment scaled by lagged total assets. *AQ* is measure of accruals quality proposed by Dechow and Dichev (2002) and modified by Francis et al. (2005). *AQWi* is a modified version of the accruals quality measure proposed by Wysocki (2008). *FOG* is a measure of financial statement readability computed by Li (2006). *FRQ Index* is computed as the standardized average of *AQ*, *AQWi*, and *FOG*. *OverFirm* is a ranked variable based on the average of a ranked (deciles) measure of cash and leverage (multiplied by minus one). *LogAsset* is the log of total assets. *Mkt-to-Book* is the ratio of the market value to the book value of total assets. $\sigma(CFO)$ is the standard deviation of CFO. $\sigma(Sales)$ is the standard deviation of the sales. $\sigma(I)$ is the standard deviation of *Investment*. For $\sigma(CFO)$, $\sigma(Sales)$, and $\sigma(I)$, the numerators are deflated by average total assets and are computed over years t-5 to t-1. *Z-Score* is a measure of distress computed following the methodology in Altman (1968). *Tangibility* is the ratio of PPE to total assets. *K-structure* is a measure of market leverage computed as the ratio of long-term debt to the sum of long-term debt to the market value of equity. *Ind. K-structure* is the mean *K-structure* for firms in the same SIC 3-digit industry. *CFOsale* is the ratio of *CFO* to sales. *Slack* is the ratio of cash to PPE. *Dividend* is an indicator variable that takes the value of one if the firm paid a dividend. *Age* is the difference between the first year when the firm appears in CRSP and the current year. *OperatingCycle* is a measure of the operating cycle of the firm. *Loss* is an indicator variable that takes the value of one if net income before extraordinary items is negative, zero otherwise. *Institutions* is the percentage of firm shares held by institutional investors. *Analysts* is the number of analysts following the firm. *G-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003). *G-Score dummy* is an indicator variable that takes the value of one if *G-Score* is missing and zero otherwise. *OverAggregate* is a ranked variable based on the unexplained aggregate investment rate for all firms in the economy. *OverIndustry* is a ranked variable based on the unexplained industry-year investment. The model includes industry fixed-effects based on the Fama-French (1997) 48-industry classifications. *T*-statistics are presented in parenthesis below the coefficients and are corrected for heteroskedasticity, and cross-sectional and time-series correlation using a two-way cluster at the firm and year level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Figure 1 – Investment residual across accounting quality groups

Panel A – Under-Investment



Panel B – Over-Investment

