How Does Financial Reporting Quality Relate to Investment Efficiency?

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Abstract:

Prior evidence that higher quality financial reporting improves capital investment efficiency leaves unaddressed whether it reduces over- or under-investment. This study provides evidence of both in documenting a conditional 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 also are found to deviate less from predicted investment levels and show less sensitivity to macroeconomic conditions. These results suggest that one mechanism linking reporting quality and investment efficiency is a reduction of frictions such as moral hazard and adverse selection that hamper efficient investment.

1. Introduction

Prior studies suggest that higher quality financial reporting should increase investment efficiency (e.g., Bushman and Smith, 2001; Healy and Palepu, 2001; Lambert, Leuz, and Verrecchia, 2007). Consistent with this argument, Biddle and Hilary (2006) find that firms with higher quality financial reporting exhibit higher investment efficiency proxied by lower investment-cash flow sensitivity. However, investment-cash flow sensitivity can reflect either financing constraints or an excess of cash (e.g., Kaplan and Zingales, 1997, 2000; Fazzari, Hubbard, and Petersen, 2000). These findings raise the further question of whether higher quality financial reporting is associated with a reduction of over-investment or with a reduction of under-investment. This study provides evidence of both.

We begin by positing that the association between financial reporting quality and investment efficiency relates to a reduction of 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 higher-quality financial reporting is associated with either lower over-investment, lower under-investment, or both. 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 deviation from this expected level. Third, 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 the industry levels.

Two key constructs in this 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, that 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. To enhance comparability with prior studies, we use a measure of accruals quality derived in Dechow and Dichev (2002) as one 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 it has been used extensively in the prior literature. Second, we use a measure of accruals quality proposed by Wysocki (2008) to address limitations in the Dechow and Dichev measure. 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.

Our analysis yields three key findings. First, we find that higher reporting quality is associated with both lower over- and under-investment. Specifically, reporting quality is negatively associated with investment among firms shown by the prior literature to be more likely to over-invest (i.e., cash rich and unlevered firms) (Myers, 1977; Jensen, 1986), and positively associated with investment among firms shown to be more likely to under-invest (e.g., firms that are cash constrained and highly levered). Thus, 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 when modeled at the firm level. Third, reporting quality is negatively related to investment when aggregate investment is high and positively related when aggregate investment is low. This finding suggests that firms with higher financial reporting quality are less affected by aggregate macro-economic shocks than firms with lower quality financial reporting.

A credible alternative interpretation of our results is that they could be capturing the effect of different corporate governance mechanisms that are correlated with reporting quality. To address this concern, we explicitly test whether alternative monitoring mechanisms – namely institutional ownership, analyst coverage, and the market for corporate control (proxied by the

G-Score index of anti-takeover provisions) - are associated with investment efficiency. The evidence is mixed on whether these governance mechanisms reduce over- and under-investment. However, our inferences regarding the association between financial reporting quality and investment are not affected by the inclusion of these corporate governance metrics suggesting that the effect we document is not simply a manifestation of reporting quality as a proxy for corporate governance.

While our results suggest that financial reporting quality is associated with higher investment efficiency, some caveats are in order. First, our main findings use a comprehensive measure of investment. When we investigate sub-components of investment, our results are stronger for R&D activities and acquisitions than for capital expenditures but the results for capital expenditures are insignificant for the Wysocki (2008) measure of accruals quality and weaker for the FOG index. Second, throughout the paper the results are strongest for the Dechow and Dichev's measure than for the other financial reporting quality proxies. Given the concerns raised by Wysocki (2008) regarding the construct validity of *AQ* as a proxy for financial reporting quality, we further show that our results are generally robust to the use of a financial reporting quality index based on the Wysocki measure of accruals quality and the FOG index. Nevertheless, the economic magnitude of our findings might be better captured by the findings using these latter variables.

Our findings contribute to a growing body of literature that studies relations between financial reporting quality and investment (e.g., Bens and Monahan, 2004; Biddle and Hilary, 2006; Bushman, Piotroski and Smith, 2006; Beatty, Liao and Weber, 2008; Francis and Martin, 2008; Hope and Thomas, 2008; McNichols and Stubben, 2008). Documenting a relation between financial reporting quality and investment efficiency has both macro-economic (given the importance of investment as a determinant of growth) and firm-level implications (given that investment is a major determinant of the return on capital obtained by investors). Our results extend and generalize the prior results by considering a comprehensive measure of investment (and its sub-components), by using multiple proxies for financial reporting quality, and by specifically documenting an association between financial reporting quality and two sources of economic inefficiency, over-investment and under-investment. This relation between financial reporting quality and over- and under-investment has been largely unexplored by the prior research.

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

2.1. Determinants of capital investment efficiency

In the neo-classical framework, the marginal Q ratio is the sole driver of capital investment policy (e.g., Yoshikawa, 1980; Hayashi, 1982; Abel, 1983). 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 also recognizes the possibility that firms may depart from this optimal level and either over- or under-invest. For example, prior research identifies two primary imperfections – moral hazard and adverse selection – 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 to suggest that managers will invest in negative net present value projects when there is divergence in principal-agent incentives. Moral hazard can lead to either over- or under-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. For example, Jensen (1986) predicts that managers have incentives to consume perquisites and to grow their firms beyond the optimal size. These predictions receive empirical support from Blanchard, Lopez-de-Silanez, and Shleifer (1994), among others. 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 reduce these information asymmetries and can be associated with investment efficiency.

2.2. Financial reporting quality and sub-optimal investment levels

Prior studies suggest that higher quality financial reporting can enhance 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 increases shareholder ability to monitor managerial investment activities, it can be associated with investment efficiency by reducing 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). Financial reporting quality may mitigate this problem. Consistent with this view, Chang, Dasgupta and Hilary (2009) propose a model of dynamic adverse selection and show empirically that firms with better financial reporting have more flexibility to issue capital. If financial reporting quality reduces adverse selection costs, it can be associated with investment efficiency through the reduction in external financing costs and through the reduction in the likelihood that a firm obtains excess funds because of temporary mispricing. 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 negatively associated with 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.

2.3. Other governance mechanisms

The above hypotheses suggest a link between financial reporting quality and investment efficiency. However, other governance mechanisms could also be associated with 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. Chang, Dasgupta and Hilary (2006) show that greater analyst coverage improves the flexibility in the financial policy, which may help to mitigate under-investment. 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 analyses explicitly test whether these governance mechanisms are also associated with lower under- and/or over-investment.

3. Research design

We test these hypotheses in three ways. First, we examine 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 (identified by the prior literature) to classify firms with higher likelihood of over- or under-investing (in Section 5, we also consider measures of over- and under-investment based on economy-wide and industry-specific partitions). Second, we directly model the expected level of firm-specific capital investment based on the firm's investment opportunities, and test the association between financial reporting quality and deviations from this expected level (our second proxy for over- and under-investment). As a robustness check, we also condition on investment aggregated at economy and industry levels to provide a proxy for over- and under-investment less affected by firm-specific financial reporting quality (see Section 5.2).

3.1. *Conditional relation between financial reporting quality and 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). Specifically we estimate the following model.

$$Investment_{i,t+1} = \alpha + \beta_1 FRQ_{i,t} + \beta_2 FRQ_{i,t} * OverI_{i,t+1} + \beta_3 OverI_{i,t+1} + \beta_4 Gov_{i,t} + \beta_5 Gov_{i,t} * OverI_{i,t+1} + \Sigma\gamma_j Control_{j,i,t} + \varepsilon_{i,t+1} \quad (1)$$

As described in detail below, our main measure of investment (*Investment)* includes both capital and non-capital investment (we discuss alternative measures of investment in Section 5). *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 (as detailed below, *OverI* is increasing in the likelihood of over-investment). *Gov* is a set of corporate governance proxies. *Control* is a set of control variables.

We estimate Equation 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 the 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 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). An advantage of this approach is that it considers several types of investments such as capital expenditures, acquisitions and asset sales. In addition, we explicitly incorporate research and development into our measure of investment because of the increasing importance of R&D in recent years. This measure contrasts with prior research that normally studies these components separately (Biddle and Hilary, 2006; Bushman *et al*., 2006; Francis and Martin, 2008). *Investment* in a given firm-year is the sum of capital expenditures, R&D expenditures, and acquisitions minus sales of PPE, scaled by lagged total assets. For comparability with other research, in Section 5 we discuss the results for the sub-components of investment.

We use four different proxies for financial reporting quality. The first measure, accruals quality (*AQ*), 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; Core, Guay, and Verdi, 2008). The measure 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. *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 proxy for reporting quality is a modification of the accruals quality measure proposed by Wysocki (2008), who argues that the measure derived in Dechow and Dichev (2002) does not reliably capture high quality accruals. Wysocki 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. The motivation behind this measure is to extract the contemporaneous association between accruals and cash flows which could be confounded by opportunistic earnings management activities. 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 that regresses 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]

To avoid concerns regarding the measurement of accruals quality, we also consider a third proxy for reporting quality by Li (2008) measuring financial disclosure transparency. Li computes the *FOG* index as a measure of the readability of financial reports. The idea is that managers can obfuscate the quality of 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

[1] Two other measures of accruals quality proposed by Wysocki (2008) are intended to address the firm-specific time-series (as opposed to the cross sectional) estimation of the Dechow and Dichev model which is not used in our paper.

and lower future profitability. As with *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 a fourth measure of reporting quality and in Section 5.3 also consider a version that omits AQ (*FRQ Index2*).

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 using two variables identified by the prior literature. 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*,* 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, as for 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

[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).

[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.

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).

As discussed in Section 2, we also investigate an alternative hypothesis that corporate governance mechanisms could also be associated with over- and/or under-investment. We use three proxies for corporate governance - the presence of institutional investors, financial analysts, and the market for corporate control. 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 *et al.*, 2006), we assume that firms not covered by IBES have zero analyst coverage. We use *InvG-Score*, the anti-takeover protection index used in Gompers *et al*. (2003), as a proxy for the market for corporate control. 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. For consistency with our other measures, we multiply the score by minus one so that the measure is increasing in corporate governance. Because G-scores are missing for 60% of our sample, 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. We add interactions between *OverFirm* and *Institutions, Analysts,* and *InvG-Score* to separately test the effect of these governance mechanisms on over- and under-investment.

We also introduce controls for effects that could confound our findings. First, 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 control for cash flow and sales volatility. We also control for investment volatility to ensure that the results are not simply capturing a relation between over- and under-investment and investment volatility. Second, 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, 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 expected level of investment

The analysis described in Section 3.1 has focused on the conditional relation between financial reporting quality and 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. In this section we 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 is associated with a smaller

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[4] We omit R&D from this set because R&D 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 these variables does not affect our conclusions.

difference between actual and expected investment given that the firm is in a condition more prone to either over- or under-investment, here we directly model if higher financial reporting quality is associated with a lower 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:

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

$Investment_{t+1}$ 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 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 Equation 2 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 set of explanatory and control variables are the same we use in estimating

[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.

Equation 1 but we also control for cash and leverage (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 the *G-Score* post-1991). We collect financial reporting data from Compustat, price and return data from CRSP, analyst data from IBES, ownership from Thomson Financial, and governance data from Gompers *et al*. (2003). 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.

Panel A of Table 1 presents descriptive statistics for the variables described above. 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). Similarly, the mean (median) values for *AQWi* and *FOG* are 1.18 (1.12) and -19.31 (-19.15). These values are consistent with prior research (Francis *et al*., 2005; Li, 2008; Wysocki, 2008).

Panel B of Table 1 presents correlations among our main variables. The two accruals quality measures are positively and significantly related (correlation of 0.19). The correlation between *FOG* and the two accruals quality measures is lower (0.08 and 0.04, respectively), 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*, with the correlations ranging from -0.05 to -0.13. 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 conditional 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 for *AQWi* to 2.60 for *FRQ Index*. In terms of the economic significance, increasing *AQ* (*AQWi*) by one standard deviation increases *Investment* by approximately 0.71% (0.27%) among firms that are under-investing. Given that the mean investment equals 14.14%, this effect represents an increase of 5.0% (1.9%). These findings provide consistent 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 for *AQWi* to -4.46 for *FRQ Index*). 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 untabulated t-statistics range from -2.84 for *AQWi* to -4.78 for *FRQ Inde*x. In terms of the economic significance, increasing *AQ* (*AQWi*) by one standard deviation decreases *Investment* among firms that are over-investing by approximately

1.0% (0.6%). This effect represents a decrease in investment of about 7.3% (4.4%) on a relative basis. Thus, the findings in Table 2 also provide consistent support for hypothesis *H1a*.[6]

When we turn our attention to the corporate governance variables, we find that the estimated coefficients on the main effects are positive for institutional ownership and, against the prediction, negative for *InvG-Score*. In terms of the interactions between the proxies for corporate governance and *OverFirm*, the estimate coefficients are generally insignificant suggesting that the relation between investment and governance is independent of the likelihood that the firm might over-invest. The other variables are statistically insignificant. These findings suggest that the institutional ownership (the effectiveness of the market for corporate control) increases (decreases) investment regardless of whether a firm is more or less likely to over-invest.

In our main test, we use an aggregated measure of cash balance and leverage to classify firms by the likelihood that they will over- or under-invest. We do so to mitigate the random error component in the individual measures. When we use cash and leverage as separate portioning variables, untabulated results indicate 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, respectively). The coefficient associated with *FRQ* is also positive in both cases but only significant for cash (with t-statistics equal to 2.11 and 1.40 for cash and leverage, respectively).

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[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

Our analysis so far has been conditional on the firm being in a setting where over- or under-investment is more likely. We next directly model the association between financial reporting quality and 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 (Equation (2)) is in the bottom quartile of the distribution (i.e., firms classified as under-investing), the value of two if it is in the middle two quartiles, and the value of three if it is in the top quartile (i.e., firms classified as over-investing).

Before considering a multivariate analysis, it is useful to examine the univariate relation between the investment residuals across the three groups of accounting quality (Figure 1). Panel A presents the analyses for firms that are more likely to under-invest. 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-investment. 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). Panel A presents the results regarding under-investment. The coefficients associated with financial reporting quality all have the predicted sign. However, only the coefficients for *AQ*, *FOG* or the *FRQ Index* are statistically significant (with t-statistics ranging from -2.32 to -2.40) whereas the coefficient for *AQWi* is insignificant. Panel B presents the results regarding over-investment. The results with the financial reporting quality proxies are similar to the findings in panel A. That is, the coefficients are negative and significant for *AQ*, *FOG* and the *FRQ Index* (with t-statistics ranging from -1.80 to -3.62), but are insignificant for *AQWi*.

When we consider the governance variables, we find that institutional ownership is negatively associated with the likelihood that a firm is in the under-investment quartile (Panel A). *InvGscore* is statistically insignificant in all cases. In addition, institutional ownership and analyst coverage are *positively* associated with the likelihood that a firm is in the over-investment quartile. These findings are inconsistent with the hypothesis that corporate governance mitigates over-investment but are consistent with the results in Table 2 that show a positive association between some institutional ownership and capital investment.

5. Robustness checks

As robustness checks, we conduct 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 and discuss the results for the individual proxies in the text. Finally, we also assess the sensitivity of our results to a financial reporting quality index that is solely based on *AQWi* and *FOG*, and does not include *AQ* (*FRQ Index2*).

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). As 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 compute *Non-Capex* as the sum of R&D expenditures and acquisitions, scaled by lagged total assets (results are unchanged if we include advertising expenses in *Non-Capex*.) We re-estimate our main model using these two measures.

Results reported in Table 4 indicate that, when using the *FRQ Index* as a proxy for financial reporting quality, the results are not affected by the decision to use *Capex* or *Non-Capex* as the dependent variable. The main effects for financial reporting quality are positive and significant (the t-statistics equal 3.38 and 5.95) whereas the interaction terms between *OverFirm* and *FRQ Index* are negative and significant (with t-statistics of -5.91 and -8.02). In untabulated analysis, however, we find that the results with *Capex* are driven by *AQ* and *FOG* whereas the results with *Non-Capex* are robust to all three of these proxies for financial reporting quality. Specifically, when *Capex* is used as the dependent variable, the estimated coefficients are significant with the predicted sign for *AQ* (t-statistics of 6.16 and -7.54 on the main and interaction effects respectively), of marginal significance with the predicted sign for *FOG* (t-statistics of 1.28 and -2.44), and statistically insignificant for *AQWi* (t-statistics of -1.18 and -0.51). However, when *Non-Capex* is used as the dependent variable, the estimated coefficients are always significant with the predicted signs for the main (t-statistics of 5.27, -6.85, 5.27) and interaction effects (t-statistics of -4.57, 2.65, and -3.19) of *AQ*, *AQWi* and *FOG*, respectively.

With respect to the corporate governance variables, we find that *InvG-Index*, is negatively associated with investment for firms likely to under-invest and positively associated with *Capex* for firms likely to over-invest. We find opposite results for analyst coverage but only in the *Capex* regression, with *Analyst* statistically insignificant in the *Non-Cap*ex regression. Institutional ownership is positively associated with *Non-Capex* investment among firms likely to under-invest but also positively (against prediction) associated with *Capex* among firms likely to over-invest.

5.2. Partitioning variables at the aggregate and industry levels

In the analysis above, we use firm characteristics – cash and leverage – to proxy for the likelihood that a firm will 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 financial reporting quality and over/under-investment. As a sensitivity analysis, we use investment aggregated 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, in each of the sample years, we measure the average *Investment* and average *Sales Growth* in the overall economy. We estimate Equation 2 using these aggregated data and use the residuals as proxies for aggregate over-investment in a given year. We then rank the residuals from these models into deciles (re-scaled from zero to one) to form a measure of aggregate over-investment in each year, *OverAggregate*. We similarly estimate an investment model at the industry level using the average *Investment* and average *Sales Growth* for all industries with at least 20 observations in a given year based on the Fama and French (1997) 48-industry classification for each year. We rank the residuals from the industry-year estimation of Equation 2 into deciles to form a measure of aggregate industry-year over-investment, *OverIndustry.* We then re-estimate Equation 1 using these two different partitioning variables as a proxy for *OverI*. The industry analysis is conducted over our usual sample period (1993 to 2005). However, this relatively short period provides little time-series variation, which is especially important at the economy level. Thus, for the aggregate-economy partition, we present the results for an expanded sample period of 1975 to 2005 omitting the governance variables since these data are not available for the earlier years.

Results are presented in Table 5 for the industry partitioning in Column 1 and the aggregate partitioning in Column 2. The results are consistent with our previous conclusions. For the industry-based partition (Column 1), the estimated coefficients have the predicted sign but *FRQ Index* is not statistically significant. The interaction term (with a t-statistic of -2.91) and the joint effect are significantly different from zero.[7] For the economy-based partition (Column 2), both the coefficient on the *FRQ Index* variable and its interaction with *OverAggregate* have the expected signs and are statistically significant (the t-statistics are 4.12 and -6.14). The joint effects are also significantly negative, suggesting that the negative relation between reporting

[7] When we expand the sample period to 1975 to 2005 (and omit the corporate governance variables), both *FRQ* and its interaction with *OverIndustry* become statistically significant (with t-statistics of 2.66 and -4.09).

quality and investment among firms more likely to over-invest is also robust to these alternative specifications.

In an untabulated analysis, we re-estimate our two specifications using the individual measures of reporting quality. For the industry partition, the results are generally consistent with *AQ,* weaker with *FOG* but insignificant with *AQWi*. In addition, the results are stronger for over-investment than for under-investment. Specifically, the t-statistics for the main effect (interaction terms) are 1.87, -0.07, and 1.06 (-2.79, 0.80, and -3.42) for *AQ*, *AQWi* and *FOG*, respectively. For the aggregate partition, the results are significant in three out of four cases. Specifically, the t-statistics for the main effect (interaction terms) are 3.95 and 0.72 (-5.44 and -2.93) for *AQ* and *AQWi*, respectively.

When we turn our attention to the proxies for corporate governance, our results are also similar to previous findings. *Institutions* is significantly positive, *InvGscore* is significantly negative and the interaction between *InvG-Score* and *OverIndustry* is positive. All the other variables are statistically insignificant.

5.3. Financial Reporting Quality Index without AQ

As discussed above, our results are stronger for *AQ* than for the remaining financial reporting quality proxies. However, one concern with *AQ* suggested by Wysocki (2008) is that it might not be a good proxy for financial reporting quality. To ensure that our results are not simply driven by *AQ*, we repeat all our tests with an alternative financial reporting quality index that aggregates only *AQWi* and *FOG* and omits *AQ* (*FRQ Index2*). The results are generally consistent with our predictions. That is, the estimated coefficients have the predicted signs and are statistically significant in all but two cases. The two exceptions are the main effects for financial reporting quality in the *Capex* regression (Table 4) and for aggregate investment (Table 5) with t-statistics of 0.98 and 1.30, respectively. Overall these results show that our findings are not simply driven by *AQ* and that are generally consistent when using alternative proxies for financial reporting quality.

6. Conclusion

Prior studies suggest that higher financial reporting quality can improve investment efficiency by reducing information asymmetries that give rise to frictions such as moral hazard and adverse selection. We extend this research by documenting the channels by which financial reporting quality relates to investment efficiency. Specifically, we test the hypotheses that higher financial reporting quality can be associated with either lower over- or under-investment.

Our results are consistent with these hypotheses when tested in several ways. First, higher financial reporting quality is associated with lower investment among firms that are cash rich and unlevered, and with higher investment among firms that are cash constrained and highly levered. 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. Overall, our findings are consistent with the idea that financial reporting quality serves a role in mitigating information frictions that ultimately hamper investment efficiency.

While our findings suggest that financial reporting quality is associated with lower over- and under-investment, an opportunity exists to extend our findings in several ways. First, one could explore the causal link between financial reporting quality and investment efficiency. Second, one could further explore the link between reporting quality and either over- or under-investment. For instance, one could study whether the negative relation between reporting quality and under-investment is due to firm's ability to raise debt and/or equity capital. Finally, one could explore other dimensions of investment such as the riskiness of investment activities (see Loktionov (2009) for a recent paper in this area). We leave these issues for future research.

References

Abel, A., 1983. Optimal investment under uncertainty. American Economic Review 73, 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, 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, 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, 963-982.

Blanchard, O., F. Lopez-de-Silanez, and A. Shleifer, 1994. What do firms do with cash windfalls? Journal of Financial Economics 36, 337-360.

Bushman, R., R. Indjejikian, 1993. Shareholder demand for ''distorted'' accounting disclosures. The Accounting Review 68, 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, 3009-3048.

Chang, X., S. Dasgupta, and G. Hilary, 2009. The effect of auditor quality on financing decisions. The Accounting Review 84, 1085-1117.

Core, J., W. Guay, and R. Verdi, 2008. Is accruals quality a priced risk factor? Journal of Accounting and Economics 46, 2-22.

Dechow, P., 1994. Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. Journal of Accounting and Economics 18, 3-42.

Dechow, P., and I. Dichev, 2002. The quality of accruals and earnings: The role of accrual estimation errors. The Accounting Review 77, 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, 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, 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, 499-533.

Francis, J., R. LaFond, P. Olsson, and K. Schipper, 2004. Cost of equity and earnings attributes. The Accounting Review 79, 967-1010.

Francis, J., R. LaFond, P. Olsson, and K. Schipper, 2005. The market pricing of accruals quality. Journal of Accounting and Economics 39, 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, 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, 221- 247.

Hayashi, F., 1982. Tobin's marginal q and average q: A neoclassical interpretation. Econometrica 50, 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, 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, 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, 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, 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, 169-215.

Kaplan, S., and L. Zingales, 2000. Investment-cash flow sensitivities are not valid measures of financing constraints. Quarterly Journal of Economics 115, 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, 221-247.

Liu, M., and P. Wysocki, 2007. Cross-sectional determinants of information quality proxies and cost of capital measures. Working paper, MIT.

Loktionov, Y., 2009. Does accounting quality mitigate risk shifting? Working paper, MIT.

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, 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, 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, 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.

Yoshikawa, H., 1980. On the "q" theory of investment. American Economic Review 70, 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.

Governance Variables

Institutions = The percentage of firm shares held by institutional investors.

Analysts = The number of analysts following the firm as provided by *IBES*.

InvG-Score = The measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003), multiplied by minus one.

G-Score dummy = an indicator variable that takes the value of one if *G-Score* is missing, and zero otherwise.

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).

σ(CFO) = standard deviation of the cash flow from operations deflated by average total assets from years t-5 to t-1.

σ(Sales) = standard deviation of the sales deflated by average total assets from years t-5 to t-1.

σ(I) = standard deviation of investment (*Investment*, *Capex*, and *Non-Capex*) from years t-5 to t-1.

Z-Score = 3.3*(item 170) + (item 12) + 0.25*(item 36) + 0.5*((items 4 – item 5) / 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).

Table 1 – Descriptive Statistics

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. *σ(CFO)* is the standard deviation of CFO. *σ(Sales)* is the standard deviation of the sales. *σ(I)* is the standard deviation of *Investment*. For *σ(CFO)*, *σ(Sales)*, and *σ(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. *InvG-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003), multiplied by minus one. *G-Score dummy* is an indicator variable that takes the value of one if *G-Score* is missing, and zero otherwise.

Panel A – Descriptive Statistics

OBS	OBS	Mean	STD	Min	Median	Max
Investment $_{t+1}$ *(%)*	34,791	14.14	16.32	-4.00	9.28	121.50
AQ	34,791	-0.06	0.05	-0.29	-0.04	0.00
AQWi	34,791	1.18	0.37	0.41	1.12	3.11
FOG	20,443	-19.31	1.42	-25.65	-19.15	-16.16
FRQ Index	20,443	0.01	0.62	-2.55	0.04	2.36
LogAsset	34,791	5.55	2.19	0.97	5.46	11.03
Mkt-to-Book	34,791	1.92	1.51	0.51	1.42	14.01
σ(CFO)	34,791	0.09	0.09	0.01	0.07	0.80
σ(Sales)	34,791	0.19	0.17	0.01	0.14	0.95
σ(I)	34,791	11.29	13.91	0.51	6.63	98.20
Z-score	34,791	1.28	1.42	-7.58	1.38	4.83
Tangibility	34,791	0.31	0.24	0.01	0.25	0.91
K-structure	34,791	0.19	0.21	0.00	0.12	0.94
Ind. K-struc.	34,791	0.19	0.12	0.00	0.17	0.76
CFOsale	34,791	-0.08	0.96	-13.10	0.06	0.80
Slack	34,791	1.98	5.63	0.00	0.27	66.01
Dividend	34,791	0.44	0.50	0.00	0.00	1.00
Age	34,791	19.13	15.01	1.00	14.00	79.00

Oper. Cycle	34,791	4.68	0.72	1.86	4.75	6.53
Losses	34,791	0.28	0.45	0.00	0.00	1.00
Institutions	34,791	0.37	0.28	0.00	0.35	1.00
Analysts	34,791	5.59	7.54	0.00	2.00	38.00
InvG-Score	34,791	-3.54	4.78	-15.00	0.00	0.00
G-Score Dummy	34,791	0.38	0.49	0.00	0.00	1.00

Table 1 – Cont'd

Panel B – Correlation matrix

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXI	XXI	XXI
Investment	1.00																							
AQ	-0.13	1.00																						
AQWi	-0.07	0.19	1.00																					
FOG	-0.05	0.08	0.04	1.00																				
FRQ Index	-0.13	0.66	0.64	0.60	1.00																			
LogAsset	-0.12	0.44	0.06	0.00	0.26	1.00																		
Mkt-to-Book	0.36	-0.18	-0.07	-0.04	-0.15	-0.07	1.00																	
σ(CFO)	0.20	-0.66	-0.07	-0.08	-0.42	-0.41	0.26	1.00																
σ(Sales)	0.00	-0.44	-0.03	-0.05	-0.27	-0.27	0.04	0.38	1.00															
σ(I)	0.15	-0.19	-0.04	-0.07	-0.16	-0.07	0.09	0.34	0.15	1.00														
Z-score	-0.21	0.21	0.11	0.12	0.23	0.15	-0.19	-0.37	0.05	-0.30	1.00													
Tangibility	0.00	0.37	0.04	0.04	0.23	0.26	-0.19	-0.29	-0.25	-0.03	-0.05	1.00												
K-structure	-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											
Ind. K-struc.	-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										
CFOsale	-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									
Slack	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								
Dividend	-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							
Age	-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						
Op. Cycle	-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					
Losses	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				
Institutions	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			
Analysts	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		
InvG-Score	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	
G-Score Dum	-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 2 – Conditional Relation between Investment and Financial Reporting Quality

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. *σ(CFO)* is the standard deviation of CFO. *σ(Sales)* is the standard deviation of the sales. *σ(I)* is the standard deviation of *Investment*. For *σ(CFO)*, *σ(Sales)*, and *σ(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. *InvG-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003), multiplied by minus one. *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.

	Financial Reporting Quality Proxy			
Predictors	*AQ*	*AQWi*	*FOG*	*FRQ Index* $_{t+1}$ (%)
FRQ	**14.106****	**0.718***	**0.251****	**1.082*****
	(2.12)	**(1.89)**	**(1.98)**	**(2.60)**
FRQ*OverFirm	**-34.796*****	**-2.386*****	**-1.235*****	**-3.862*****
	(-3.50)	**(-2.67)**	**(-2.96)**	**(-4.46)**
Joint significance	**0.0004**	**0.0051**	**0.0029**	**0.0000**
Governance Variables				
Institutions	6.342***	6.659***	7.904***	7.647***
	(6.04)	(6.44)	(5.15)	(4.92)
Analysts	0.054	0.063	0.077	0.073
	(1.19)	(1.35)	(1.16)	(1.07)
InvG-Score	-0.193***	-0.210***	-0.205***	-0.188**
	(-3.21)	(-3.46)	(-2.74)	(-2.51)
G-Score Dummy	-2.594***	-2.576***	-1.859**	-1.850**
	(-3.70)	(-3.71)	(-2.22)	(-2.21)
*Institutions*OverFirm*	-2.146	-2.850	-4.700*	-3.957
	(-1.07)	(-1.45)	(-1.87)	(-1.52)
*Analysts*OverFirm*	0.001	-0.021	0.037	0.049
	(0.01)	(-0.24)	(0.35)	(0.44)
*InvG-Score*OverFirm*	0.045	0.081	0.111	0.080

	(0.49)	(0.89)	(0.94)	(0.67)
Control Variables				
OverFirm	6.784***	12.047***	-14.769*	8.515***
	(6.87)	(10.17)	(-1.84)	(8.50)
LogAsset	-0.645***	-0.641***	-1.048***	-1.049***
	(-7.24)	(-6.96)	(-7.24)	(-7.33)
Mkt-to-Book	2.285***	2.310***	2.209***	2.183***
	(12.44)	(12.48)	(12.45)	(12.53)
σ(CFO)	5.396**	7.070***	10.971***	8.794***
	(2.23)	(3.40)	(4.13)	(3.26)
σ(Sales)	-3.490***	-3.241***	-3.402***	-3.779***
	(-3.68)	(-3.42)	(-3.22)	(-3.64)
σ(I)	0.117***	0.116***	0.084***	0.084***
	(6.23)	(6.18)	(4.27)	(4.27)
Z-score	-1.173***	-1.191***	-1.082***	-1.035***
	(-5.68)	(-5.77)	(-7.12)	(-6.69)
Tangibility	12.457***	12.497***	13.638***	13.730***
	(12.10)	(12.74)	(13.49)	(13.49)
Ind K-structure	-19.575***	-19.274***	-19.395***	-19.598***
	(-14.27)	(-14.09)	(-9.69)	(-9.80)
CFOsale	-0.982***	-0.965***	-1.256***	-1.270***
	(-5.25)	(-5.24)	(-6.54)	(-6.54)
Dividend	-0.601***	-0.593***	-0.237	-0.220
	(-2.61)	(-2.59)	(-1.02)	(-0.94)
Age	-0.034***	-0.034***	-0.027***	-0.026***
	(-4.34)	(-4.28)	(-3.13)	(-3.07)
Operating Cycle	-0.440**	-0.452**	-0.451*	-0.440*
	(-2.17)	(-2.20)	(-1.89)	(-1.82)
Losses	-3.578***	-3.593***	-3.845***	-3.838***
	(-11.84)	(-11.91)	(-10.20)	(-10.23)
Industry FE	Yes	Yes	Yes	Yes
Firm/Year Cluster	Yes	Yes	Yes	Yes
OBS	34,791	34,791	20,443	20,443
R-square (%)	21.42	21.38	22.67	22.74

Table 3 – Financial Reporting Quality and Deviations from Expected Investment

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 unpredicted 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. *σ(CFO)* is the standard deviation of CFO. *σ(Sales)* is the standard deviation of the sales. *σ(I)* is the standard deviation of *Investment*. For *σ(CFO)*, *σ(Sales)*, and *σ(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. *InvG-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003), multiplied by minus one. *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.

Panel A – Under-investment versus normal investment

	Financial Reporting Quality Proxy			
Predictors	*AQ*	*AQWi*	*FOG*	*FRQ Index* $_{t+1}$ (%)
FRQ	**-1.810*****	**-0.039**	**-0.042****	**-0.103****
	(-3.00)	**(-0.81)**	**(-2.40)**	**(-2.32)**
Governance Variables				
Institutions	-0.497***	-0.511***	-0.461***	-0.451***
	(-4.19)	(-4.30)	(-2.96)	(-2.90)
Analysts	-0.001	-0.001	-0.014**	-0.014**
	(-0.12)	(-0.14)	(-2.15)	(-2.17)
InvG-Score	0.018	0.017	0.021	0.021
	(1.04)	(1.00)	(1.08)	(1.07)
G-Score Dummy	-0.022	-0.028	-0.002	-0.006
	(-0.14)	(-0.17)	(-0.01)	(-0.03)
Control Variables				
LogAsset	-0.031	-0.035*	0.010	0.012
	(-1.47)	(-1.66)	(0.28)	(0.37)
Mkt-to-Book	-0.035	-0.033	-0.014	-0.015
	(-1.62)	(1.55)	(-0.52)	(-0.56)
σ(CFO)	-1.446***	-0.980***	-1.796***	-1.969***
	(-4.74)	(-3.50)	(-4.69)	(-5.06)

σ(Sales)	0.387***	0.469***	0.676***	0.643***
	(2.91)	(3.59)	(4.09)	(3.89)
σ(I)	0.009***	0.009***	0.012***	0.012***
	(5.53)	(5.43)	(5.82)	(5.88)
Z-score	-0.130***	-0.131***	-0.113***	-0.112***
	(-5.78)	(-5.85)	(-4.06)	(-4.01)
Tangibility	-0.069	-0.113	-0.306	-0.294
	(-0.47)	(-0.79)	(-1.64)	(-1.58)
K-structure	0.776***	0.781***	0.669***	0.668***
	(6.00)	(6.03)	(4.18)	(4.17)
Ind K-structure	-5.812***	-5.834***	-5.829***	-5.793***
	(-18.68)	(-18.70)	(-15.19)	(-15.12)
CFOsale	0.096***	0.101***	0.150***	0.149***
	(3.40)	(3.59)	(3.66)	(3.62)
Slack	0.012***	0.012***	0.016***	0.015***
	(2.80)	(2.71)	(2.60)	(2.59)
Dividend	-0.063	-0.068	-0.053	-0.048
	(-1.13)	(-1.21)	(-0.76)	(-0.69)
Age	0.002	0.002	0.005*	0.005*
	(1.05)	(1.04)	(1.77)	(1.77)
Operating Cycle	-0.145***	-0.144***	-0.160***	-0.160***
	(-3.93)	(-3.88)	(-3.27)	(-3.28)
Losses	0.105**	0.111**	0.157***	0.153***
	(2.37)	(2.49)	(2.76)	(2.70)
Firm Cluster	Yes	Yes	Yes	Yes
Obs	34,791	34,791	20,443	20,443
Pseudo R^2 (%)	8.43	8.46	8.78	8.79

Table 3 – continued

Panel B – Over-investment versus normal investment

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

Firm Cluster	Yes	Yes	Yes	Yes
Obs	34,791	34,791	20,443	20,443
Pseudo R^2 (%)	8.43	8.46	8.78	8.79

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

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Capex* and *Non-Capex* investment*.* *Capex* is a measure of capital expenditures scaled by lagged PPE. *Non-capex* is the sum of research and development and acquisitions deflated by lagged total assets. *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. *σ(CFO)* is the standard deviation of CFO. *σ(Sales)* is the standard deviation of the sales. *σ(I)* is the standard deviation of *Investment*. For *σ(CFO)*, *σ(Sales)*, and *σ(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. *InvG-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003), multiplied by minus one. *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.

	Dependent Variable =	
Predictors	*Capex*	*Non-Capex*
FRQ	**2.319*****	**1.563*****
	(3.38)	**(5.95)**
FRQ*OverFirm	**-8.508*****	**-4.555*****
	(-5.91)	**(-8.02)**
Joint significance	**0.0000**	**0.0000**
Governance Variables		
Institutions	-1.940	3.383***
	(-0.99)	(2.88)
Analysts	0.229**	-0.013
	(2.49)	(-0.27)
InvG-Score	-0.467***	-0.247***
	(-4.09)	(-4.19)
G-Score Dummy	-2.734**	-1.134**
	(-2.47)	(-1.98)
*Institutions*OverFirm*	16.299***	-0.577
	(4.08)	(-0.24)
*Analysts*OverFirm*	-0.327*	0.111
	(-1.73)	(1.42)
*InvG-Score*OverFirm*	1.423***	0.166*
	(5.84)	(1.65)
Control Variables		
OverFirm	12.376***	4.902***

	(7.06)	(6.28)
LogAsset	-0.168	-0.797***
	(-0.69)	(-6.13)
Mkt-to-Book	4.092***	1.454***
	(16.34)	(9.32)
σ(CFO)	25.318***	2.482
	(4.09)	(1.20)
σ(Sales)	0.719	-3.150***
	(0.41)	(-3.08)
σ(I)	0.037***	0.103***
	(3.24)	(5.05)
Z-score	2.029***	-1.601***
	(10.57)	(-10.53)
Tangibility	-16.703***	-4.204***
	(-7.57)	(-7.48)
Ind K-structure	-6.561**	-14.201***
	(-2.36)	(-9.01)
CFOsale	0.276	-1.372***
	(0.58)	(-7.23)
Dividend	-2.379***	0.184
	(-4.43)	(0.82)
Age	-0.074***	-0.010
	(-5.34)	(-1.36)
Operating Cycle	-1.457***	-0.577***
	(-2.92)	(-3.19)
Losses	-6.237***	-2.241***
	(-11.48)	(-5.85)
Industry FE	Yes	Yes
Firm/Year Cluster	Yes	Yes
OBS	20,443	20,443
R-square (%)	24.22	25.45

Table 5 – Aggregate Over-Investment Partitions

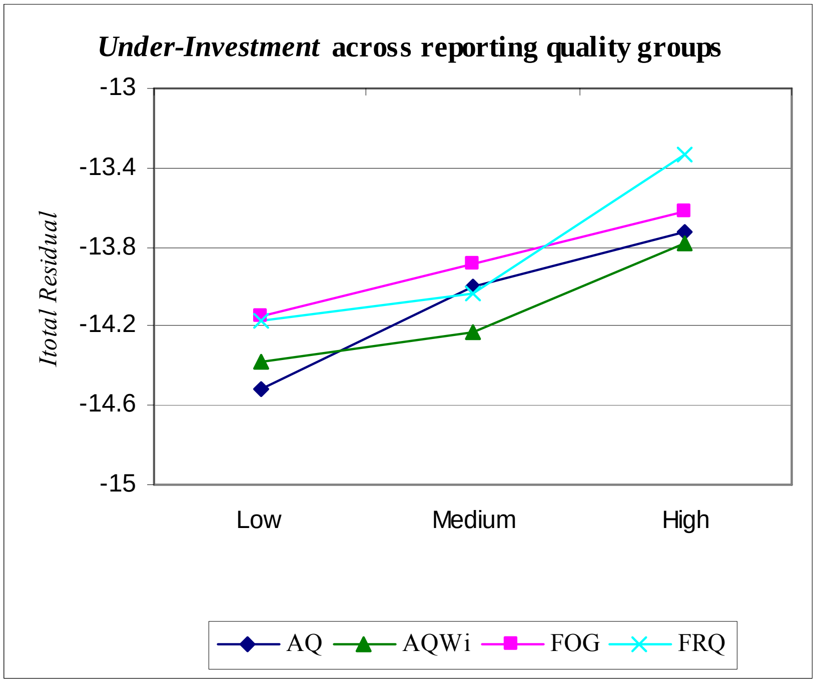
This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Investment. Investment* is a measure of total investment scaled by lagged total assets. *FRQ Index* is computed as the standardized average of *AQ*, *AQWi*, and *FOG*. *OverFirm* is a ranked variable 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. *σ(CFO)* is the standard deviation of CFO. *σ(Sales)* is the standard deviation of the sales. *σ(I)* is the standard deviation of *Investment*. For *σ(CFO)*, *σ(Sales)*, and *σ(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. *InvG-Score* is the measure of anti-takeover protection created by Gompers, Ishii and Metrick (2003), multiplied by minus one. *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.

	(1)	(2)
FRQ	**0.393**	**0.779*****
	(1.21)	**(4.12)**
FRQ*OverIndustry	**-1.883*****	
	(-2.91)	
FRQ*OverAggregate		**-1.881*****
		(-6.14)
Joint significance	**0.0009**	**0.0000**
<u>*Governance Variables*</u>		
Institutions	5.689***	
	(8.29)	
Analysts	0.031	
	(0.71)	
InvG-Score	-0.245***	
	(-2.89)	
G-Score Dummy	-1.715**	
	(-2.03)	
*Institutions*OverIndustry*	-0.818	
	(0.56)	
Analysts OverIndustry*	0.069	
	(1.31)	
InvG-Score OverIndustry*	0.193**	
	(2.56)	
<u>Control Variables</u>		
OverIndustry	7.335***	

	(6.68)	
OverAggregate		0.402
		(0.57)
LogAsset	-0.912***	-0.002
	(-5.67)	(-0.02)
Mkt-to-Book	2.256***	2.557***
	(13.18)	(15.37)
σ(CFO)	11.272***	6.371***
	(4.49)	(3.71)
σ(Sales)	-3.856***	-2.471***
	(-3.72)	(-4.16)
σ(I)	0.075***	0.118***
	(3.81)	(7.66)
Z-score	-0.913***	-0.624***
	(-6.18)	(-3.04)
Tangibility	10.194***	10.756***
	(8.31)	(11.41)
K-structure	-7.455***	-8.022***
	(-7.52)	(-15.71)
Ind K-structure	-8.451***	-12.542***
	(-4.05)	(-9.10)
CFOsale	-1.336***	-1.390***
	(-6.41)	(-6.69)
Slack	-0.047	0.032
	(-1.03)	(1.21)
Dividend	-0.358*	-0.729***
	(-1.68)	(-3.06)
Age	-0.032***	-0.048***
	(-3.41)	(-6.72)
Operating Cycle	-0.840**	-0.157
	(-2.41)	(-0.63)
Losses	-3.321***	-3.679***
	(-9.11)	(-15.59)
Industry FE	Yes	Yes
Firm/Year Cluster	Yes	Yes
OBS	20,443	71,036
R-square (%)	23.79	19.40

Figure 1 – Investment Residual across Financial Reporting Quality Groups

Panel A – Under-Investment



Panel B – Over-Investment