Financial Reporting Quality and Investment Efficiency

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Abstract

This paper studies the relation between financial reporting quality and investment efficiency on a sample of 49,543 firm-year observations between 1980 and 2003. Financial reporting quality has been posited to improve investment efficiency, but there has been little empirical evidence supporting this claim to date. Consistent with this claim, I find that proxies for financial reporting quality are negatively associated with both firm underinvestment and overinvestment. Further, financial reporting quality is more strongly associated with underinvestment for firms facing financing constraints and with overinvestment for firms with large cash balances, which suggests that financial reporting quality mitigates information asymmetries arising from adverse selection problems and agency conflicts. Finally, the relation between financial reporting quality and investment efficiency is stronger for firms with low quality information environments. Overall, this paper has implications for research examining the determinants of investment efficiency and the economic consequences of enhanced financial reporting.

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1. Introduction

This paper studies the relation between financial reporting quality and investment efficiency. Recent papers (e.g., Healy and Palepu, 2001; Bushman and Smith, 2001; Lambert, Leuz, and Verrecchia, 2005) suggest that enhanced financial reporting can have important economic implications such as increased investment efficiency. However, despite solid theoretical support for such a relation, there is little empirical evidence supporting these claims. I hypothesize that financial reporting quality can improve investment efficiency by reducing information asymmetry in two ways: (1) it reduces the information asymmetry between the firm and investors and thus lowers the firm's cost of raising funds; and (2) it reduces information asymmetry between investors and the manager and thus lowers the shareholders' cost of monitoring managers and improves project selection.

The two key constructs in the analysis are investment efficiency and financial reporting quality. I conceptually define a firm as investing efficiently if it undertakes all and only projects with positive net present value (NPV) under the scenario of no market frictions such as adverse selection or agency costs. Thus inefficient investment includes passing up investment opportunities that would have positive NPV in the absence of adverse selection (underinvestment). Likewise, inefficient investment includes undertaking projects with negative NPV (overinvestment). I measure investment efficiency as deviations from expected investment using a parsimonious investment model which predicts expected investment as a function of growth opportunities (Tobin, 1982). Thus, both underinvestment (negative deviations from expected investment) and overinvestment (positive deviations from expected investment) are considered inefficient investment.

I conceptually define financial reporting quality as the precision with which financial reporting conveys information about the firm's operations, in particular its expected cash flows, in order to inform equity investors. As described in the FASB Statement of Financial Accounting Concepts No. 1, financial reporting should "…provide information that is useful to present and potential investors in making rational investment decisions…" (par. 34) and "…provide information to help present and potential investors in assessing the amounts, timing, and uncertainty of prospective cash receipts..." (par. 37). Further, expected cash flows is a key input to firm capital budgeting, which is particularly important in the context of this paper which studies financial reporting implications for corporate investment. I proxy for financial reporting quality using measures of accruals quality based on the idea that accruals improve the informativeness of earnings by smoothing out transitory fluctuations in cash flows (Dechow and Dichev, 2002; McNichols, 2002). The use of accruals quality relies upon the fact that accruals are estimates of future cash flows and earnings will be more representative of future cash flows when there is lower estimation error embedded in the accruals process.

I study the relation between financial reporting quality and investment efficiency on a sample of 49,543 firm-year observations during the sample period of 1980 to 2003. The analysis yields three key findings. First, the proxies for financial reporting quality are negatively associated with both firm underinvestment and overinvestment. This result extends research in Wang (2003) who predicts and finds a positive relation between capital allocation efficiency and three earnings attributes (value-relevance, persistence, and precision) without making the distinction between under- and overinvestment.

Second, cross-sectional tests indicate that the impact of financial reporting quality on investment efficiency is due to the alleviation of adverse selection and agency costs. For instance, financial reporting quality is more strongly negatively associated with underinvestment for firms facing financing constraints. This result suggests that, for this type of firm, financial reporting quality improves investment efficiency by lowering its cost of raising funds. Likewise, financial reporting quality is more strongly negatively associated with overinvestment for firms with large cash balances. This result suggests that financial reporting quality improves investment efficiency for these firms by lowering shareholders' cost of monitoring managers and improving project selection.

Finally, I predict that the relation between financial reporting quality and investment efficiency is stronger for firms with poor information environments. Financial reports are just one source of information to investors, and investors are more likely to rely on financial accounting information to infer the economic conditions of the firm's operations for companies with otherwise weak information environments. I proxy for the information environment using the number of analysts following a firm as an ex-ante measure for the amount of publicly available information about the firm, and bid-ask spreads as an ex-post measure of the information asymmetry between the firm and investors (e.g., Amihud and Mendelson, 1986; Roulstone, 2003). Consistent with the prediction, the relation between financial reporting quality and investment efficiency is stronger for firms with low analyst following and for firms with high bid-ask spreads. These results suggest that financial reporting quality can affect investment efficiency directly in addition to the link through price informativeness documented in Durnev, Morck, and Yeung (2004). In addition, the findings using analyst following are consistent with Botosan (1997) who finds that greater disclosure is associated with lower cost of capital for firms with low analyst following.

Although my results suggest that firms with higher financial reporting quality are associated with more efficient investment, one cannot conclude from this paper that increasing financial reporting quality would necessarily translate into higher investor welfare. Enhanced financial reporting may improve investment efficiency by reducing information asymmetry. However, firms must weigh this benefit against the costs (e.g., proprietary costs) and against alternative ways to reduce information asymmetry such as courting more analysts. Further, it may even be impossible for some firms to increase financial reporting quality given the limitations imposed by GAAP. Nonetheless, this paper contributes to literature on the economic consequences of enhanced financial reporting by showing that financial reporting quality can be associated with more efficient investment.

The remainder of the paper proceeds as follows. Section 2 develops the hypotheses and Section 3 describes the measurement of investment efficiency and financial reporting quality. Section 4 presents the results. Section 5 offers some sensitivity analysis and Section 6 concludes.

2. Hypothesis development

In this section I first review the determinants of investment efficiency. Then I discuss how financial reporting quality can affect investment efficiency. Finally, I develop predictions on the relation between financial reporting quality and investment efficiency, and the channels through which this relation is expected to take place. Figure 1 describes these links.

2.1. Determinants of investment efficiency

There exist at least two determinants of investment efficiency. First, a firm needs to raise capital in order to finance its investment opportunities. In a perfect market, all projects with positive net present values should be funded; however, a large literature in finance has shown that firms face financing constraints that limit managers' ability to finance potential projects (Hubbard, 1998). One conclusion of this literature is that a firm facing financing constraints will pass up positive NPV projects due to large costs of raising capital, resulting in underinvestment (Arrow 1 in Figure 1). Second, even if the firm decides to raise capital, there is no guarantee that the correct investments are implemented. For instance, managers could choose to invest inefficiently by making bad project selections, consuming perquisites, or even by expropriating existing resources. Most of the literature in this area predicts that poor project selection leads the firm to overinvest (Stein, 2003), but there are also a few papers which predict the firm could underinvest (e.g., Bertrand and Mullainathan, 2003). These links are presented respectively by Arrows 2A and 2B in Figure 1.

Information asymmetry can affect the cost of raising funds and project selection. For instance, information asymmetry between the firm and investors (commonly referred as an adverse selection problem) is an important driver of a firm's cost of raising the capital required to finance its investment opportunities (Arrow 3 in Figure 1). Myers and Majluf (1984) develop a model in which information asymmetry between the firm and investors gives rise to firm underinvestment. They show that when managers act in favor of existing shareholders and the firm needs to raise funds to finance an existing positive NPV project, managers may refuse to raise funds at a discounted price even if that means passing up good investment opportunities.

Also, information asymmetry can prevent efficient investment because of the differential degree of information between managers and shareholders (commonly referred as a principal-agent conflict). Since managers maximize their personal welfare, they can choose investment opportunities that are not in the best interest of shareholders (Berle and Means, 1932; Jensen and Meckling, 1976). The exact reason why managers inefficiently invest shareholders' capital varies across different models, but it includes perquisite consumption (Jensen, 1986, 1993), career concerns (Holmstrom, 1999), and preference for a "quiet life" (Bertrand and Mullainathan, 2003), among others. More importantly, the predicted relation is that agency problems can affect investment efficiency due to poor project selection (Arrow 4A in Figure 1) and can increase the cost of raising funds if investors anticipate that managers could expropriate funded resources (Arrow 4B in Figure 1) (Lambert, Leuz, and Verrecchia, 2005).

In sum, the discussion above suggests that information asymmetries between the firm and investors and between the principal and the agent can prevent efficient investment. In the next section, I discuss how financial reporting quality can enhance investment efficiency by mitigating these information asymmetries.

2.2. Role of financial reporting

Financial reporting quality can be associated with investment efficiency in at least two ways. First, it is commonly argued that financial reporting mitigates adverse selection costs (Arrow 5 in Figure 1) by reducing the information asymmetry between the firm and investors, and among investors (Verrecchia, 2001). For instance, Leuz and Verrecchia (2000) find that a commitment to more disclosure reduces such information asymmetries and increases firm liquidity. On the other hand, the existence of information asymmetry between the firm and investors could lead suppliers of capital to discount the stock price and to increase the cost of raising capital because investors would infer that firms raising money is of a bad type (Myers and Majluf, 1984). Thus, if financial reporting quality reduces adverse selection costs, it can improve investment efficiency by reducing the costs of external financing and, as discussed in more detail below, the potential for financial reporting quality to improve investment efficiency is greatest in firms facing financing constraints.

Second, a large literature in accounting suggests that financial reporting plays a critical role in mitigating agency problems. For instance, financial accounting information is commonly used as a direct input into compensation contracts (Lambert, 2001) and is an important source of information used by shareholders to monitor managers (Bushman and Smith, 2001). Further, financial accounting information contributes to the monitoring role of stock markets as an important source of firm-specific information (e.g., Holmstrom and Tirole, 1993; Bushman and Indjejikian, 1993; Kanodia and Lee, 1998). Thus, if financial reporting quality reduces agency problems (Arrow 6 in Figure 1), it can then improve investment efficiency by increasing shareholder ability to monitor managers and thus improve project selection and reduce financing costs.[1]

2.3. Predictions

[1] For example, Bens and Monahan (2004) find a positive association between AIMR disclosure ratings and the excess value of diversification as defined by Berger and Ofek (1995). They conclude that disclosure plays a monitoring role in mitigating management's investment decisions.

Based on the discussion above that financial reporting affects both adverse selection and agency conflicts, I predict an average negative relation between financial reporting quality and both underinvestment and overinvestment. These links complement research in Bushman, Piotroski, and Smith (2005), which studies the relation between country measures of timely loss recognition and the country propensity to liquidate bad projects (i.e., mitigate overinvestment), and in Wang (2003) which explores the relation between capital allocation efficiency and accounting information quality for a sample of US firms, without making a distinction between under- and overinvestment.[2]

H_1: Financial reporting quality is negatively associated with underinvestment.

H_2: Financial reporting quality is negatively associated with overinvestment.

In addition to investigating the average relation between financial reporting quality and investment efficiency, I also investigate the mechanisms through which financial reporting quality can affect investment efficiency using cross-sectional analysis. First, I predict that the relation between financial reporting quality and firm underinvestment is stronger for firms facing financing constraints. By definition, constrained firms are those for which the ability to raise funds is the most likely impediment to efficient investment, and for these firms, financial reporting quality is especially important in mitigating adverse selection costs.

H_3: The relation between financial reporting quality and underinvestment is stronger for financing constrained firms.

[2] One concern with Hypotheses 1 and 2 is that causality goes the other way. For instance, poorly performing managers could be investing inefficiently and thus choose to report low quality financial information in order to hide their bad performance (e.g., Leuz, Nanda, and Wysocki, 2003). I discuss the empirical tests used to address this alternative hypothesis in Section 4.

Second, I predict that the relation between financial reporting quality and firm overinvestment is stronger for firms with large cash balances and free cash flows. Managers of firms with large cash balances and free cash flows have more opportunity to engage in value destroying investment activities (e.g., Jensen, 1986; Blanchard, Lopez-de-Silanes, and Shleifer, 1994; Harford, 1999; Opler et al., 1999; Richardson, 2006). Consequently, financial reporting quality can play a more important monitoring role in mitigating agency problems for these firms.

> *H_4: The relation between financial reporting quality and overinvestment is stronger for firms holding large cash balances and free cash flows.*

Third, I study the complementary and substitute relation between financial reporting quality and a firm's information environment, and how it affects investment efficiency. Financial reporting quality is just one source of information about the firm's operations used by investors. For instance, investors in firms followed by a large number of analysts or firms with informative stock prices may be less dependent on financial reports when other elements of the firm's information environment are of high quality. Thus I hypothesize that financial reporting quality is more important in improving investment efficiency when the amount of information publicly available about the firm is low.[3]

> *H_5: The relation between financial reporting quality and investment efficiency is stronger for firms with relatively poor information environments.*

3. Empirical work

3.1. Proxies for investment efficiency

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[3] One concern with Hypothesis 5 is that financial reporting quality and the firm's information environment are likely to be correlated. Indeed, Verdi (2005) shows that the firm information environment can be aggregated in accounting-based and market-based correlated constructs. Hypothesis 5 implicitly assumes away this correlation by investigating the effect of financial reporting quality on investment efficiency holding the market-based information environment constant.

In order to construct measures of investment efficiency, I first estimate a model that predicts firm investment levels and then use residuals from this model as a proxy for inefficient investment. The data are from the Compustat Annual file during the years 1980 to 2003. Total new *Investment* in a given firm-year is the sum of capital expenditures (item 128), R&D expenditures (item 46), and acquisitions (item 129) minus sales of PPE (item 107) and depreciation and amortization (item 125) multiplied by 100 and scaled by average total assets (item 6), following Richardson (2006). This measure uses an accounting-based framework to estimate new investment as the difference between total investment and investment required for maintenance of assets in place. In the sensitivity section I also discuss the robustness of the results to the use of only capital expenditures as an alternative proxy for investment that is frequently used in the literature (e.g., Hubbard, 1998).

I estimate a parsimonious model for investment demand as a function of growth opportunities measured by Tobin's *Q* (Tobin, 1982). This model is based on the argument that growth opportunities should explain corporate investment when markets are perfect (Hubbard, 1998).[4]

$$Investment_{i,t} = \beta_{0\,j,t} + \beta_{1\,j,t} * Q_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

I estimate the model cross-sectionally for all industries with at least 20 observations in a given year based on the Fama and French (1997) 48-industry classification. *Q* is calculated as the ratio of the market value of total assets (defined as

[4] A large finance literature uses investment cash flow sensitivities as a proxy for inefficient investment (or market frictions). I do not use this approach for two reasons: First, traditional papers measure cash flow without making the distinction between cash flows and accruals, and Bushman, Smith, and Zhang (2005) illustrate the sensitivity of the results to the appropriate measurement of operating cash flows. Second, positive investment cash flow sensitivities could mean both financing constraints and/or agency problems which makes it impossible to test the cross-sectional hypotheses of the paper (Hypotheses 3 to 5).

total assets (item 6) plus the product of stock price (item 199) and the number of common shares outstanding (item 199) minus the book value of equity (item 60)) to book value of total assets (item 6) at the start of the fiscal year. The sample consists of 98,675 firm-year observations with available data to estimate *Investment* and *Q* during the sample period of 1980 to 2003. Consistent with previous 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 I winsorize all variables at the 1% and 99% levels by year.[5]

Table 1 presents the results from the investment model in Equation 1. Panel A offers descriptive statistics for *Investment* and *Q*. The mean (median) firm in the sample invests 7.26% (3.84%) of total assets per year and has an average (median) *Q* equal to 1.90 (1.32), consistent with related literature (e.g., Richardson, 2006; Almeida, Campello, and Weisbach, 2004). Panel B presents mean and median values of the estimated industry coefficients on *Q*, the average R-square, and the number of significant positive coefficients for each year. In all years the mean and median coefficients are positive and relatively stable during the sample period. The mean R-square ranges from 6% in 1997 to 14% in 1991.[6] Finally, in each year, more than half of the industry coefficients on *Q* are positive and statistically different from zero at a five percent significance level.[7]

[5] The model in Equation 1 includes an intercept which imposes that for each industry-year the mean firm will have a zero residual. In untabulated analysis, I re-estimate the model adding the intercept back to the residual so that it allows industry-years to have a non-zero mean (for example, industries that overinvest or periods with large economic growth). The results are robust (in general even stronger) to this test.

[6] Note that the reported R-squares measure only the within industry-year variation because the model is estimated separately for each industry-year. An equivalent approach in which the model is estimated across all industry-years with separate intercepts and coefficients for each industry-year leads to an R-square of 23.5%, suggesting that the overall explanatory power of the model is larger than that reported in Table 1.

[7] A current ongoing debate in the finance literature is the implications for measurement error in the estimation of *Q* (Erickson and Whited, 2000; Gomes, 2001; Alti, 2003). Since the subsequent analysis hinges on the investment model in Equation 1, I perform two sensitivity tests: First, I include past returns in

I measure investment efficiency using the residuals from the model in Equation 1. *Overinvestment* is the positive residuals of the investment model and *Underinvestment* is the negative residuals of the investment model multiplied by negative one, such that both measures are decreasing in investment efficiency. In untabulated analysis, I repeat all tests after excluding firms with the smallest 10% and 20% investment residuals because these firms are more likely to be affected by measurement error in the investment model (i.e., misclassified as overinvesting or underinvesting firms). The results for these analyses are similar to those reported below.

Table 1 – Panel C presents descriptive statistics for *Investment Residual*, *Overinvestment* and *Underinvestment*. By construction, *Investment Residual* has a mean value of zero; ranging from -64.46% to 80.43%. There are 39,107 (59,568) firms classified as overinvesting (underinvesting) firms. The mean (median) value is 9.73% (5.63%) for *Overinvestment* and 6.39% (4.71%) for *Underinvestment*. These results show that the residuals from the investment model are more frequently negative, although in smaller magnitude. Panel D presents Pearson correlations between the measures of investment efficiency and firm characteristics. *Investment Residual* is uncorrelated with firm size (measured as the log of total assets (item 6) at the start of the fiscal year) and slightly negatively correlated with return volatility (measured as the standard deviation of daily returns during the prior fiscal year). However, when the residuals are separated into *Overinvestment* and *Underinvestment*, I find that these variables are negatively correlated with size and positively correlated with return volatility and *Q* (the magnitude of the

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the investment model to capture growth opportunities not reflected in *Q* (Lamont, 2000; Richardson, 2006); and second, I exclude all industry-year observations in which the estimated coefficient on *Q* is not positive and significant. The subsequent results are not sensitive to these tests.

correlations range from 0.18 to 0.32). These results suggest either that: (1) small firms, with more growth opportunities and volatile operations, have more inefficient investment; or (2) the investment model is a poor fit for these firms. In any case, it highlights the importance to control for these firm characteristics in the subsequent analysis.

In order to better understand the properties of the residuals from the investment model I perform analyses testing the persistence of investment efficiency over time. First, I find that 40% (48%) of the firms in the top (bottom) *Investment Residual* quintile in a given year remain in the top (bottom) quintile in the following year, and 27% (36%) remain three years later (Panel E). In addition, one lag of *Investment Residual* in an autoregressive model explains 16% of current *Investment Residual* (untabulated). The inclusion of higher orders of past residuals has a small contribution in explanatory power (R-square of only 18% if five lags are included in the model). These analyses suggest that residuals of the investment model are not random, which seems to support the view that they capture a firm investment characteristic. However, I cannot rule out the explanation that the persistence in the residuals is a function of an omitted correlated variable in the investment model.

3.2. Proxies for financial reporting quality

The conceptual definition of financial reporting quality used in this paper is the accuracy with which financial reporting conveys information about the firm's operations, in particular its expected cash flows, in order to inform investors in terms of equity investment decisions. This definition is consistent with the FASB – SFAC No. 1 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. I proxy for financial reporting quality using measures of accruals quality derived in prior work (Dechow and Dichev, 2002; McNichols, 2002) based on the idea that accruals are estimates of future cash flows, and earnings will be more representative of future cash flows when there is lower estimation error embedded in the accruals process (McNichols, 2002).[8]

I 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. All variables are scaled by average total assets.

$$Accruals_{i,t} = \alpha + \beta_1 * CashFlow_{i,t-1} + \beta_2 * CashFlow_{i,t} + \beta_3 * CashFlow_{i,t+1} + \beta_4 * \Delta Revenue_{i,t} + \beta_5 * PPE_{i,t} + \varepsilon_{i,t}. \quad (2)$$

where *Accruals* = (ΔCA - ΔCash) – (ΔCL - ΔSTD) – Dep,
ΔCA = Change in current assets (item 4),
ΔCash = Change in cash/cash equivalents (item 1),
ΔCL = Change in current liabilities (item 5),
ΔSTD = Change in short-term debt (item 34),
Dep = Depreciation and amortization expense (item 14),
CashFlow = Net income before extraordinary items (item 18) minus *Accruals*
Δ*Revenue* = Change in revenue (item 12), and
PPE = Gross property, plant, and equipment (item 7).
All variables are deflated by average total assets (item 6).

Following Francis et al. (2005), I estimate the model in Equation 2 cross-sectionally for each industry with at least 20 observations in a given year based on the Fama and French (1997) 48-industry classification. *AccrualsQuality* at year t is the

[8] I discuss the sensitivity of the results to the use of alternative measures of accruals quality and other attributes of earnings in Section 5.

standard deviation of the firm-level residuals from Equation 2 during the years t-5 to t-1, assuring that all explanatory variables are measured before period t for the computation of *AccrualsQuality* in that year. I multiply *AccrualsQuality* by negative one so that this variable becomes increasing in financial reporting quality.

As discussed in Dechow and Dichev (2002) and McNichols (2002), the estimation of *AccrualsQuality* captures the absolute variation in the residuals of Equation 2 rather than the variation relative to a benchmark. One concern with this approach is that *AccrualsQuality* may be capturing some underlying degree of volatility in the business, and the results in Table 1 show that investment efficiency is negatively correlated with firm uncertainty. Thus, I follow the suggestion in McNichols (2002) and create a *relative* measure of accruals quality. In particular, I measure *AccrualsQualityRel* as the ratio of the standard deviation of the residuals from Equation 2 during the years t-5 to t-1 to the standard deviation of total accruals during the years t-5 to t-1 multiplied by negative one. This measure captures the relative variance of the estimation errors in accruals compared to the total variance. I show below that this measure is only slightly correlated with firm size and cash flow volatility, mitigating the concern that the proxies for financial reporting quality are associated with investment efficiency because of the spurious effect of firm uncertainty.

4. Results

To investigate hypotheses 1 and 2, I first present preliminary analysis on the univariate relation between the measures of investment efficiency and financial reporting quality. Table 2 - Panel A presents descriptive statistics for a smaller sample than reported in Table 1 due to data availability for *AccrualsQuality* and *AccrualsQualityRel*.

The sample consists of 49,543 firm-year observations and all variables are winsorized at the 1% and 99% levels by year. In this sample, there are 19,473 (30,070) firms classified as overinvesting (underinvesting) firms. The mean (median) value for *Overinvestment* is 7.81% (4.45%) and for *Underinvestment* is 5.37% (4.09%). The magnitudes are smaller than reported in Table 1 because the data required to estimate *AccrualsQuality* and *AccrualsQualityRel* bias the sample toward larger firms. Among the financial reporting quality proxies, the mean (median) firm in the sample has an *AccrualsQuality* of -0.04 (-0.03) and an *AccrualsQualityRel* of -0.74 (-0.64). Finally, I include descriptive statistics on firm size, cash flow volatility, and Tobin *Q* because these firm characteristics are shown to be associated with investment efficiency in Table 1.[9] The distribution of *Q* is slightly changed (as compared to Table 1) to a mean (median) *Q* of 1.63 (1.23) again reflecting the sample bias toward larger firms.

Panel B presents Pearson (Spearman) correlations above (below) the main diagonal for the variables in Panel A. By construction, *Overinvestment* and *Underinvestment* cannot be correlated because each firm-year observation can only be in one group. Most importantly, *Overinvestment* is negatively correlated with *AccrualsQuality* (Pearson correlation equals -0.19) and with *AccrualsQualityRel* (Pearson correlation equals -0.08); the same is true for *Underinvestment* (Pearson correlations equal -0.22 and -0.10 respectively). These results present preliminary evidence for the relation between financial reporting quality and investment efficiency in hypotheses 1 and 2. Finally, as in Dechow and Dichev (2002), *AccrualsQuality* is highly correlated

[9] In Table 1, I use return volatility instead of cash flow volatility to avoid imposing the five-year data requirement for the estimation of cash flow volatility. However, this data is required to estimate *AccrualsQuality* and does not impose any sample bias at this stage of the analysis. I use cash flow volatility in the remainder of the paper because *AccrualsQuality* is highly correlated with cash flow volatility as discussed by Dechow and Dichev (2002). However, the results are not sensitive to this choice.

with *Size* (Pearson correlation equals 0.42) and with *CashFlowVol* (Pearson correlation equals -0.66). However, note that *AccrualsQualityRel* is much less correlated with these variables (correlations of -0.08 and 0.04 with size and cash flow volatility respectively), supporting the argument that this variable is uncorrelated with firm uncertainty.[10]

Table 3 presents the multiple regressions. The estimated model is a regression of investment efficiency on financial reporting quality, firm characteristics, and industry (based on the Fama and French (1997) 48-industry classification) and year fixed effects. The dependent variable is *Underinvestment* in the first two columns and *Overinvestment* in the remaining columns. All standard errors are clustered by firm using the Huber-White procedure.[11] As predicted in hypothesis 1, *Underinvestment* is negatively related to *AccrualsQuality* and *AccrualsQualityRel* (both coefficients are significant at 1% level). The estimated coefficients are also negative and significant for *Overinvestment*, supporting the prediction in hypothesis 2. The estimated coefficients suggest that increasing *AccrualsQuality* (*AccrualsQualityRel*) by one standard deviation is associated with a reduction on *Underinvestment* of 0.21% (0.11%) and on *Overinvestment* of 0.31% (0.22%). Given that the mean values for *Underinvestment* and *Overinvestment* in Table 2 are 5.73% and 7.81%, these changes average between 1% and 5%, suggesting that the economic significance of the effect is moderate.

One alternative explanation for the results in Table 3 is that causality goes the other way. For instance, suppose that poorly performing managers are more likely to

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[10] The signs of the correlations between *AccrualsQuality* and size and cash flow volatility are the opposite of the ones presented in Dechow and Dichev (2002) because I multiply *AccrualsQuality* by negative one so that this variable is increasing in reporting quality.

[11] Petersen (2005) suggests two methods to correct for both cross-sectional and time-series dependence in the data: the Huber-White procedure and adjusted Fama-MacBeth. Since, neither method is perfect, I repeat all subsequent analysis using Fama-MacBeth (1973) estimators adjusting for time-series dependence. The results lead to the same inferences as reported in the text.

invest inefficiently and also choose to report low quality financial information in order to hide their bad performance (e.g., Leuz, Nanda, and Wysocki, 2003). Then one could spuriously find a positive association between financial reporting quality and investment efficiency. In order to address this concern, I perform two tests. First, I repeat the analysis using the financial reporting quality proxies lagged by two periods (the variables in the model are already lagged by one period). Second, I explicitly control for past investment efficiency in the model. The intuition behind this test is that if past investment efficiency drives financial reporting quality then there should be no relation between financial reporting quality and *future* investment efficiency after controlling for *past* investment efficiency.

Table 4 – Panel A presents the results of the two sensitivity analyses when *Underinvestment* is used as the dependent variable. When *AccrualsQuality* and *AccrualsQualityRel* (Columns I and II) are lagged by two periods, the inferences are unchanged. The estimated coefficients are statistically negative at conventional levels. In Columns III and IV, I include past *Underinvestment* in the model. In this case, the estimated coefficient on *AccrualsQuality* is still negative and significant, while the coefficient on *AccrualsQualityRel* is negative but only marginally significant (two-sided p-value of 0.14). Table 4 – Panel B repeats the analysis for *Overinvestment*. Again, all the inferences are unchanged since the estimated coefficients on *AccrualsQuality* and *AccrualsQualityRel* are statistically negative in all models.

Overall, the results in Tables 3 and 4 support hypotheses 1 and 2 that financial reporting quality is negatively associated with both underinvestment and overinvestment, consistent with the argument that financial reporting mitigates both adverse selection and agency costs.

4.1. Cross-sectional Partitions

In this section, I discuss the empirical approach used to test hypotheses 3, 4, and 5. These hypotheses involve cross-sectional predictions about the relation between financial reporting quality and investment efficiency across sub-groups of the sample. Thus, I estimate separate coefficients for these sub-groups as described in the model below:

$$\begin{aligned}(\textit{Investment Inefficiency})_{i,t} = {} & \beta_0 + \beta_1 * \textit{Partition}_{i,t-1} + \beta_2 * \textit{ReportingQuality}_{i,t-1} \\ & + \beta_3 * \textit{ReportingQuality} * \textit{Partition}_{i,t-1} + \beta_4 * \textit{Controls}_{i,t-1} \\ & \Sigma\, \beta_t * \textit{Year}_t + \Sigma\, \beta_j * \textit{Industry}_j + \varepsilon_{it}. \qquad (3)\end{aligned}$$

where *Investment Inefficiency* is either *Underinvestment* or *Overinvestment*, *ReportingQuality* is either *AccrualsQuality* or *AccrualsQualityRel*. *Partition* is coded as an indicator variable based on measures of financing constraints, excess cash, or information environment described below (results are similar if the *Partition* is used as a continuous or ranked (deciles) variable). The partitioning variables are defined such that a negative coefficient on the interaction term (β_3) implies that the relation between financial reporting quality and inefficient investment is stronger for firms in the sub-group of interest (e.g., financially constrained firms). As additional analysis, I test the null hypothesis that the sum of the coefficients β_2 and β_3 is equal to zero in order to test whether the relation between financial reporting quality and investment efficiency is at least present in the sub-group of interest.[12]

[12] Hypotheses 3 to 5 are also important in mitigating the concern that an omitted correlated variable could be driving the positive association between financial reporting quality and investment efficiency. For instance, if managers choose better (worse) investment projects and report more (less) informative financial accounting information when they know more (less) about growth opportunities and expected cash flows,

4.1.1. Financing Constraints

In this section, I investigate hypothesis 3 which predicts that the relation between financial reporting quality and *Underinvestment* is stronger for financing constrained firms because these firms are, by definition, limited in their ability to raise funds. I follow the approach in Hubbard (1998) to classify firms into financially constrained and unconstrained categories. In particular, I use five different criteria because of the lack of consensus about which approach provides the best classification (Almeida, Campello, and Weisbach, 2004). First, I classify firms into *Payout Constrained* if the firm is in the bottom three quartiles in terms of total payout in a given year and unconstrained otherwise. I measure total payout as the sum of dividends and share repurchases deflated by year-end market capitalization using the method described in Boudoukh et al. (2005). Second, I classify firms into *Age Constrained* if the firm is in the bottom three quartiles of firm age in a given year (and unconstrained otherwise) based on the argument that young firms are more likely to face financing constraints. Age is measured as the difference in years since the first year the firm appears in the CRSP database. Third, I classify firms into *Size Constrained* if the firm is in the bottom three quartiles of total assets in a given year and unconstrained otherwise. Fourth, I measure *Rating Constrained* if the firm has long-term debt outstanding (item 9) but does not have public debt rated by S&P (item 280) and unconstrained otherwise. Finally, I construct the KZ Index following the approach in Kaplan and Zingales (1997) and classify a firm as *KZ Index Constrained*

then a positive relation between financial reporting quality and investment efficiency could just be a reflection of the quality of the manager's information set and might not be related to financial reporting quality. However, this alternative hypothesis would not predict the relation between financial reporting quality and investment efficiency to be dependent on financing constraints, cash balances, or the existing information environment. Thus, if such interactions exist, then it would strengthen the result that financial reporting quality *per se* is associated with investment efficiency.

if the firm is in the top three quartiles of the KZ Index in a given year and unconstrained otherwise.[13] Untabulated analysis show that the first four classifications are positively correlated (Pearson correlations ranging from 0.11 to 0.45) but the *KZ Index* classification is not correlated with the remaining criteria (Pearson correlations ranging from -0.01 to 0.11), consistent with previous research (e.g., Almeida, Campello, and Weisbach, 2004).[14] Further, all financing constraint proxies are positively correlated with *Underinvestment* (Pearson correlations range from 0.01 to 0.14).

Table 5 presents the results related to hypothesis 3. All models include the control variables size, cash flow volatility, *Q*, and industry and year fixed effects as before but the coefficient estimates on these variables are not tabulated for brevity. The estimated coefficients on the control variables are similar to those reported in Table 3. The results are separated for *AccrualsQuality* and for *AccrualsQualityRel*. For *AccrualsQuality*, the estimated coefficients on the main effect (third column labeled 'Reporting Quality') are all negative with only one statistically significant coefficient. These results indicate that, for a sample of unconstrained firms, the relation between *AccrualsQuality* and *Underinvestment* is basically not significant. The estimated coefficients on the interaction terms, however, are negative in four out of five cases and significant in two. Further, the F-test rejects the hypothesis of no relation between *AccrualsQuality* and *Underinvestment* in almost all cases for the sample of financially constrained firms. The only exception is

[13] The KZ Index is calculated using the following formula: KZ Index = -1.002 * CashFlow + 0.283 * Q + 3.139 * Leverage – 39.368 * Dividends – 1.315 * Cash. For more details see Almeida, Campello, and Weisbach (2004, p. 1790).

[14] Principal component analysis on the five financing constraints proxies yields two factors. The first factor explains 40% of the variation and loads on all proxies but the KZ Index. The second factor explains another 20% of the variation in the data and loads on the Payout and the KZ Index measures.

when the *KZ Index* is used as the criteria for financing constraint classification.[15] When *AccrualsQualityRel* is used as the financial reporting quality proxy, the results are largely the same. In terms of economic significance, increasing *AccrualsQuality* (*AccrualsQualityRel*) by one standard deviation is associated with a reduction in *Underinvestment* of 0.26% (0.16%) for firms classified as *Rating Constrained* and 0.08% (0.06%) for unconstrained firms (compared to 0.21% (0.11%) for the full sample as discussed above). Overall, the results present marginal support for hypothesis 3 that the relation between financial reporting quality and *Underinvestment* is stronger for financing constrained firms.

4.1.2. Cash Balances

In this section, I investigate hypothesis 4 which predicts that the relation between financial reporting quality and *Overinvestment* is stronger for firms with large cash balances and free cash flows because these firms are more likely to overspend existing resources (Jensen, 1986). I use two criteria to classify firms based on cash holdings and one proxy for free cash flow. First, I create an indicator variable, *High Cash*, coded as '1' if the firm is above the median in the distribution of cash balances deflated by total assets in a given year and '0' otherwise. Second, I follow the approach in Opler et al. (1999) who predict cash balances as a function of firms' characteristics, and use residuals from this model as a proxy for excess cash. Opler et al. show that firms hold more cash in the presence of growth opportunities and firm uncertainty, and less cash when they are forced to payout interest obligations and have more access to financing (proxied by leverage and size). Thus, I estimate annual regressions of cash balances (item 1) deflated by total

[15] The inconsistent result using the KZ Index is consistent with prior work in the finance literature (e.g., Almeida, Campello, and Weisbach, 2004; Almeida and Campello, 2005) which finds opposite results when this variable is used as a proxy for financing constraints.

assets (item 6) on firm size, leverage, Q, and cash flow volatility. Leverage is measured as the sum of the book value of short term (item 34) and long term debt (item 9) deflated by the book value of equity (item 60) and the remaining variables are the same as described above. The explanatory power of the models ranges from 16% in 1986 to 42% in 2003. I create an indicator variable, *Excess Cash*, coded as '1' if the firm has a positive residual from the model predicting cash balances, and '0' otherwise. Finally, following Richardson (2006), *Free Cash Flow* is equal to cash flow from operations plus R&D expenses minus depreciation and the predicted investment for the firm as estimated in Table 1. *Free Cash Flow* is recoded as an indicator variable coded as '1' if the computation of free cash flow is positive and '0' otherwise.

Table 6 presents the results related to hypothesis 4. As before, all models include the control variables size, cash flow volatility, *Q*, and industry and year fixed effects (estimates not tabulated). The first set of results presents estimated coefficients for *AccrualsQuality* and the second reports coefficients for *AccrualsQualityRel*. The results show that the estimated coefficients on the main effect of financial reporting quality are negative but not significant in all six models (three models for *AccrualsQuality* and three for *AccrualsQualityRel*). The estimated coefficients on the interaction term, on the other hand, are negative in all cases and significant in three out of six cases, and the F-test rejects the hypothesis of no relation in all cases. In terms of economic significance, increasing *AccrualsQuality* (*AccrualsQualityRel*) by one standard deviation is associated with a reduction on *Overinvestment* of 0.41% (0.35%) for firms classified as *High Cash* and 0.06% (0.06%) for firms with low cash (compared to 0.31% (0.22%) for the full sample as discussed above). Overall, the results support hypothesis 4 by showing that the relation between financial reporting quality and *Overinvestment* is stronger for firms with large and excessive cash balances but the results are not statistically significant for firms generating free cash flows. This support the hypothesis that financial reporting quality reduces firm overinvestment by lowering shareholder's cost of monitoring managers and thus limiting managers' ability to undertake inefficient investment projects.

4.1.3. Information Environment

In this section, I investigate hypothesis 5 which predicts that the relation between financial reporting quality and investment efficiency is stronger for firms with poor information environments because investors of these firms are more likely to rely on financial accounting information to infer the economic conditions of the firm's operations. I use two proxies for the firm information environment: the number of analysts following the firm and the bid-ask spread. I use the number of analysts following a firm as a proxy for the amount of publicly available information about the firm. Analysts are an important source of information for investors; they issue forecasts, reports about individual companies, and stock recommendations. Roulstone (2003) examines the role of analysts in improving market liquidity and finds that analysts provide public information that reduces information asymmetries between firms and market participants. I collect data on analyst following from IBES and measure the number of analysts following the firm as the maximum number of analysts forecasting annual earnings for a firm during the fiscal year t. If the firm is not followed by IBES I assume that the number of analysts following the firm is zero. I consider a firm as *Low Analyst* if the firm is in the bottom three quartiles in a given year (coded as '1' and '0' otherwise).

The second proxy for a firm's information environment is the bid-ask spread. See Amihud and Mendelson (1986) and Roulstone (2003) among others for discussions of spreads as a proxy for the information asymmetry between the firm and investors. I collect intraday trade data to compute bid-ask spread from the Trades and Quotes database (TAQ) and from the Institute for the Study of Security Markets database (ISSM). The TAQ database includes trades and quotes starting in 1993, and the ISSM database contains intraday data for NYSE/AMEX firms from 1983 to 1992 and for NASDAQ firms from 1987 to 1992. I measure quoted bid-ask spread as the ask price minus the bid price divided by the average of the bid and ask prices. The bid-ask spread is averaged across all transactions during the day for each firm, then daily mean bid-ask spreads are averaged during the month t. Finally I compute bid-ask spread as the average of the monthly bid-ask spreads during the fiscal year t. I consider a firm as *High Spread* if the firm is in the top three quartiles in a given year (coded as '1' and '0' otherwise).

Table 7 presents the results related to hypothesis 5. As before, all models include the control variables (estimates are untabulated). The table is divided into *Underinvestment* and *Overinvestment* results. The first set of results presents estimated coefficients for *AccrualsQuality* and the second reports coefficients for *AccrualsQualityRel*. When bid-ask spread is used as the partitioning variable, I find that none of the coefficients on the main effect of financial reporting quality are significant, and three out of four coefficients on the interaction term are significant. The only exception is the coefficient on the interaction between *High Spread* and *AccrualsQualityRel* for *Underinvestment*. Further, in three out of four cases the F-test rejects the hypothesis of no effect of financial reporting quality on investment efficiency for the sample of firms with *High Spread*. As for *Low Analyst*, the results on the estimated coefficients on the interaction terms are weaker; only one coefficient is statistically negative. Still, in three out of four models the F-test rejects the hypothesis of no relation for the sample of firms with *Low Analyst*. Overall, the results provide weak support for the hypothesis that the effect of financial reporting on investment efficiency is more important when the firm information environment is of low quality.[16]

5. Sensitivity Analysis

In this section I discuss some robustness tests to the analysis presented in the paper. First, I study the sensitivity of the results to inclusion of omitted control variables using firm fixed-effect estimation. The advantage of this approach is that it controls for all time-invariant unobservable firm characteristics. However, since the estimation of *AccrualsQuality* and *AccrualsQualityRel* is done using five years of data, the within-firm variation is small, which makes the fixed-effect estimation very conservative. The analysis is done for all firms with at least five, ten, or fifteen years of data in order to increase the within firm variation (sample sizes of 43,739, 33,454, and 24,420 firm-year observations respectively). Untabulated analyses show that the results in Hypotheses 1 and 4 are mostly robust to the firm fixed-effect estimation. Results of Hypotheses 2 and 3 are weaker (coefficients are of the same sign but in most cases not significant at conventional levels) and, in the case of Hypothesis 5, the results are similar (weaker) when *Underinvestment* (*Overinvestment*) is used as the dependent variable.

[16] I also performed tests using a 2x2 classification based on the firm's financial reporting quality and information environment (sorted independently as a low/high). Either high financial reporting quality or high information environment is sufficient to mitigate *Underinvestment* but only financial reporting quality is sufficient to mitigate *Overinvestment*, suggesting a substitute relation between financial reporting quality and the firm information environment in improving investment efficiency.

Second, I investigate the sensitivity of the results to the use of alternative measures of accruals quality such as the non-linear discretionary accruals model in Ball and Shivakumar (2005) and the accrual quality measures developed by Wysocki (2006). The key innovation in Wysocki's (2006) measures is to remove the smoothness effect of accruals in the Dechow and Dichev (2002) model. Results using the Ball and Shivakumar (2005) model are very similar to those reported on the paper. The use of Wysocki's measure, on the other hand, leads to similar results for hypotheses 1, 2, and 5 but insignificant results for hypotheses 3 and 4. As discussed in more detail below, these results are not surprising given that Wysocki's (2006) measure excludes the smoothness component of accruals, and smoothness is positively associated with investment efficiency.

In addition, I investigate the sensitivity of the results to the use of alternative attributes of earnings as proxies for financial reporting quality. Accruals quality represents one dimension of financial reporting quality but other dimensions of earnings have also been used as a proxy for financial reporting quality (Francis et al., 2004). These attributes of earnings would not necessarily affect investment efficiency in the same way. For instance, one could argue *Timeliness* and *Conservatism* are more important in conveying information about bad firm's economic states, thus improving *Overinvestment* but may not be associated with *Underinvestment*. Nevertheless, it is useful to see how these measures are related and the respective association with investment efficiency (Verdi, 2005). Francis et al. (2004) identify six earnings attributes (other than *AccrualsQuality*) previously used in accounting research to characterize desirable features of earnings. The six attributes are: *Persistence*, *Predictability*, *Smoothness*, *ValueRelevance*, *Timeliness*, and *Conservatism*. I also include a measure of price informativeness as used by Durnev, Morck, and Yeung (2004).

When *Underinvestment* is used as the dependent variable (Hypotheses 1 and 3), I find consistent results using *Persistence*, *Predictability*, and *Smoothness* but insignificant results for the remaining variables (with the exception of *Informativeness* in which the relation is positive and significant, against the prediction). The analysis using *Overinvestment* (Hypotheses 2 and 4) yield weaker results since only the estimated coefficients on *Smoothness* and *Informativeness* are negative and significant in the expected direction. The remaining coefficients are either insignificantly negative or positive in the case of *Persistence*. Overall the results provide marginal support for the relation between other dimensions of earnings and *Underinvestment*, and weak support for *Overinvestment*. The finding that *Smoothness* is negatively associated with both *Underinvestment* and *Overinvestment* explains the weaker results using Wysocki's measure of accruals quality given that this measure excludes the smoothness component in the accruals quality measure developed by Dechow and Dichev (2002).

In the third sensitivity test, I repeat the analysis using capital expenditures (deflated by average total assets) as a measure of investment in order to make the results more comparable with the extant finance literature. In addition, the investment measure used in the paper includes only cash acquisitions and ignores stock acquisitions which constitute the majority of M&A transactions. Untabulated analyses using CAPEX show that the results in Hypothesis 1, 3, and 5 are similar to those reported. Results in Hypothesis 2 are consistent but weaker when *AccrualsQuality* is used as the proxy for financial reporting quality. Finally, results are inconsistent with Hypothesis 4 (estimated coefficients on the interaction terms are mostly insignificant).

Finally, I include goodwill (item 204) in the discretionary accruals model. As discussed in Jones (1991), PPE is included in the model to capture the normal level of depreciation, and using the same logic, goodwill would capture the normal level of amortization in accruals. This inclusion is justified because the measure of investment includes acquisitions. Goodwill is only available from Compustat starting in 1988 which is why it is excluded in the main tests. In untabulated analysis I find little impact on the discretionary accruals model (the Pearson correlation between discretionary accruals including and excluding goodwill is 0.99), and the results presented in the paper are unchanged if I restrict the sample to post 1988 and include goodwill in the discretionary accruals model.

6. Summary and conclusion

Despite recent claims that financial reporting quality can have economic implications for investment efficiency, there is little evidence on this relation empirically. This paper studies the relation between financial reporting quality and investment efficiency. The analysis is done on a sample of 49,543 firm-year observations during the sample period of 1980 to 2003.

I find that proxies for financial reporting quality, namely measures of accruals quality, are negatively associated with both firm underinvestment and overinvestment. The relation between financial reporting quality and underinvestment is stronger for firms facing financing constraints, consistent with the argument that financial accounting information can reduce the information asymmetry between the firm and investors, and thus lower the firm's cost of raising funds. Likewise, the relation between financial reporting quality and overinvestment is stronger for firms with large cash balances, which suggests that financial reporting quality can reduce the information asymmetry between the principal and the agent and thus lower shareholders' cost of monitoring managers and improving project selection. Finally, I find that the relation between financial reporting quality and investment efficiency is stronger for firms with low quality information environments.

Overall, this paper contributes to the extant accounting literature that investigates the economic implications of enhanced financial reporting. This literature has shown that financial reporting quality has economic consequences such as increased liquidity, lower costs of capital, and higher firm growth (e.g., Leuz and Verrecchia, 2000; Francis et al., 2004, 2005; Martin, Khurana, and Pereira, 2005). This paper extends this research by showing that financial reporting information can reduce information asymmetries that impede efficient corporate investment policies.

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Figure 1 –Link between Financial Reporting Quality and Investment Efficiency

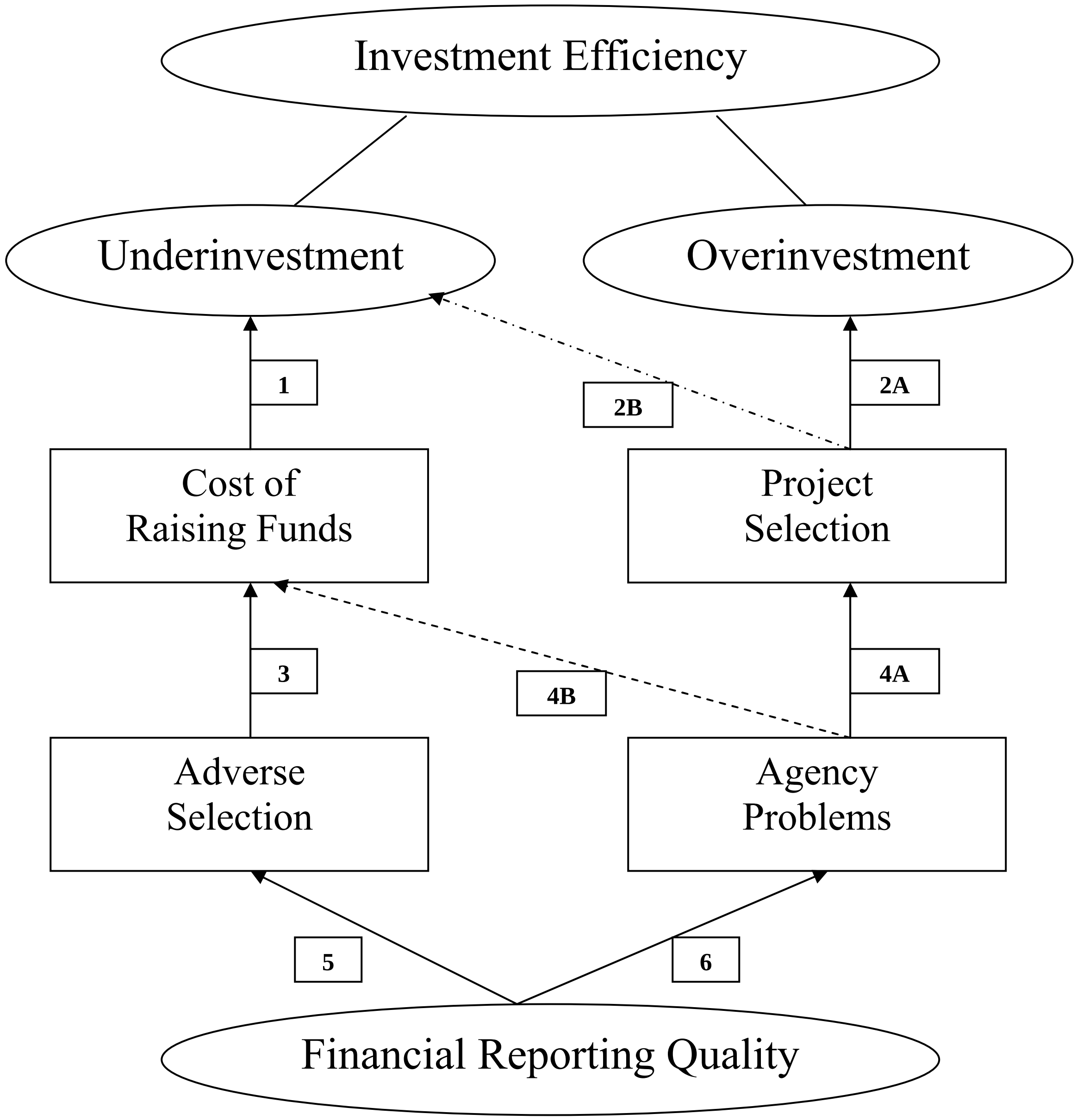

Table 1 – Investment Model

This table presents descriptive statistics on the investment model and on the proxies for investment efficiency. *Investment* is the total investment expenditure calculated as 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) and depreciation and amortization (item 125), multiplied by 100 and scaled by average total assets (item 6). *Q* is a measure of growth opportunities. It is calculated as the ratio of the market value of total assets (item 6 + (item 25 * item 199) – item 60) to book value of total assets (item 6). *Investment Residual* is equal to the residuals of the investment model. *Overinvestment* is the positive residuals of the investment model. *Underinvestment* is the negative residuals of the investment model multiplied by '-1'. *Size* is the log of total assets (item 6) measured at the end of the fiscal year. *Return Volatility* is the standard deviation of daily stock returns during the fiscal year.

Panel A – Descriptive statistics on the investment model

	Obs	Mean	STD	Min	Median	Max
$Investment_t$ (%)	98,675	7.26	13.29	-31.14	3.84	81.99
Q_{t-1}	98,675	1.90	1.73	0.45	1.32	19.15

Panel B – Investment model: $Investment_{i,t} = \beta_{0\,j,t} + \beta_{1\,j,t} * Q_{i,t-1} + \varepsilon_{i,t}$

	Coefficient on *Q*			
Year	Mean	Median	R-Square	# p-value < 0.05
1980	4.73	3.11	0.15	25/36
1981	2.36	2.34	0.09	19/36
1982	2.66	2.47	0.11	22/36
1983	2.91	2.03	0.09	19/35
1984	3.62	2.77	0.08	21/36
1985	3.79	3.08	0.08	19/37
1986	3.10	2.03	0.10	23/37
1987	2.88	2.62	0.10	23/37
1988	2.72	2.50	0.08	21/37
1989	2.24	1.82	0.10	23/37
1990	2.28	1.90	0.09	25/37
1991	2.24	2.24	0.13	31/37
1992	2.47	2.16	0.12	28/37
1993	2.26	1.80	0.08	21/37
1994	2.42	2.59	0.07	20/38
1995	2.60	2.33	0.09	26/38
1996	2.40	2.17	0.08	23/38
1997	2.50	2.38	0.06	22/38
1998	2.63	2.18	0.07	24/37
1999	2.87	2.01	0.11	24/38
2000	3.37	1.73	0.11	24/37
2001	3.41	2.03	0.14	28/37
2002	1.91	1.81	0.08	20/34
2003	2.38	1.91	0.11	22/33

Table 1 – Investment Model – Cont'd

Panel C – Descriptive statistics on the residuals of the investment model

	Obs	Mean	STD	Min	Median	Max
Investment Residual (%)	98,675	0.00	11.63	-64.46	-1.66	80.43
Overinvestment $_t$ (%)	39,107	9.73	11.44	0.00	5.63	80.43
Underinvestment $_t$ (%)	59,568	6.39	5.92	0.00	4.71	64.46

Panel D – Correlation between investment residuals and firm characteristics

	Size	*Return Volatility*	*Q*
Investment Residual (%)	0.01	-0.04	0.00
Overinvestment $_t$ (%)	-0.21	0.18	0.19
Underinvestment $_t$ (%)	-0.26	0.26	0.32

Panel E – Persistence of Investment Residual

Time	Percentage of firms in quintile of *Investment Residual*					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	# Firms
Year 0					100.00	7,296
Year 1	12.46	11.97	13.89	22.26	39.42	6,509
Year 2	16.32	15.49	15.99	21.75	30.45	5,728
Year 3	17.43	17.13	17.15	21.31	26.99	4,928
Year 0	100.00					6,642
Year 1	47.81	22.10	10.80	9.35	9.95	5,539
Year 2	39.77	22.43	14.02	10.78	12.99	4,664
Year 3	35.52	22.27	14.66	12.77	14.79	3,970

Table 2 – Descriptive Statistics

This table presents descriptive statistics and pairwise correlations for the investment inefficiency and the financial reporting quality variables. Pearson (Spearman) correlations are presented above (below) the main diagonal. *Overinvestment* is the positive residuals of the investment model. *Underinvestment* is the negative residuals of the investment model multiplied by '-1'. *AccrualsQuality* is measured as the negative value of the standard deviation of the residuals from a Dechow and Dichev (2002) model of current accruals on lag, current, and lead cash flow from operations augmented by the change in sales, and property, plant and equipment during the years t-5 to t-1. *AccrualsQualityRel* is the ratio of the standard deviation of the residuals from the Dechow and Dichev model during the years t-5 to t-1 to the standard deviation of total accruals during the years t-5 to t-1. *Size* is the log of total assets (item 6) measured at the end of the fiscal year. *Cash Flow Vol* is the standard deviation of cash flows from operations divided by beginning total assets during the years t-4 to t. *Q* is a measure of growth opportunities. It is calculated as the ratio of the market value of total assets (item 6 + (item 25 * item 199) – item 60) to book value of total assets (item 6).

Panel A - Descriptive Statistics

	Obs	Mean	STD	P1	Median	P99
Overinvestment $_t$ (%)	19,473	7.81	9.51	0.02	4.45	62.88
Underinvestment $_t$ (%)	30,070	5.37	4.77	0.03	4.09	28.65
AccrualsQuality $_{t-1}$	49,543	-0.04	0.03	-0.20	-0.03	0.00
AccrualsQualityRel $_{t-1}$	49,543	-0.74	0.46	-3.51	-0.64	-0.10
Size $_{t-1}$	49,543	5.29	2.11	0.49	5.15	10.82
Cash Flow Vol $_{t-1}$	49,543	0.08	0.07	0.01	0.06	0.45
Q $_{t-1}$	49,543	1.63	1.34	0.45	1.23	19.15

Panel B – Correlation Matrix

	Overinvestment	*Underinvestment*	*AccrualsQuality*	*AccrualsQualityRel*	*Size*	*Cash Flow Vol*	*Q*
Overinvestment $_t$	---	.	-0.19	-0.08	-0.18	0.20	0.18
Underinvestment $_t$	.	---	-0.22	-0.10	-0.20	0.20	0.24
AccrualsQuality $_{t-1}$	-0.17	-0.22	---	0.22	0.42	-0.66	-0.49
AccrualsQualityRel $_{t-1}$	-0.08	-0.13	0.30	---	-0.08	0.04	-0.09
Size $_{t-1}$	-0.17	-0.21	0.45	-0.06	---	-0.43	-0.49
Cash Flow Vol $_{t-1}$	0.18	0.18	-0.70	0.16	-0.49	---	0.46
Q $_{t-1}$	0.19	0.24	-0.54	-0.11	-0.53	0.52	---

Table 3 – Determinants of Investment Inefficiency

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Underinvestment* and *Overinvestment*. *Underinvestment* is the negative residuals of the investment model multiplied by '-1'. *Overinvestment* is the positive residuals of the investment model. *AccrualsQuality* is measured as the negative value of the standard deviation of the residuals from a Dechow and Dichev (2002) model of current accruals on lag, current, and lead cash flow from operations augmented by the change in sales, and property, plant and equipment during the years t-5 to t-1. *AccrualsQualityRel* is the ratio of the standard deviation of the residuals from the Dechow and Dichev model during the years t-5 to t-1 to the standard deviation of total accruals during the years t-5 to t-1. *Size* is the log of total assets (item 6) measured at the end of the fiscal year. *Cash Flow Vol* is the standard deviation of cash flows from operations divided by beginning total assets during the years t-4 to t. *Q* is a measure of growth opportunities. It is calculated as the ratio of the market value of total assets (item 6 + (item 25 * item 199) – item 60) to book value of total assets (item 6). T-statistics are presented in italics below the coefficients and are corrected for time-series correlation using Huber-White standard errors clustered by firm. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels.

		Underinvestment $_t$ (%)		*Overinvestment* $_t$ (%)	
	Sign	I	II	III	IV
Intercept		6.14***	6.29***	8.30***	8.40***
		11.33	*11.51*	*5.55*	*5.66*
AccrualsQuality $_{t-1}$	-	-6.99***		-10.29***	
		-4.65		*-2.61*	
AccrualsQualityRel $_{t-1}$	-		-0.24***		-0.48**
			-3.28		*-2.50*
Size $_{t-1}$		-0.40***	-0.42***	-0.56***	-0.59***
		-17.34	*-18.63*	*-12.02*	*-12.83*
Cash Flow Vol $_{t-1}$		1.72**	3.79***	9.76***	12.80***
		2.13	*5.10*	*4.83*	*7.41*
Q $_{t-1}$		0.60***	0.60***	0.65***	0.65***
		13.50	*13.52*	*7.45*	*7.42*
Industry and Year Dummies		Yes	Yes	Yes	Yes
R-square (%)		27.49	27.40	11.19	11.18
Observations		30,070	30,070	19,473	19,473

Table 4 – Causality Tests

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Underinvestment* and *Overinvestment*. *Underinvestment* is the negative residuals of the investment model multiplied by '-1'. *Overinvestment* is the positive residuals of the investment model. *AccrualsQuality* is measured as the negative value of the standard deviation of the residuals from a Dechow and Dichev (2002) model of current accruals on lag, current, and lead cash flow from operations augmented by the change in sales, and property, plant and equipment during the years t-5 to t-1. *AccrualsQualityRel* is the ratio of the standard deviation of the residuals from the Dechow and Dichev model during the years t-5 to t-1 to the standard deviation of total accruals during the years t-5 to t-1. *Size* is the log of total assets (item 6) measured at the end of the fiscal year. *Cash Flow Vol* is the standard deviation of cash flows from operations divided by beginning total assets during the years t-4 to t. *Q* is a measure of growth opportunities. It is calculated as the ratio of the market value of total assets (item 6 + (item 25 * item 199) – item 60) to book value of total assets (item 6). T-statistics are presented in italics below the coefficients and are corrected for time-series correlation using Huber-White standard errors clustered by firm. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels.

Panel A – Underinvestment Model

		Underinvestment $_t$ (%)			
	Sign	I	II	III	IV
Intercept		6.47***	6.55***	4.60***	4.68***
		11.20	*11.29*	*9.63*	*9.74*
AccrualsQuality $_{t-1}$	-			-3.16**	
				-2.41	
AccrualsQualityRel $_{t-1}$	-				-0.09
					-1.47
AccrualsQuality $_{t-2}$	-	-4.43***			
		-2.87			
AccrualsQualityRel $_{t-2}$	-		-0.18**		
			-2.33		
Underinvestment $_{t-1}$	+			0.42***	0.42***
				31.44	*31.45*
Size $_{t-1}$		-0.40***	-0.42***	-0.24***	-0.25***
		-16.83	*-17.87*	*-12.92*	*-13.52*
Cash Flow Vol $_{t-1}$		2.45***	3.67***	0.32	1.27*
		2.96	*4.67*	*0.44*	*1.89*
Q $_{t-1}$		0.60***	0.60***	0.48***	0.48***
		12.22	*12.22*	*12.67*	*12.66*
Industry and Year Dummies		Yes	Yes	Yes	Yes
R-square (%)		27.50	27.47	43.25	43.23
Observations		27,714	27,714	19,719	19,719

Table 4 – Causality Tests – Cont'd

Panel B – Overinvestment Model

		Overinvestment$_t$ (%)			
	Sign	I	II	III	IV
Intercept		7.51***	7.65***	6.25***	6.31***
		4.98	*5.10*	*4.99*	*5.10*
AccrualsQuality$_{t-1}$	-			-16.59***	
				-3.55	
AccrualsQualityRel$_{t-1}$	-				-0.71***
					-3.25
AccrualsQuality$_{t-2}$	-	-8.90**			
		-2.18			
AccrualsQualityRel$_{t-2}$	-		-0.39**		
			-2.04		
Overinvestment$_{t-1}$	+			0.25***	0.25***
				14.90	*14.95*
Size$_{t-1}$		-0.54***	-0.56***	-0.51***	-0.56***
		-11.07	*-11.90*	*-10.11*	*-11.00*
Cash Flow Vol$_{t-1}$		10.79***	13.21***	6.78***	11.63***
		5.30	*7.20*	*2.83*	*5.75*
Q$_{t-1}$		0.72***	0.73***	0.51***	0.51***
		7.25	*7.26*	*5.05*	*5.06*
Industry and Year Dummies		Yes	Yes	Yes	Yes
R-square (%)		11.11	11.09	19.66	19.60
Observations		17,813	17,813	10,534	10,534

Table 5 – *Underinvestment* Regressions – Partitions by Financing Constraint

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Underinvestment*. *Underinvestment* is the negative residuals of the investment model multiplied by '-1'. *AccrualsQuality* is measured as the negative value of the standard deviation of the residuals from a Dechow and Dichev (2002) model of current accruals on lag, current, and lead cash flow from operations augmented by the change in sales, and property, plant and equipment during the years t-5 to t-1. *AccrualsQualityRel* is the ratio of the standard deviation of the residuals from the Dechow and Dichev model during the years t-5 to t-1 to the standard deviation of total accruals during the years t-5 to t-1. *Payout Constrained* is an indicator variable coded as '1' if the firm is in the bottom three quartiles in terms of total payout in a given year and '0' otherwise. *Age Constrained* is an indicator variable coded as '1' if the firm is in the bottom three quartiles of firm age in a given year and '0' otherwise. *Size Constrained* is an indicator variable coded as '1' if the firm is in the bottom three quartiles of total assets in a given year and '0' otherwise. *Rating Constrained* is an indicator variable coded as '1' if the firm has long-term debt outstanding (item 9) but does not have a public debt rated by S&P (item 280) and '0' otherwise. *KZ Index Constrained* is an indicator variable coded as '1' if the firm is in the top three quartiles of the KZ index in a given year and '0' otherwise. T-statistics are presented in italics below the coefficients and are corrected for time-series correlation using Huber-White standard errors clustered by firm. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels. F-Test tests the hypothesis that the estimated coefficients $\beta_2 + \beta_3$ below equal to zero.

$$(Investment\ Inefficiency)_{i,t} = \beta_0 + \beta_1 * Partition_{i,t-1} + \beta_2 * ReportingQuality_{i,t-1} + \beta_3 * ReportingQuality * Partition_{i,t-1} + \beta_4 * Controls_{i,t-1}$$
$$\Sigma \beta_t * Year_t + \Sigma \beta_j * Industry_j + \varepsilon_{it}.$$

	Reporting Quality: *Accruals Quality*				*Reporting Quality*: *Accruals Quality Rel*				
Partition Criteria	*Partition*	*Reporting Quality*	*Reporting Quality *Partition*	F-Test $\beta_2 + \beta_3 = 0$	*Partition*	*Reporting Quality*	*Reporting Quality *Partition*	F-Test $\beta_2 + \beta_3 = 0$	Obs
Payout Constrained	0.06	-3.59	-3.11	15.94***	0.11	-0.14	-0.11	6.07**	25,399
	0.56	*-1.42*	*-1.23*		*0.99*	*-1.36*	*-0.83*		
Age Constrained	-0.28**	-3.26	-4.22*	21.59***	-0.31***	-0.07	-0.24*	11.43***	30,070
	-2.50	*-1.40*	*-1.73*		*-2.67*	*-0.66*	*-1.72*		
Size Constrained	-0.41**	-1.75	-5.56	22.15***	-0.38**	-0.13	-0.15	8.69***	30,070
	-2.43	*-0.45*	*-1.41*		*-2.36*	*-1.22*	*-1.03*		
Rating Constrained	-0.08	-2.55	-6.18***	28.05***	0.03	-0.12	-0.22*	12.59***	30,070
	-0.67	*-1.12*	*-2.63*		*0.29*	*-1.23*	*-1.70*		
KZ Index Constrained	1.20***	-5.51***	2.20	2.05	1.08***	-0.16*	-0.05	2.35	25,399
	9.37	*-3.20*	*0.93*		*8.00*	*-1.84*	*-0.33*		

Table 6 – *Overinvestment* Regressions – Partitions by Cash Holdings

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Overinvestment*. *Overinvestment* is the positive residuals of the investment model. *AccrualsQuality* is measured as the negative value of the standard deviation of the residuals from a Dechow and Dichev (2002) model of current accruals on lag, current, and lead cash flow from operations augmented by the change in sales, and property, plant and equipment during the years t-5 to t-1. *AccrualsQualityRel* is the ratio of the standard deviation of the residuals from the Dechow and Dichev model during the years t-5 to t-1 to the standard deviation of total accruals during the years t-5 to t-1. *High Cash* is an indicator variable coded as '1' if the firm is above the median based on the distribution of cash holdings in a given year and '0' otherwise. *Excess Cash* is estimated from annual regressions of cash balances (item 1) deflated by total assets (item 6) on firm size, leverage, Q, and cash flow volatility. *Excess Cash* is recoded as an indicator variable coded as '1' if the firm is a positive residual on the cash balance model in a given year and '0' otherwise. *Free Cash Flow* is estimated as cash flow from operations plus R&D expenses minus depreciation and the predicted investment for the firm as estimated in Table 1. *Free Cash Flow* is recoded as an indicator variable coded as '1' if the computation of free cash flow is positive and '0' otherwise. T-statistics are presented in italics below the coefficients and are corrected for time-series correlation using Huber-White standard errors clustered by firm. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels. F-Test tests the hypothesis that the estimated coefficients $\beta_2 + \beta_3$ below equal to zero.

$$(Investment\ Inefficiency)_{i,t} = \beta_0 + \beta_1 * Partition_{i,t-1} + \beta_2 * ReportingQuality_{i,t-1} + \beta_3 * ReportingQuality * Partition_{i,t-1} + \beta_4 * Controls_{i,t-1}$$
$$\Sigma \beta_t * Year_t + \Sigma \beta_j * Industry_j + \varepsilon_{it}.$$

	Reporting Quality: *Accruals Quality*				*Reporting Quality*: *Accruals Quality Rel*				
Partition Criteria	*Partition*	*Reporting Quality*	*Reporting Quality *Partition*	F-Test $\beta_2 + \beta_3 = 0$	*Partition*	*Reporting Quality*	*Reporting Quality *Partition*	F-Test $\beta_2 + \beta_3 = 0$	Obs
High Cash	0.21	-2.20	-11.38**	9.68***	0.17	-0.10	-0.66**	8.96***	19,473
	0.86	*-0.41*	*-2.07*		*0.64*	*-0.47*	*-2.01*		
Excess Cash	0.43*	-6.09	-8.89*	7.35**	0.40	-0.22	-0.52	11.38***	19,473
	1.87	*-1.37*	*-1.72*		*1.40*	*-1.01*	*-1.47*		
Free Cash Flow	0.14	-7.48	-6.00	8.99***	0.22	-0.36	-0.23	6.53**	19,473
	0.61	*-1.52*	*-1.17*		*0.81*	*-1.26*	*-0.69*		

Table 7 – Investment Efficiency Regressions – Partitions by Information Environment

This table presents pooled time-series cross-sectional regression OLS coefficients of a model predicting *Overinvestment* and *Underinvestment*. is the negative residuals of the investment model multiplied by '-1'. *Overinvestment* is the positive residuals of the investment model. *Underinvestment AccrualsQuality* is measured as the negative value of the standard deviation of the residuals from a Dechow and Dichev (2002) model of current accruals on lag, current, and lead cash flow from operations augmented by the change in sales, and property, plant and equipment during the years t-5 to t-1. *AccrualsQualityRel* is the ratio of the standard deviation of the residuals from the Dechow and Dichev model during the years t-5 to t-1 to the standard deviation of total accruals during the years t-5 to t-1. *High Spread* is an indicator variable coded as '1' if the firm above the median based on the distribution of bid-ask spreads in a given year and '0' otherwise. Bid-ask spreads is the average of the monthly bid-ask spreads during the fiscal year t where bid-ask spread is the ask price minus the bid price divided by the average of the bid and the ask prices. The bid-ask spread is averaged across all transactions during the day for each firm and then daily mean bid-ask spreads are averaged during the month t. *Low Analyst* is an indicator variable coded as '1' if the firm is above the median in the number of analysts following in a given year and '0' otherwise where the number of analysts following is the maximum number of analysts forecasting annual earnings for a firm during the fiscal year t. T-statistics are presented in italics below the coefficients and are corrected for time-series correlation using Huber-White standard errors clustered by firm. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels. F-Test tests the hypothesis that the estimated coefficients $\beta_2 + \beta_3$ below equal to zero.

$$(Investment\ Inefficiency)_{i,t} = \beta_0 + \beta_1 * Partition_{i,t-1} + \beta_2 * ReportingQuality_{i,t-1} + \beta_3 * ReportingQuality * Partition_{i,t-1} + \beta_4 * Controls_{i,t-1}$$
$$\Sigma\, \beta_t * Year_t + \Sigma\, \beta_j * Industry_j + \varepsilon_{it}.$$

	Reporting Quality: *Accruals Quality*				*Reporting Quality*: *Accruals Quality Rel*				
Partition Criteria	*Partition*	*Reporting Quality*	*Reporting Quality *Partition*	F-Test $\beta_2 + \beta_3 = 0$	*Partition*	*Reporting Quality*	*Reporting Quality *Partition*	F-Test $\beta_2 + \beta_3 = 0$	Obs
Underinvestment									
High Spread	-0.01	1.76	-9.76**	18.06***	0.23	-0.11	-0.11	5.50**	19,474
	-0.06	*0.43*	*-2.45*		*1.42*	*-0.71*	*-0.64*		
Low Analyst	0.15	-4.15	-2.30	15.60***	0.23	-0.19	0.00	4.07**	26,344
	1.09	*-1.20*	*-0.65*		*1.61*	*-1.49*	*0.00*		
Overinvestment									
High Spread	-0.67**	6.20	-13.19*	2.24	-0.87**	0.20	-0.83**	4.80**	12,271
	-2.11	*0.81*	*-1.73*		*-2.30*	*0.63*	*-2.01*		
Low Analyst	-0.53*	-7.02	-3.43	5.94**	-1.01***	0.10	-0.79**	7.20***	16,594
	-1.82	*-0.95*	*-0.45*		*-2.96*	*0.34*	*-2.16*		