The Spillover Effect of Fraudulent Financial Reporting on Peer Firms' Investment Efficiency

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Abstract

We investigate the real effects of fraudulent financial reporting on peer firms' investment efficiencies before the misreporting was detected. We argue that the inflated financial performance of the scandal firms conveys misleading signals about new investment opportunities to industry peers and provides heightened expectations and distorted incentives for peer firms' managers to follow the scandal firm's aggressive investment strategy. We use a sample of high-profile firms that were allegedly accused of accounting fraud by the SEC to investigate the effects of fraudulent reporting. We hypothesize and find a significant abnormal increase in investments by peer firms during the scandal period. We also document that the increase in investment is greater the further the competitor's performance lags behind that of the scandal firm, especially when the peer firm is of more comparable size to the scandal firm. Consistent with peer firms' CEOs being misled by the rosy prospects portrayed in the scandal firm's fraudulent financial reports, there is an increase in CEO ownership during the scandal period. We further find that additional investments made by peer firms in the scandal period have weaker association with future cash flows. Overall, our study provides systematic and more direct evidence that fraudulent accounting information results in over-investments by competitors.

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1. Introduction

How accounting information affects investment efficiency is a topic of fundamental importance. A growing literature focuses on how a firm's accounting quality affects its *own* investment efficiency (Biddle and Hilary, 2006; Biddle, Hilary and Verdi, 2008; Beatty, Liao and Weber, 2008). We argue a firm's accounting quality can also have a spillover effect and influence *other* firms' investment decisions. One channel is that managers may rely on other firms' financial reports to distinguish between good and bad investment projects. For example, "managers can identify promising new investment opportunities on the basis of the high profit margins reported by other firms" (Bushman and Smith, 2001). It follows that one firm's fraudulent financial reporting might send a false signal to other firms about new investment opportunities, leading to sub-optimal investments by peer firms in the same industry.

Another channel through which a firm's fraudulent reporting might affect other firms' investment decisions is the distorted incentives provided by management compensation contracts that use the reported accounting numbers of scandal firms as a benchmark for performance evaluation. Karaoglu, Sandino and Beatty (2006) argue that the scandal firm's "inflated performance" may lead investors and board members of the competing firm to believe that their own managers could perform better, resulting in higher benchmarks. Meanwhile, firms that misreported financial statements often invest aggressively during misreporting periods to appear as efficient as what they portray in

financial reports (Sadka, 2006; Keida and Philippon, 2005), leaving the peer firms with the wrong impression that by following these "successful" investment strategies they could also achieve similar financial performance. We argue that the heightened pressure to meet or beat the "inflated" financial benchmarks gives the manager incentives to prematurely jump on those "promising" new investment opportunities or inappropriately mimic fraudulent firms' sub-optimal investment strategies.

Anecdotal evidence also supports our argument. Sidak (2003) shows that WorldCom's falsified internet traffic reports to FCC encouraged widespread overinvestment in network capacity by industry rivals. Sadka (2006) illustrates that scandal firms, such as WorldCom, may engage in sub-optimal price cuts and output increases to match their reported superior financial performance, which he argues could "potentially bankrupt the entire industry." Our study is partly motivated by this anecdotal evidence and provides systematic empirical evidence on the impact of accounting frauds on investment efficiency of industry peers.

We hypothesize that the spillover effect of fraudulent financial reporting will lead to an abnormal increase in investment by peer firms during the fraudulent period compared to prior periods. We also hypothesize that the abnormal increase in investment will be larger the further the peer firm's financial performance lags behind that of the scandal firm. In addition, we expect the spillover effect will be stronger when the peer firm is more likely to benchmark against the fraudulent firm. Furthermore, consistent with our argument that abnormal investments made in the fraudulent period are sub-optimal, we predict a weaker association between future cash flows and investments

made in the fraudulent period than that in prior periods. Finally, to the extent that managers of peer firms are misled by the rosy prospects portrayed in the fraudulent firm's financial reports, we hypothesize that peer firms' CEO has a net increase in ownership during the fraudulent period.

We focus on accounting frauds conducted by a group of high profile firms that "are more likely to be a major 'benchmark' in their industries." We follow Karaoglu, Sandino and Beatty (2006) and define these high-profile scandal firms as those that (1) were allegedly accused of accounting fraud by the SEC, (2) were found to have been inflating their accounting performance and (3) were in the S&P 500, the S&P 400 Midcap, or the S&P Smallcap indices. We define the scandal or fraudulent period as the time span indicated in the SEC statement. Peer firms are defined as those that have the same 3-digit SIC code as the fraudulent firms. To control for the industry and time effects, we conduct a difference in difference analysis where the control group is the (non-peer) firms in the same 2-digit SIC code as fraudulent firms.

We find a significant increase in both capital and R&D expenditures by industry peers of these scandal firms during the scandal period as opposed to the pre-scandal period, after adjusting for the changes in investment of control firms during the same period.[1] We further find that the abnormal increase in investment is positively correlated with the difference in financial performance (scaled accounting earnings) between the

[1] In this paper, we use the terms "fraudulent period" and "scandal period" interchangeably. They both denote the period that the scandal firm engaged in fraudulent financial reporting, before the actual detection of the fraud.

scandal firm and the industry peer during the scandal period. This result suggests that the rosier the scandal firms' performance indicates compared to peer firms, the more likely the peer firms' managers have incentives to mimic scandal firms. In addition, we find this positive association between the abnormal investment and the earnings distance is stronger when the peer firm is of more comparable size to the scandal firm, which we use to proxy for peers firms' likelihood of benchmarking performance against scandal firms.

Furthermore, we find the correlation between future cash flow and current investment becomes significantly weaker for investments made in the scandal period compared to the pre-scandal period. This phenomenon persists for at least three years after the abnormal investment is made. This result suggests that the abnormal investment made in the scandal period is not beneficial to shareholders and very likely to be sub-optimal.

Finally, CEOs of peer firms have a net increase in ownership during the scandal period compared to the pre-scandal period, after adjusting for the changes in CEO trading of matched control firms during the same period. This evidence implies that peer firms' executives were in fact misled by the inflated financial performance of the scandal firm and left tracks of their optimistic expectations in their trading data.

Taken together, the evidence is consistent with fraudulent financial reporting having a negative externality on the investment efficiency of competing firms in the same industry. Distorted accounting signals generated by high-profile scandal firms on average lead to overinvestment by industry peers. Cross-sectionally, the stronger the pressure to

catch up with the benchmark performance or to learn from the "industry leader", the greater the investment distortion.

Our paper makes several contributions. First, this study provides evidence on an important yet largely neglected channel through which accounting information affects corporate investments. Previous studies argue that higher accounting quality improves investment efficiency by reducing information asymmetry between firms and external suppliers of capital or between management and shareholders (e.g., Biddle and Hilary, 2008 and Biddle, Hilary and Verdi, 2008). In contrast, this paper focuses on information spillovers in the product market, where scandal firms' financial reports provide useful information to competitors about new investment opportunities. Leuz and Wysocki (2008) argue that this spillover effect of fraudulent financial reporting on real investment behavior remains under-explored. We document systematic evidence that fraudulent financial reporting results in sub-optimal investment by industry peers, suggesting that a leading firm's accounting information plays an important role in peer firms' investment decisions.

Our paper is closely related to Durnev and Mangen (2008) that investigate whether the announcement of accounting restatement causes a systematic change in peers' investment activities. Durnev and Mangen find that peer firms significantly lower their investment in the year after fraudulent firms' restatement announcements and the reduction in investment growth is greater the more negative the competitor's abnormal return at the restatement announcement. They interpret the results as peer firms learning from the news in the restatement. Their findings are potentially consistent with our study.

Our study differs from Durnev and Mangen (2008) in two aspects. First, our setting allows us to tease out confounding explanations and provide a more direct test of the effect of fraudulent reporting on peer firms' investment activities. Prior studies show that a restatement announcement signals increased information risk and thereby higher cost of capital for the entire industry (Gleason, Jenkins and Johnson, 2004; Kravet and Shevlin, 2007). Therefore, Durnev and Mangen's (2008) findings are subject to an alternative explanation that an increase in information risk after the restatement announcement makes it more costly for peer firms to obtain external financing to sustain the investment growth. In order to address the concern that our results may also be subject to this cost of capital effect, we test whether the cost of equity and cost of debt decrease in the scandal period vis-à-vis prior periods. We find no significant changes in the cost of capital for peer firms during the scandal period and are therefore able to rule out the possibility that the abnormal increase in investment by peer firms is driven by lower cost of external financing.

Second, our fraudulent firm sample contain high profile firms whose performance is more likely to be the benchmark for firms in the same industry; whereas, firms that make restatements have a big variation in firm size and in the reasons for restatements. Many restating firms are not industry leaders or firms with high visibility, and the spillover effect is likely to be weaker (Gonen, 2003). Therefore, our research design gives us more power to detect the impact of misreporting on investment decisions by peer firms. While Durnev and Mangen's (2008) results imply restatements correct prior signals sent by the restating firms, they do not find results consistent with this implication. That is, they do not find that peer firms have an abnormal investment growth before fraudulent

firms' restatements; in contrast, they find the investment patterns immediately before restatements are similar to those after restatements..

Finally, our paper makes contributions to the literature that documents consequences of misreporting financial statements. Francis (2001) calls for research on "the adverse effects of bad accounting," which is "an appropriate extension" of the research on the consequences of accounting choice. Sadka (2006) further argues that the existing literature understates the economic consequences of accounting fraud by ignoring the effect of fraud on competing firms and consumers. Therefore, this study answers Francis and Sadka's calls for research by providing large sample evidence that accounting frauds distort industry competitors' investment decisions and result in inefficient allocation of resources in the economy.

The rest of the paper is organized as follows. Section 2 provides background information for our study. We discuss our hypothesis development in Section 3. We describe our research design and sample selection in Section 4. We present our empirical results in Section 5 and conclude in Section 6.

2. Background

2.1 Anecdotal evidence

On June 26, 2002, SEC filed a complaint charging WorldCom, a major player in the telecommunication industry, with "a massive accounting fraud totaling more than

$3.8 billion."[2] The complaint further alleges that WorldCom falsely portrayed itself as a profitable business by fraudulently capitalizing rather than expensing its line costs. WorldCom later admitted that from 1999 through the first quarter of 2002, the company materially overstated its reported earnings by about $9 billion in the accounting fraud.[3]

In a case study of the WorldCom scandal, Sidak (2003) concludes that "WorldCom's false internet traffic reports and accounting fraud encouraged overinvestment in long-distance capacity and Internet backbone capacity" by competitors. The overstated earnings of WorldCom distorted the economic gains of acquiring new customers and caused other firms to invest too much. Among his examples, AT&T Labs reported in 2001 that rival telecommunications providers made investment decisions in reliance on WorldCom's fraudulent reports. The Eastern Management Group also determined that a significant percentage of the $90 billion invested by other carriers in the industry was misallocated because of WorldCom's faulty projections.

Karaoglu et al. (2006) provides another example quoting Charles Noski, AT&T's vice chairman prior to the WorldCom scandal. Noski mentioned that "We were constantly dissecting all of the public information about WorldCom/MCI and we would scratch our heads and try to figure out how they were doing it all." He also talked about discussions with AT&T's COO offering $2-$4 billion for upgrading of systems although they later concluded that the additional investment was not necessary.

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[2] Source: SEC Litigation Release No. 17588 and Accounting and Auditing Release No. 1585.

[3] Source: SEC Litigation Release No. 17829 and Accounting and Auditing Release No. 1658.

Sadka (2006) documents that during the scandal period WorldCom increased its market share in most of its markets and started a price war to attract customers, consistent with WorldCom taking real actions to appear as efficient as what they portray in financial statements. He also cites a recent *Wall Street Journal* article[4] where Michael Armstrong (the former CEO of AT&T) claims that the accounting fraud of WorldCom prompted AT&T to make suboptimal investment decisions: "I would never have faced that decision had the WorldCom fraud not taken place."

Our study is partly motivated by the anecdotal evidence above and provides systematic and large-sample evidence on the impact of accounting fraud on investment efficiency of industry peers.

2.2 Related Research

Prior literature has examined the direct effect of a firm's accounting quality on its own investment efficiency. For example, Biddle and Hilary (2006) find that firms with lower accounting quality have higher sensitivity of investment to internally generated cash flows, consistent with either over-investment due to agency cost of excess free cash flows or under-investment due to capital rationing by external investors. Similarly, Biddle, Hilary and Verdi (2008) argue that higher quality financial reporting mitigates information asymmetries that give rise to frictions such as moral hazard and adverse selection, and thereby reduces both over- and under-investment. In addition, Beatty, Liao

[4] The *Wall Street Journal*, May 26, 2004, Former chief tries to redeem the calls he made at AT&T, by Rebecca Blumestein and Peter Grant.

and Weber (2008) suggest that financial reporting quality influences buy vs. lease decisions.

Focusing on fraudulent financial reporting, Kedia and Philippon (2005) build a model where bad managers who want to hide their poor quality not only need to manipulate accounting numbers to boost reported financial performance, but also have to mimic good managers in their investment decisions in order to match the boosted performance. In equilibrium, fraudulent reporting firms invest too much. Similarly, Sadka's (2006) model predicts that fraudulent reporting firms' output decisions should be consistent with their reported performance. And his model goes one step further predicting that the competing firms' output decisions will be also affected by the scandal firm's financial statements, generating negative externalities on social welfare. However, he doesn't provide a large sample test of this prediction.

Karaoglu et al. (2006) examine whether scandal firms' inflated accounting numbers was used as industry benchmarks in executive performance evaluation, and whether such use caused earnings management by industry peers. They find that peer firms' executive compensation is negatively associated with scandal firms' performance. They also find that peer firms use more discretionary accruals the further their earnings lag behind that of the scandal firm. Our study differs from theirs in that we focus on the spillover effect of fraudulent financial reporting on peer firms' *real* activities (i.e., investments), rather than accounting manipulations.

Durnev and Mangen (2008) investigate whether the announcement of accounting restatement causes a systematic change in peers' investment activities after the

announcement. They show that peer firms significantly lower their investment growth in the year after fraudulent firms' restatement announcement, and the reduction in investment growth is greater the more negative the competitor's abnormal return at the restatement announcement. In their study, a fraudulent firm's restatement announcement serves as an exogenous shock that reveals new information. They infer that peer firms learn from the new information and modify their investment strategies accordingly. But they cannot rule out the possibility that their results may be driven by the increased cost of capital in the external financing markets after the restatement announcements.

3. Hypothesis Development

We hypothesize that a high profile firm's fraudulent financial reporting can have real impacts on competing or peer firms' investment activities through at least two channels. The first channel is that competitors may rely on the high-profile firm's financial reports to mitigate uncertainty of the product market and distinguish between promising and inauspicious investment projects[5] (Dixit and Pindyck, 1994; Hayes and Lundholm, 1996; Bushman and Smith, 2001). Therefore, when a high-profile firm materially inflates its reported financial performance, the falsified rosy signals about investment prospects will encourage competitors to make more investments than they would otherwise absent the misleading information. The aforementioned anecdotal evidence on WorldCom scandal is a case in point. The overstated earnings of WorldCom

[5] In unreported analysis, we find evidence that peer firms' investment is significantly positively associated with the reported profitability of the high-profile firm, after controlling for peer firms' own profitability.

distorted the economic gains of acquiring new customers and caused competitors such as AT&T and Eastern Management Group to invest too much.

A firm's fraudulent reporting can also have a spillover effect on other firms' investment behavior through their evaluation of managerial efficiency by benchmarking competitors' financial performance (Antle and Smith, 1986; Leuz and Wysocki, 2008). Fraudulent reporting can yield materially overstated benchmarks, resulting in heightened expectations from investors and distorted incentives for managers of competing firms to change their investment strategies to catch up with the scandal firm. This is exacerbated by the fact that scandal firms often invest aggressively during periods of fraudulent reporting to appear as efficient as what they portray in financial reports (Sadka, 2006; Keida and Philippon, 2005)[6]. Therefore it can be tempting for managers of competing firms to herd on aggressive investment strategies to catch up with sandal firms' performance. This "Bandwagon effect" will tend to snowball when more investors, board members or managers inappropriately attribute the "stellar" performance of the scandal firm to its aggressive investment strategies (Leibenstein, 1950). Taken together, we expect the scandal firm's fraudulent reporting will lead to an increase in investments by industry peers during the scandal period. This leads to our first hypothesis.[7]

H1: *Competitors of the scandal firm invest more during the scandal period than during the pre-scandal period.*

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[6] In unreported analysis, we find similar results for our sample: the scandal firms' investments during the scandal period are positively associated with the extent to which they overstate their earnings.

[7] All hypotheses are stated in alternative form.

Under relative performance evaluation, the further a firm's financial performance lags behind that of the benchmark firm, the lower the executive compensation (Karaoglu et al., 2006). Lower compensation in turn creates greater incentives and pressure for the managers to catch up by "learning" from the benchmark firm's "successful" investment strategies. All else equal, more desperate underperformers are also more likely to follow the fraudulent firms' falsified rosy signals and prematurely jump on the "promising" new investment opportunities. Therefore, our second hypothesis is:

H2: *The magnitude of the increase in investment during the scandal period is positively associated with the extent that peer firms lag behind scandal firms in financial performance.*

Relative performance evaluation will be more effective in filtering out common uncertainties when the benchmark firm is more comparable to the focal firm (Antle and Smith, 1986). To the extent that firms of similar size in the same industry are exposed to similar business risk, a firm's likelihood to benchmark against the scandal firm increases with the similarity in firm size between the two firms. It follows that the pressure for competitors' managers to overcome underperformance behind scandal firms and adopt similar aggressive investment strategies is higher when they are of comparable size. Therefore, our third hypothesis is:

H3: *The increase in investment and the positive association between the increase in investment and the financial performance gap are stronger when the peer firm is of more comparable size to the scandal firm.*

Fraudulent financial reporting sends out misleading information about demand and profitability of the product markets. To the extent that peer firms made their investment decisions based on a falsified signal and feedback during the scandal period, the investments are likely to be inefficient and should have a weaker association with future cash flows. This leads to our fourth hypothesis.

H4: *The association between future cash flows and investments will be weaker during the scandal period compared to the pre-scandal period.*

We argue that managers of peer firms engage in sub-optimal investments during the scandal period because they are misled by the rosy prospects portrayed in the scandal firm's financial reports. That is, it is likely that the managers of peer firms can't see through scandal firms' tricks in manipulating earnings. For example, Mandel (2002) argues that "when Enron Corp. reported revenue growth of 70% annually from 1997 to 2000, and operating profit growth of 35% a year, that drew other electric and gas utility companies into energy trading. The fact that Enron achieved much of its gains by moving debt off the books and using other accounting tricks was not obvious at the time." As a result, managers of peer firms will be optimistic about their investment returns and choose to increase their insider holdings during the scandal period to benefit from the expected stock price jumps. Our fifth hypothesis therefore is:

H5: *Peer firms' management has a net increase in their ownership during the scandal period compared to the pre-scandal period.*

4. Research Design

To identify fraudulent reporting firms, we follow Karaoglu et al. (2006)'s strategy. Instead of focusing on restatement firms like Durnev and Mangen (2008), we focus on accounting frauds conducted by a group of high profile firms that "are more likely to be a major 'benchmark' in their industries." We define these high-profile scandal firms as those that (1) were allegedly accused of accounting fraud by the SEC, (2) were found to have been inflating their accounting performance and (3) were in the S&P 500, the S&P 400 Midcap, or the S&P Smallcap indices. Compared to restatement firms, these scandal firms are more likely to be leading firms in their industries due to their firm size and visibility. Therefore, these scandal firms' reported financial performance and investment strategies are likely to be used as benchmarks by peer or competing firms.

Our approach, however, slightly differs from Karaoglu et al. (2006) in two aspects. First, for each industry classified using 3-digit SIC codes, we only include the first firm that commit a fraud in the sample period. This approach is based on Karaoglu et al. (2006)'s finding that these first scandal firms' misreported numbers are particularly predictive of peer firms' earnings manipulation behaviors. Second, we exclude financial institutions (SIC code 6000-6999) because financial institutions' investment behaviors are different from other industries. We use the periods stated in SEC Litigation Releases as the scandal periods. We summarize the scandal firms and scandal periods in Table 1. We identify 14 scandal firms representing 14 different industries.

The focus of our paper is peer firms' investment behavior. Peer or competing firms in our paper are defined as firms that have the same 3-digit SIC code as the scandal

firms.[8] Our sample include 1,717 peer firms concentrated in industries such as crude petroleum and natural gas (SIC code 131), drugs (SIC code 283), computer and office equipment (SIC code 357), electric lighting and wiring equipment (SIC code 364), misc. transportation equipment (SIC code 379), and drug stores and proprietary stores (SIC code 591).

To investigate how the scandal firm's fraudulent reporting affects peer firms' investments during the scandal period vis-à-vis the pre-scandal period, we employ a difference-in-difference approach to control for industry and time effects, where the pre-scandal period is defined as three years before the onset of the scandal period. We use firms in the same 2-digit SIC code as the scandal firm as the control group, excluding peer firms. We assume that firms with the same 2-digit SIC codes share similar overall growth opportunities but non-peer firms have less incentive to benchmark against scandal firms than peer firms. We understand that this approach is not perfect, but since we are interested in overall industry effects, it seems appropriate.

4.1 Investment Model

We use capital and R&D expenditures as our proxy for investment. The following model is used to test the hypotheses 1, 2 and 3.

$$\Delta CAPEX_{adj}\ (\Delta R\&D_{adj}) = \beta_0 + \beta_1 * ROA\_DIS + \beta_2 * Size\_DISd + \beta_3 * ROA\_DIS * Size\_DISd + \beta_4 * \Delta Size_{adj} + \beta_5 * \Delta MTB_{adj} + \beta_6 * \Delta Rated_{adj} + \beta_7 * \Delta Cash_{adj} + \varepsilon \quad (1)$$

[8] In this paper, we use the terms competing firms (competitors) and peer firms interchangeably.

$\Delta Variable_{adj}$ in equation (1) represents a variable where peer firms' original value is adjusted for control group. That is, an original change in that variable is subtracted by the median value of the control group. Detailed definitions are described in the following.

$\Delta CAPEX_{adj}$: Measured as the change in the average of capital expenditure (COMPUSTAT data item 128) from three years before the scandal period (hereafter the pre-scandal period) to the scandal period divided by the average PP&E (COMPUSTAT data item 8) over the three-year pre-scandal period.

$\Delta R\&D_{adj}$: Measured as the change in the average of R&D expenditure (COMPUSTAT data item 46) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the three-year pre-scandal period

ROA_DIS: This variable is defined as ROA of scandal firms minus ROA of the peer firm, where ROA is defined as the average of earnings before extraordinary items (COMPUSTAT data item 18) divided by lagged total assets (COMPUSTAT data item 6) over the scandal period. If this value is less than zero, then we reset it to be zero.

Size_DISd: An indicator variable that equals one if the size difference between the scandal firm and the peer firm is larger than the median, and zero otherwise, where size is measured as the average of the natural log of sales (COMPUSTAT data item 12) over the scandal period.

$\Delta Size_{adj}$: Measured as the change in the average of firm sales (COMPUSTAT data item 12) from the pre-scandal period to the scandal period divided by the average sales over the three-year pre-scandal period.

ΔMTB_{adj}: Measured as the change in the average of Market-to-Book ratio (measured as (COMPUSTAT data item 6 - data item 60 + data item 25* data item 199) divided by data item 6) from the pre-scandal period to the scandal period.

$\Delta Rated_{adj}$: Measured as the change in the average of the indicator variable for whether the firm is rated by S&P from the pre-scandal period to the scandal period.

$\Delta Cash_{adj}$: Measured as the change in the average of cash holding (COMPUSTAT data item 1) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the pre-scandal period.

In the model without ROA_DIS and Size_DISd, we predict the intercept to be positive based on H1. In the model without the interacted term ROA_DIS*Size_DISd, we predict the coefficient on ROA_DIS to be positive according to H2 and similarly the coefficient on Size_DISd to be negative. In the full model of equation (1), we predict the interacted term ROA_DIS*Size_DISd to have a negative sign based on H3. Following prior literature, we also control for firm size, market-to-book ratio, whether the firm is rated by the S&P and cash holdings.

4.2 Cash Flow Model

To test whether the investment made during the scandal period is suboptimal compared to the pre-scandal period, we run a panel data regression. Again, we employ a difference-in-difference approach, where all variables (except for an indicator variable for scandal period) are adjusted for the control group. The complete model is as follows.

$$\mathbf{CFO_{t+1} = \beta_0 + \beta_1 * Scandal + \beta_2 * CAPEX\ (or\ R\&D)} \\ \mathbf{+\beta_3 * Scandal * CAPEX\ (or\ R\&D) + \beta_4 * Size + \beta_5 * MTB} \\ \mathbf{+ \beta_6 * Rated + \beta_7 * CFO_t + \varepsilon} \qquad \mathbf{(2)}$$

CFO: Following Biddle et al. (2008), this variable is defined as cash flow from operation (COMPUSTAT data item 308) divided by sales (COMPUSTAT data item 12).

Scandal: In indicator variable that equals one for investments made in the scandal period, and zero otherwise.

CAPEX: This variable is defined as capital expenditure (COMPUSTAT data item 128) divided by lagged PP&E (COMPUSTAT data item 8).

R&D: This variable is defined as R&D expenditure (COMPUSTAT data item 46) divided by lagged total assets (COMPUSTAT data item 6).

Size: This variable is defined as the natural log of sales (COMPUSTAT data item 12).

MTB: This variable is defined as market value of total assets (COMPUSTAT data item 6 – data item 60 + data item 25* data item 199) divided by book value of total assets (COMPUSTAT data item 6).

Rated: This variable equals one if the firm is rated by the S&P, and zero otherwise. Peers' firms' original Rated is then adjusted by the median of control group firms in the same fiscal year.

Based on H4, we predict that the coefficient on Scandal*CAPEX (or R&D) to be negative. In addition to firm size, market-to-book ratio and whether the firm is rated, we also control for current cash flow that is predictive of future cash flow (Barth et al., 2001).

4.3 CEO Ownership Model

To test H5, we investigate CEO's trading behavior. We follow Cheng and Warfield (2005) to measure the trading of CEO's ownership, which is defined as stock option exercise plus restricted stock grant, and add net purchases of shares from the open market. Option exercise and restricted stock data is collected from ExecuComp and insider trading data is from Thomson that collects from SEC filings (forms 3, 4 and 5). The model we use to test H5 is as follows.

$$\Delta\text{CEO Ownership}_{adj} = \beta_0 + \beta_1*\text{ROA\_DIS} + \beta_2*\text{Size\_DISd} + \beta_3*\text{ROA\_DIS}*\text{Size\_DISd} + \beta_4*\Delta\text{Size}_{adj} + \beta_5*\Delta\text{MTB}_{adj} + \beta_6*\Delta\text{Rated}_{adj} + \varepsilon \quad (3)$$

ΔCEO ownership$_{adj}$: Measured as the change in the average of CEO ownership (option exercise + restricted stock grant + purchase of shares – sale of shares) from three years before the scandal period (hereafter the pre-scandal period) to the scandal period divided by the average outstanding shares (COMPUSTAT data item 25) over the three-year pre-scandal period. The peer firm's original value

of change in CEO ownership is then adjusted for the control group by subtracting the median change in CEO ownership of the control group.

Based on H5, we predict that the intercept in the model without ROA_DIS and Size_DISd will be positive. We also predict that ROA_DIS will have a positive sign and Size_DISd will have a negative sign in the model without the interaction term. Finally, we predict the coefficient on ROS_DIS*Size_DISd to be negative in equation (3).

5. Results

5.1 Univariate Results

We compare the descriptive statistics between the peer firms and the control group in Table 2. We find that the change in capital expenditures from the pre-scandal to the scandal period is significantly higher for peer firms than control firms, although the z-stat for medians is not significant. The change in R&D expenditures for peer firms is also higher than control firms. Both results are consistent with H1, which suggests that competitors of the scandal firms are inclined to make more investments during the scandal vs. pre-scandal periods than control firms. In addition, we find results consistent with H5 that peer firms' managers are optimistic about the future prospects and have a net increase in ownership during the scandal period.

We show the Pearson correlation coefficients in Table 3. The univariate results suggest that when peer firms lag behind scandal firms in financial performance, the peer firms make more investments and have a net increase in CEO ownership. We also find

that when peer firms have more comparable firm size to scandal firms, they are more likely to make more investments during the scandal period.

5.2 Multivariate Results

In Table 4, we report the results of the capital expenditure models. In model (1), we find results consistent with H1 that peer firms make more investments in the scandal period. In model (2), we do not find that peer firms' investment increases with the extent of underperformance compared to scandal firms. However, we find that when peer firms are more comparable to scandal firms in size, they make more capital expenditures during the scandal period. In model (3), we find that when peer firms have a comparable size with scandal firms, capital investments are positively correlated with the extent to which peer firms lag behind in financial performance.

In Table 5, change in R&D is the dependent variable. We find results consistent with H1, H2 and H3. We find that compared to pre-scandal periods, peer firms make more R&D investments. We also find that this increase in investments is greater when the peer firms have similar size to scandal firms. Further, this increase in investment is positively correlated with the gap in financial performance between peer firms and scandal firms, especially when peer firms are of a comparable size.

In Table 6 and 7 we show results consistent with H4 that investments in scandal periods have a lower correlation with future cash flow compared to pre-scandal periods. This result suggests that the investments made by peer firms during scandal periods are more likely to be suboptimal.

In Table 8, we find that CEOs of peer firms have a net increase in ownership compared to pre-scandal periods. Also, we find that this increase in CEO ownership is positively correlated to the gap in reported financial performance between peer firms and scandal firms when the peer firms are of comparable firm size.

5.3 Additional Analysis

In unreported analysis, we are unable to find a significant change during the scandal period for neither the cost of debt, measured as the ratio of interest expenses over total debt, nor the cost of equity, measured as the PEG ratio. This result, in addition to the CEO trading result, distinguishes our paper from Durnev and Mangen (2008). Durnev and Mangen's (2008) result is confounded by the cost of equity effect. Prior studies show that restatement announcement signals increased information risk for the entire industry (Gleason, Jenkins and Johnson, 2004; Kravet and Shevlin, 2007). That is, their results can be explained by increased cost of capital for the peer firms. The finding that cost of capital does not change during the scandal periods likely eliminates the possibility that our results are driven by changes in external financing costs.

6. Conclusions

In this paper, we examine whether a firm's accounting quality has real effects on other firms' investment efficiencies. This real spillover effect remains largely unexplored in the prior literature (Leuz and Wysocki, 2008). A notable exception is Durnev and Mangen (2008), who find that peer firms experience a significant decline in their

investment growth in the year after fraudulent firms' restatement announcements. However, they are unable to tease out the possibility that the reduction in investment growth is a result of increased difficulty to obtain external financing to fund the investment growth due to the contagion effect in capital markets. Furthermore, while they argue their results are consistent with restatement announcements informing competitors that managers over-invested based on erroneous signals, they do not find evidence that peer firms have a significant increase in investment growth before the restatement announcement.

Rather than inferring indirectly from peer firms' reactions to restatement announcements, we focus on the abnormal increase in peer firms' investments during the scandal period and thereby provide more direct evidence of the real spillover effect of fraudulent financial reporting. We also find there is no significant change in the cost of capital during the scandal period. Therefore, our results are unlikely to be driven by the temporary improvement of external financing conditions.

Focusing on accounting frauds conducted by a group of high profile firms that are more visible and more likely to be benchmarked against, we find a significant abnormal increase in investments by competitors during the scandal period using the difference-in-difference method. We further find that the abnormal increase in investment is greater the further the competitor's performance lags behind that of the scandal firm, especially when the peer firm is of more comparable size to the scandal firm. In addition, we show that these additional investments have weaker associations with future cash flows, suggesting investment inefficiencies. Finally, our results suggest that peer firms' CEOs

were in fact misled by the falsified rosy prospects portrayed in the scandal firm's fraudulent financial reports, and manifest their optimistic expectations by increasing their ownership.

Overall, our findings are consistent with fraudulent financial reporting having a negative externality on the investment efficiency of peer firms in the same industry. Distorted accounting signals generated by high-profile scandal firms on average leads to overinvestment by industry peers. In a nutshell, our study contributes to the literature by providing more direct and systematic evidence of the real spillover effects of bad accounting on competitors' investment efficiencies.

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Table 1: List of scandal firms

Scandal Firms	3-digit SIC Codes	Scandal Period	Number of Peer Firms
Dynegy Inc	131	2001-2002	120
Guilford Mills Inc	225	1997-1998	13
Bristol-Myers Squibb Company	283	2000-2001	290
Material Sciences Corporation	347	1996-1998	4
Xerox Corporation	357	1997-2000	193
Thomas & Betts Corporation	364	1998-1999	325
Oak Industries Inc.	367	1995-1996	5
Thor Industries Inc	379	1996-1998	119
Qwest Communications International	481	1999-2002	9
Enron Corporation	517	1997-2001	16
Dollar General Corporation	533	1998-2001	13
Rite Aid Corporation	591	1998-2000	575
Computer Associates International, Inc	737	1998-2000	14
Healthsouth Corporation et al	806	1999-2002	21

Table 2: Descriptive statistics (mean and median) of peer firms and control group firms

	Peer firms		Control group firms	
Variables	Mean	Median	Mean (t-stat for the difference)	Median (Wilcoxon z-stat for the difference)
ΔCAPEX	0.384	0.095	0.280 (3.23)***	0.072 (1.16)
ΔR&D	0.076 (N=1,311)	0.027	0.029 (7.81)*** (N=1,120)	0.005 (8.15)***
ΔSize	0.067	0.075	0.078 (-0.68)	0.053 (2.43)**
ΔMTB	0.020	-0.091	-0.163 (2.69)***	-0.093 (1.01)
ΔRated	0.037	0	0.054 (-2.38)**	0 (-2.03)**
ΔCash	0.250	0.020	0.059 (9.56)***	0.005 (4.64)***
ΔCEO ownership	0.126% (N=325)	0.011%	-0.088% (2.23)*** (N=385)	-0.022% (1.28)
Number of Observations	1,775	1,775	1,703	1,703

Variable Definition:

ΔCAPEX: Measured as the change in the average of capital expenditure (COMPUSTAT data item 128) from three years before the scandal period (hereafter the pre-scandal period) to the scandal period divided by the average PP&E (COMPUSTAT data item 8) over the three-year pre-scandal period.

ΔR&D: Measured as the change in the average of R&D expenditure (COMPUSTAT data item 46) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the three-year pre-scandal period

ΔSize: Measured as the change in the average of firm sales (COMPUSTAT data item 12) from the pre-scandal period to the scandal period divided by the average sales over the three-year pre-scandal period.

ΔMTB: Measured as the change in the average of Market-to-Book ratio (measured as (COMPUSTAT data item 6- data item 60 + data item 25* data item 199) divided by data item 6) from the pre-scandal period to the scandal period.

ΔRated: Measured as the change in the average of the indicator variable for whether the firm is rated by S&P from the pre-scandal period to the scandal period.

ΔCash: Measured as the change in the average of cash holding (COMPUSTAT data item 1) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the pre-scandal period.

ΔCEO ownership: Measured as the change in the average of CEO ownership (option exercise + restricted stock grant + purchase of shares – sale of shares) from three years before the scandal period (hereafter the pre-scandal period) to the scandal period divided by the average outstanding shares (COMPUSTAT data item 25) over the three-year pre-scandal period.

Table 3: Pearson Correlation (and P-value) for investment model variables

	$\Delta R\&D_{adj}$	$\Delta CEO\ Own_{adj}$	ROA_ DIS	Size_ DISd	$\Delta Size_{adj}$	ΔMTB_{adj}	$\Delta Rated_{adj}$	$\Delta Cash_{adj}$
$\Delta CAPEX_{adj}$	0.442 (0.001)	-0.048 (0.387)	0.064 (0.008)	-0.045 (0.061)	0.163 (0.001)	0.083 (0.001)	0.050 (0.040)	0.492 (0.001)
$\Delta R\&D_{adj}$		0.170 (0.008)	0.197 (0.001)	0.027 (0.330)	0.141 (0.001)	-0.022 (0.442)	0.032 (0.247)	0.537 (0.001)
$\Delta CEO\ Own_{adj}$			0.108 (0.054)	0.104 (0.064)	0.006 (0.913)	0.024 (0.672)	-0.046 (0.410)	0.046 (0.409)
ROA_ DIS				0.434 (0.001)	-0.032 (0.175)	0.172 (0.001)	-0.048 (0.045)	0.135 (0.001)
Size_ DISd					-0.038 (0.118)	0.027 (0.260)	-0.120 (0.001)	0.044 (0.068)
$\Delta Size_{adj}$						-0.052 (0.030)	0.025 (0.301)	0.046 (0.059)
ΔMTB_{adj}							-0.030 (0.217)	0.028 (0.244)
$\Delta Rated_{adj}$								0.092 (0.001)

Variable Definition

$\Delta Variable_{adj}$ represents a variable where peer firms' original value is adjusted for the control group. That is, an original change in that variable is subtracted by the median value of the control group. Detailed definitions are described in the following.

$\Delta CAPEX_{adj}$: Measured as the change in the average of capital expenditure (COMPUSTAT data item 128) from three years before the scandal period (hereafter the pre-scandal period) to the scandal period divided by the average PP&E (COMPUSTAT data item 8) over the three-year pre-scandal period.

$\Delta R\&D_{adj}$: Measured as the change in the average of R&D expenditure (COMPUSTAT data item 46) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the three-year pre-scandal period

$\Delta CEO\ ownership_{adj}$: Measured as the change in the average of CEO ownership (option exercise + restricted stock grant + purchase of shares – sale of shares) from three years before the scandal period to the scandal period divided by the average outstanding shares (COMPUSTAT data item 25) over the three-year pre-scandal period.

OA_DIS: This variable is defined as ROA of scandal firms minus ROA of the peer firm, where ROA is defined as the average of earnings before extraordinary items (COMPUSTAT data item 18) divided by lagged total assets (COMPUSTAT data item 6) over the scandal period. If this value is less than zero, then we reset it to be zero.

Size_DISd: An indicator variable that equals one if the size difference between scandal firms and the peer firm is larger than the median, and zero otherwise, where size is measured as the average of the natural log of sales (COMPUSTAT data item 12) over the scandal period.

$\Delta Size_{adj}$: Measured as the change in the average of firm sales (COMPUSTAT data item 12) from the pre-scandal period to the scandal period divided by the average sales over the three-year pre-scandal period.

ΔMTB_{adj}: Measured as the change in the average of Market-to-Book ratio (measured as (COMPUSTAT data item 6- data item 60 + data item 25* data item 199) divided by data item 6) from the pre-scandal period to the scandal period.

$\Delta Rated_{adj}$: Measured as the change in the average of the indicator variable for whether the firm is rated by S&P from the pre-scandal period to the scandal period.

$\Delta Cash_{adj}$: Measured as the change in the average of cash holding (COMPUSTAT data item 1) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the pre-scandal period.

Table 4: Determinants of change in peer firms' capital expenditure from pre-scandal to scandal periods

Dependent Variable: $\Delta CAPEX_{adj}$				
		Model (1)	Model (2)	Model (3)
VARIABLES	Prediction	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Intercept	+	0.109 (4.74)***	0.173 (5.40)***	0.1334 (3.80)***
ROA_DIS	+		0.059 (0.89)	0.605 (2.83)***
Size_DISd	-		-0.153 (-3.15)***	-0.090 (-1.68)*
ROA_DIS * Size_DISd	-			-0.605 (-2.69)***
$\Delta Size_{adj}$	+	0.202 (6.98)***	0.199 (6.89)***	0.195 (6.77)***
ΔMTB_{adj}	+	0.032 (3.70)***	0.031 (3.56)***	0.033 (3.76)***
$\Delta Rated_{adj}$	+	0.019 (0.18)	-0.021 (-0.20)	-0.032 (-0.31)
$\Delta Cash_{adj}$	+	0.534 (23.19)***	0.535 (23.08)***	0.534 (23.04)***
Observations		1,717	1,717	1,717
Adj. R-squared		0.2655	0.2690	0.2717

Note: ***, **, and * represent the 1%, 5% and 10% significance.

Variable Definition:

Peer firms: Firms that belong to the same industry as the scandal firms, where industry is defined by the 3-digit SIC codes.

Control group firms: Firms that have the same 2-digit SIC codes as the scandal firms, excluding the peer firms.

$\Delta Variable_{adj}$ represents a variable where peer firms' original value is adjusted for the control group. That is, an original change in that variable is subtracted by the median value of the control group. Detailed definitions are described in the following.

$\Delta CAPEX_{adj}$: Measured as the change in the average of capital expenditure (COMPUSTAT data item 128) from three years before the scandal period (hereafter the pre-scandal period) to the scandal period divided by the average PP&E (COMPUSTAT data item 8) over the three-year pre-scandal period.

ROA_DIS: This variable is defined as ROA of scandal firms minus ROA of the peer firm, where ROA is defined as the average of earnings before extraordinary items (COMPUSTAT data item 18) divided by lagged total assets (COMPUSTAT data item 6) over the scandal period. If this value is less than zero, then we reset it to be zero.

Size_DISd: An indicator variable that equals one if the size difference between scandal firms and the peer firm is larger than the median, and zero otherwise, where size is measured as the average of the natural log of sales (COMPUSTAT data item 12) over the scandal period.

$\Delta Size_{adj}$: Measured as the change in the average of firm sales (COMPUSTAT data item 12) from the pre-scandal period to the scandal period divided by the average sales over the three-year pre-scandal period.

ΔMTB_{adj}: Measured as the change in the average of Market-to-Book ratio (measured as (COMPUSTAT data item 6- data item 60 + data item 25* data item 199) divided by data item 6) from the pre-scandal period to the scandal period.

$\Delta Rated_{adj}$: Measured as the change in the average of the indicator variable for whether the firm is rated by S&P from the pre-scandal period to the scandal period.

$\Delta Cash_{adj}$: Measured as the change in the average of cash holding (COMPUSTAT data item 1) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the pre-scandal period.

Table 5: Determinants of change in R&D expenditure for peer firms from pre-scandal to scandal periods

Dependent Variable: $\Delta R\&D_{adj}$				
		Model (1)	Model (2)	Model (3)
VARIABLES	Prediction	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Intercept	+	0.038 (7.84)***	0.032 (4.76)***	0.025 (3.28)***
ROA_DIS	+		0.090 (6.85)***	0.193 (3.99)***
Size_DISd	-		-0.031 (-3.06)***	-0.020 (-1.78)*
ROA_DIS * Size_DISd	-			-0.111 (-2.21)**
$\Delta Size_{adj}$	+	0.027 (4.60)***	0.028 (4.81)***	0.027 (4.71)***
ΔMTB_{adj}	+	-0.001 (-0.86)	-0.003 (-1.94)*	-0.003 (-1.75)*
$\Delta Rated_{adj}$	+	-0.021 (-0.85)	-0.020 (-0.81)	-0.022 (-0.90)
$\Delta Cash_{adj}$	+	0.101 (22.09)***	0.098 (22.02)***	0.098 (22.07)***
Observations		1,276	1,276	1,276
Adj. R-squared		0.2993	0.3232	0.3253

Note: ***, **, and * represent the 1%, 5% and 10% significance.

Variable Definition:

Peer firms: Firms that belong to the same industry as the scandal firms, where industry is defined by the 3-digit SIC codes.

Control group firms: Firms that have the same 2-digit SIC codes as the scandal firms, excluding the peer firms.

$\Delta Variable_{adj}$ represents a variable where peer firms' original value is adjusted for the control group. That is, an original change in that variable is subtracted by the median value of the control group. Detailed definitions are described in the following.

$\Delta R\&D_{adj}$: Measured as the change in the average of R&D expenditure (COMPUSTAT data item 46) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the three-year pre-scandal period

ROA_DIS: This variable is defined as ROA of scandal firms minus ROA of the peer firm, where ROA is defined as the average of earnings before extraordinary items (COMPUSTAT data item 18) divided by lagged total assets (COMPUSTAT data item 6) over the scandal period. If this value is less than zero, then we reset it to be zero.

Size_DISd: An indicator variable that equals one if the size difference between scandal firms and the peer firm is larger than the median, and zero otherwise, where size is measured as the average of the natural log of sales (COMPUSTAT data item 12) over the scandal period.

$\Delta Size_{adj}$: Measured as the change in the average of firm sales (COMPUSTAT data item 12) from the pre-scandal period to the scandal period divided by the average sales over the three-year pre-scandal period.

ΔMTB_{adj}: Measured as the change in the average of Market-to-Book ratio (measured as (COMPUSTAT data item 6- data item 60 + data item 25* data item 199) divided by data item 6) from the pre-scandal period to the scandal period.

$\Delta Rated_{adj}$: Measured as the change in the average of the indicator variable for whether the firm is rated by S&P from the pre-scandal period to the scandal period.

$\Delta Cash_{adj}$: Measured as the change in the average of cash holding (COMPUSTAT data item 1) from the pre-scandal period to the scandal period divided by the average total assets (COMPUSTAT data item 6) over the pre-scandal period.

Table 6: Correlations of future cash flows and capital expenditures for peer firms in pre-scandal vs. scandal periods

	Dependent Variables	CFO_{t+1}	CFO_{t+2}	CFO_{t+3}
VARIABLES	Prediction	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Intercept	?	0.044 (0.80)	-0.129 (-1.59)	-0.348 (-2.98)***
Scandal	-	-0.120 (-1.67)*	-0.065 (-0.61)	0.129 (0.84)
CAPEX	?	-0.044 (-0.67)	0.128 (1.34)	0.194 (1.39)
CAPEX*Scandal	-	-0.213 (-2.18)**	-0.514 (-3.55)***	-0.869 (-4.07)***
Size	+	0.237 (13.74)***	0.357 (14.14)***	0.459 (12.72)***
MTB	?	-0.044 (-3.74)***	-0.039 (-2.21)**	-0.028 (-1.10)
Rated	?	-0.429 (-4.14)***	-0.584 (-3.87)***	-0.739 (-3.43)**
CFO_t	+	0.553 (54.09)***	0.475 (30.95)***	0.492 (22.38)***
Observations		7,417	6,879	6,289
Adj. R-squared		0.4242	0.2461	0.1777

Note: ***, **, * represent the 1%, 5% and 10% significance.

Variable Definition: (All continuous variables are industry-adjusted: the median of each variable in the control group is subtracted from peer firms' original values)

Peer firms: Firms that belong to the same industry as the scandal firms, where industry is defined by the 3-digit SIC codes.

Control group firms: Firms that have the same 2-digit SIC codes as the scandal firms, excluding the peer firms.

CFO: Following Biddle et al. (2008), this variable is defined as cash flow from operation (COMPUSTAT data item 308) divided by sales (COMPUSTAT data item 12).

Scandal: In indicator variable that equals one for investments made in the scandal period, and zero otherwise.

CAPEX: This variable is defined as capital expenditure (COMPUSTAT data item 128) divided by lagged PP&E (COMPUSTAT data item 8).

Size: This variable is defined as the natural log of sales (COMPUSTAT data item 12).

MTB: This variable is defined as market value of total assets (COMPUSTAT data item 6 – data item 60 + data item 25* data item 199) divided by book value of total assets (COMPUSTAT data item 6).

Rated: This variable equals one if the firm is rated by the S&P, and zero otherwise. Peers' firms' original **Rated** is then adjusted by the median of control group firms in the same fiscal year.

Table 7: Correlations of future cash flows and R&D expenditures for peer firms in pre-scandal vs. scandal periods

	Dependent Variables	CFO_{t+1}	CFO_{t+2}	CFO_{t+3}
VARIABLES	Prediction	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Intercept	?	0.136 (1.84)*	0.139 (1.29)	0.110 (0.71)
Scandal	-	-0.113 (-1.11)	-0.163 (-1.09)	-0.133 (-0.62)
R&D	?	-1.179 (-4.09)***	-2.536 (-6.04)***	-4.64 (-7.69)***
R&D*Scandal	-	-0.517 (-1.33)	-1.226 (-2.13)**	-0.950 (-1.14)
Size	+	0.251 (10.97)***	0.363 (10.86)***	0.446 (9.30)***
MTB	?	-0.016 (-1.11)	0.032 (1.51)	0.081 (2.65)***
Rated	?	-0.707 (-4.74)***	-1.054 (-4.87)***	-1.242 (-4.03)***
CFO_t	+	0.558 (46.55)***	0.457 (25.48)***	0.443 (17.47)***
Observations		5,547	5,148	4,722
Adj. R-squared		0.4529	0.2785	0.2077

Note: ***, **, * represent the 1%, 5% and 10% significance.

Variable Definition: (All continuous variables are industry-adjusted: the median of each variable in the control group is subtracted from peer firms' original values)

Peer firms: Firms that belong to the same industry as the scandal firms, where industry is defined by the 3-digit SIC codes.

Control group firms: Firms that have the same 2-digit SIC codes as the scandal firms, excluding the peer firms.

CFO: Following Biddle et al. (2008), this variable is defined as cash flow from operation (COMPUSTAT data item 308) divided by sales (COMPUSTAT data item 12).

Scandal: In indicator variable that equals one for investments made in the scandal period, and zero otherwise.

R&D: This variable is defined as R&D expenditure (COMPUSTAT data item 46) divided by lagged total assets (COMPUSTAT data item 6).

Size: This variable is defined as the natural log of sales (COMPUSTAT data item 12).

MTB: This variable is defined as market value of total assets (COMPUSTAT data item 6 – data item 60 + data item 25* data item 199) divided by book value of total assets (COMPUSTAT data item 6).

Rated: This variable equals one if the firm is rated by the S&P, and zero otherwise. Peers' firms' original **Rated** is then adjusted by the median of control group firms in the same fiscal year.

Table 8: Determinants of change in CEO ownership for peer firms from pre-scandal to scandal periods

Dependent Variable: ΔCEO ownership$_{adj}$				
		Model (1)	Model (2)	Model (3)
VARIABLES	Prediction	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Intercept	+	2.006 (1.87)*	0.954 (0.81)	-0.288 (-0.23)
ROA_DIS	+		7,581 (1.35)	37.516 (3.13)***
Size_DISd	-		2.819 (0.86)	6.947 (1.95)*
ROA_DIS * Size_DISd	-			-38,642 (-2.82)***
ΔSize$_{adj}$	?	1.843 (0.33)	2.287 (0.41)	-0.641 (-0.11)
ΔMTB$_{adj}$	?	0.169 (0.34)	0.133 (0.26)	0.279 (0.55)
ΔRated$_{adj}$	?	-2.253 (-0.64)	-2.556 (-0.73)	-3.666 (-1.04)
Observations		321	321	321
Adj. R-squared		0.0019	0.0012	0.0228

Note: ***, **, and * represent the 1%, 5% and 10% significance.

Variable Definition:

Peer firms: Firms that belong to the same industry as the scandal firms, where industry is defined by the 3-digit SIC codes.

Control group firms: Firms that have the same 2-digit SIC codes as the scandal firms, excluding the peer firms.

ΔVariable$_{adj}$ represents a variable where peer firms' original value is adjusted for the control group. That is, an original change in that variable is subtracted by the median value of the control group. Detailed definitions are described in the following.

ΔCEO ownership$_{adj}$: Measured as the change in the average of CEO ownership (option exercise + restricted stock grant + purchase of shares – sale of shares) from three years before the scandal period (hereafter the pre-scandal period) to the scandal period divided by the average outstanding shares (COMPUSTAT data item 25) over the three-year pre-scandal period.

ROA_DIS: This variable is defined as ROA of scandal firms minus ROA of the peer firm, where ROA is defined as the average of earnings before extraordinary items (COMPUSTAT data item 18) divided by lagged total assets (COMPUSTAT data item 6) over the scandal period. If this value is less than zero, then we reset it to be zero.

Size_DISd: An indicator variable that equals one if the size difference between scandal firms and the peer firm is larger than the median, and zero otherwise, where size is measured as the average of the natural log of sales (COMPUSTAT data item 12) over the scandal period.

$\Delta Size_{adj}$: Measured as the change in the average of firm sales (COMPUSTAT data item 12) from the pre-scandal period to the scandal period divided by the average sales over the three-year pre-scandal period.

ΔMTB_{adj}: Measured as the change in the average of Market-to-Book ratio (measured as (COMPUSTAT data item 6- data item 60 + data item 25* data item 199) divided by data item 6) from the pre-scandal period to the scandal period.

$\Delta Rated_{adj}$: Measured as the change in the average of the indicator variable for whether the firm is rated by S&P from the pre-scandal period to the scandal period.