

OVER-REPORTING OF R&D BY CLASSIFICATION SHIFTING WITHIN CORE
EARNINGS

by

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Abstract

OVER-REPORTING OF R&D EXPENSE BY CLASSIFICATION SHIFTING WITHIN
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by

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This study investigates *classification shifting* from other operating expenses to *R&D* (CSR) as an earnings management tool. Investors assign higher valuation to R&D than to other expenses (Bublitz and Ettredge 1989), creating incentives for managers to classify other expenses as R&D. Using data on R&D intensive U.S. firms, I find evidence that is consistent with managers opportunistically engage in CSR. This type of classification shifting becomes more pervasive as managers approach retirement, as earnings fall short of analyst forecasts, as previous upward accruals accumulate, and in the fourth quarter. I use current and prior period variables to identify suspect firms that appear to engage in CSR. These firms experience lower future ROA and lower future stock returns than control firms. My study calls for caution in drawing inferences solely from reported R&D expenses.

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SECTION 1. INTRODUCTION

Research and development (R&D) is essential in creating intangible assets that are increasingly vital to corporate profits. Nevertheless, as future benefits of R&D endeavors are highly unpredictable, current U.S. GAAP requires R&D to be expensed as incurred.¹ Prior research finds that investors do recognize the potential future benefits of R&D and assign higher market values to R&D expenses than to other operating expenses (Bublitz and Ettredge 1989; Chauvin and Hirschey 1993; Hall 1993; Lev and Sougiannis 1996; Aboody and Lev 2000). In addition, prior research finds that large increases in R&D expenditures predict high future abnormal returns (Eberhard, Maxwell and Siddique 2004), indicating that investors under-react to the positive information content of R&D expenses.

Since R&D is perceived by investors as an investment rather than an expense, managers have the incentive to classify ordinary operating expense as R&D expenses.² I refer to this behavior as “classification shifting from other operating expenses to *R&D* (CSR).” Not only do managers have the incentive to engage in CSR, they may also have the means to do so; current guideline for R&D reporting (SFAS2) provides a general description of R&D activities, but also states that the list is non-exhaustive due to the fast evolving nature of R&D projects. As a result, managers have substantial discretion in classifying other operating expenses as R&D expenses.

¹ Current financial reporting requirement for R&D is outlined in Statement of Financial Accounting Standard 2 (SFAS2), FASB 1974. FASB permits certain software development cost to be capitalized. SFAS 86 divide the life of a software product into three stages: before technical feasibility, software production, and available for general release. R&D expenditures in the second stage (software production) can be capitalized.

² The classification shifting between operating and non-operating expenses are examined by several prior studies (McVay 2006; Barua et al. 2010). This paper focuses on classification shifting between core expenses.

This study examines whether managers engage in CSRD. This is an interesting question because despite prior evidence of classification shifting between core and non-core earnings (McVay 2006; Fan, Barua, Cready, and Thomas 2010; Barua, Lin, and Sbaraglia2010), expense shifting within core earnings remains unexplored. In the previous paragraph I argued why CSRD may take place. Now I discuss several reasons that CSRD may not happen: First, to the extent that financial statement users treat all components of core earnings as equals, CSRD would be pointless. But as earlier studies have shown, investors do assign higher valuation to R&D expenses than to other operating expenses. It remains as an empirical question whether the valuation difference between different categories of core expenses creates a strong enough incentive for managers to engage in classification shifting. Second, R&D for tax purpose has been scrutinized by regulators in recent years. Under U.S. Internal Revenue Code (IRC), firms can reduce their federal tax liability by 20 percent of qualified increase in R&D in the form of tax credit. Even though R&D financial reporting does not conform to R&D tax reporting, reported R&D and R&D for tax purpose are usually correlated, so Internal Revenue Service (IRS)'s scrutiny on R&D tax credit could inhibit over-reporting of R&D. Finally, R&D expenses are arguably less random than special items and discontinued operations, and are discussed more in financial statements than discontinued operations, so investors may be able to form better expectation for R&D expenses, which may induce managers to engage in CSRD in order to maintain the appearance of R&D level, but also mightmake it more difficult for managers to inflate reported R&D too much from previous years.

When it comes to earnings management, managers have many alternatives other than CSR. The two most well-known approaches are accrual management and real earnings management. Compared to these two approaches, CSR offers a few advantages: classification shifting is arguably less costly compared to accrual management, as there is no future period accrual reversal to contend with. In addition, CSR might be more difficult for auditors to detect, as the baseline core earnings do not change, and managers have discretion in defining R&D expenses under current US GAAP. Compared with R&D cut (real earnings management, Dechow and Sloan 1993; Darrrough and Rangan 2005), CSR increases the reported R&D level without incurring R&D spending. At the same time, expenses valued lower than R&D by the market are reduced. What is more, CSR and other forms of earnings management could be used in conjunction: For example even if real R&D is cut, CSR could boost earnings while maintaining the appearance of R&D investment.

Anecdotal evidence suggests that managers opportunistically categorize other operating expenses as R&D expenses. For example, the SEC found in 2003 that MaxWorldwide classified \$26 million regular operating expense (about 1/5 of the total operating expense) as R&D expense for the year 2001 and 2002. The SEC deemed that MaxWorldwide had no real R&D expense for 2001 and 2002. A single example of violation, however, may not represent the behaviors of other R&D firms. Thus, whether or not managers shift other operating expenses to R&D expense is an empirical question, and is the focus of this study. If some managers shift other core expenses to R&D, I expect to find a significantly negative association between discretionary (change in) R&D and (change in) other operating expenses in cross-sectional studies.

For a sample of U.S. public firms from 1975-2011, I decompose the changes and levels of R&D expenses into non-discretionary and discretionary components. I find a significantly negative association between the discretionary components of R&D and Operating Expense before R&D (OXBRD) (as a sensitivity test, I also find a significantly negative association between R&D and OXBRD after controlling for other firm characteristics.) This association is consistent with managers classifying other operating expenses as R&D.³

The negative association between discretionary R&D and discretionary OXBRD is also consistent with the notion that firms assign a fixed total amount (relative to total assets) to all operating expenses ("fixed operating expense" explanation). In such a case, as one type of operating expense increases, the rest has to decrease. To see if the negative association could be due to firms having a fixed operating expense rather than CSR, I perform three additional tests. First, to the extent that fixed operating expense argument is true, one would expect to find the same negative association between SG&A expense (excluding R&D) and Operating Expense before SG&A (OXBSGA), and between cost of goods sold (COGS) and Operating Expense before COGS (OXBC). Instead I find a significantly positive association for both cases. Second, if fixed operating expense induces the negative association, then the negative association should be stronger when a relatively non-discretionary expense (namely OXBRD) increases. Managers have incentives to shift other expenses to R&D, but not vice versa. So if classification shifting explains most of the negative association, then I expect the negative association to be

³I acknowledge that managers may sometimes wish to shift R&D to other operating expenses for proprietary reasons. In this paper however I focus on examining the likelihood of classification shifting from other operating expense to R&D.

more pronounced when the change in discretionary R&D is positive. Consistent with the classification shifting explanation, I find the negative association becomes stronger when discretionary change in R&D is positive. Third, if classification shifting causes the negative association, then I expect to find R&D to be more negatively associated with a type of expense that is easy to be categorized as R&D. It is more convenient to categorize other SG&A rather than COGS as R&D expense.⁴ Consistent with the classification shifting explanation, other SG&A is negatively associated with R&D, while COGS is not significantly associated with R&D.

Next I examine the negative association between discretionary change in R&D and change in OXBRD under several scenarios involving different managerial incentives for earnings management, because previous research finds that earnings management takes place when managers have incentives and opportunities (Burgstahler, Hail, and Leuz 2006). First, managers may have increased incentive to manage earnings when they approach retirement. Dechow and Sloan (1993) finds that managers cut R&D expenditures when they are close to retirement. I find a stronger negative association between discretionary change in R&D and change in OXBRD when managers are close to retirement, suggesting that managers may camouflage R&D cutting by shifting other operating expense to R&D. Second, Skaife, Swenson and Wangerin (2012) posit and find that managers report higher discretionary R&D when earnings just miss the consensus analyst forecast. In the same vein, I find a stronger negative association between discretionary change in R&D and change in OXBRD when earnings are below the analyst forecast. These results are consistent with classification shifting (an earnings

⁴ For most U.S. firms, reported SG&A expenses are comprised of R&D and other SG&A expenses.

management behavior) causes the negative association between discretionary change in R&D and change in OXBRD. Other explanations for this negative association seem unlikely, unless they are correlated with earnings management incentives by certain unknown mechanisms.

To the extent that managers have already managed accruals upward in previous years, their ability to maintain positive accruals in the current period is constrained. I posit and find that the association between R&D and OXBRD is more negative as a firm's previous positive accruals (measured as firms' net operating assets) accumulate. Similarly, prior studies suggest that managers are less likely to engage in accrual manipulation in the fourth quarter as it is subject to auditor scrutiny (Brown and Pinello 2007). I posit that since a manager's ability to manipulate accruals is constrained in the fourth quarter, CSRD is likely to increase. My results support this hypothesis.

CSRD may also vary with a managers' ability to shift expenses across categories. I argue that as R&D expenses increase relative to asset, it will be easier to hide other expenses as R&D, thus manager's ability to do classification shifting increases. Consistent with this argument, the negative association between changes in R&D and changes in OXBRD becomes stronger as R&D increases relative to lagged assets.

Next, I use *ex-ante* and event year variables to identify firms that seem to engage in CSRD ("suspect" CSRD firms), and select matched control firms by size, industry, and ROA. I examine the event year and future stock returns, as well as future ROA of those firms to see if suspect and control firms differ in their performance. First, if my method correctly identifies suspect CSRD firms I expect to see lower future ROA for them compared to control firms. If the market is able to detect the manipulation in the event

year, I should find significantly more negative stock returns for suspect CSRD firms in event year, and no difference in stock returns afterwards. If the market is unable to detect CSRD in the event year, then I expect to find significantly more negative stock returns for suspect CSRD firms only in subsequent years. The empirical results indicate that the market react similarly to suspect CSRD and control firms in the event year. However, perhaps due to the lack of investment in intangible assets, the suspect firms' year $t+1$ to year $t+5$ ROA deteriorate, and their year $t+1$ to year $t+5$ stock returns significantly decrease relative to control (non-suspect) firms.

To my knowledge this is the first study that provides evidence that managers over-report R&D by engaging in classification shifting from OXBRD to R&D. My contribution to the accounting literature is threefold. First, my results extend the classification shifting literature by suggesting that not all operating expenses are equal and that managers classify other operating expenses as R&D expense. This is important because by the year of 2010, over 42% of U.S. public companies report some R&D, and the mean (median) R&D expense of the R&D reporting firms is 34.3% (11.4%) of revenues, about three times larger in scale than average special items and twenty-two times larger than discontinued operations. Second, I contribute to the valuation literature by developing an *ex-ante* method to predict future returns on R&D. Last, my study shows that not all reported R&D expenditures are *bona fide*. Thus, the study calls for careful interpretation of previous results based on examining the levels and changes only in the R&D account.

My study is related to that of Skaife, Swenson and Wangerin (2012) in that both papers examine the authenticity of reported R&D expenses. The key difference is that

Skaife et al. (2012) examine firms' discretionary R&D reporting associated with the R&D tax-credit incentive and the incentive to justify missing earnings expectations. In contrast, my paper examines the interplay between discretionary changes in R&D and changes in OXBRD. In addition, I define "suspect" CSR firms by examining the discretionary changes in R&D and OXBRD, current year cash holding, and current year net stock issuance. The suspect CSR firms experience lower stock returns compared to control firms in the subsequent years. As my approach identifies suspect firms in the event year, it is better suited to aid interested parties in detecting R&D expense manipulation. Together the results of both papers support the existence of R&D over-reporting.

This paper proceeds as follows. Section 2 illustrates the details of R&D expense reporting, provides background information about classification shifting, and develops hypotheses. Section 3 presents my research design. Section 4 reports the results of empirical tests. Section 5 concludes the paper with a summary and a discussion of possible future research.

SECTION 2. LITERATURE REVIEW

2.1. RESEARCH AND DEVELOPMENT

R&D is a key driver of economic growth and progress in social welfare. Earlier studies in economics find the private rate of return on R&D is between 7 to 25 percent, the social rate of return is between 30 to 60 percent (Temple 1999).

U.S. Corporations and the Federal Government are the two primary sources of financial support for the U.S. R&D projects. The majority of basic research is conducted by research universities and supported by U.S. Government. Still, corporations funds about two-thirds of U.S. R&D. R&D spending is highest in sectors such as computer hardware and software, pharmaceutical companies, and electronic devices.

The past decades saw an increase in R&D investments, consistent with R&D playing an increasingly more critical role for modern economies. In 2010, U.S. public firms spent 34.3% of their aggregate earnings on R&D (Hirschey, Skiba and Wintoki 2012).

Nevertheless, the future benefits of R&D projects are much more unpredictable than that of traditional capital investments (Kothari, Laguerre, and Leone 2002). In October 1974, the FASB issued SFAS No. 2, which requires all firms to expense R&D costs as incurred¹. Nevertheless the market still value R&D as an investment rather than an expense (Bublitz and Ettredge 1989; Chauvin and Hirschey 1993; Hall 1993, Joos and Plesko 2005).

It has been argued that expensing of R&D expenditure may induce managers to behave myopically and reduce their R&D investments when earnings are less than ideal.

While successful R&D projects bring higher compensations and better career opportunities for the managers, R&D expenses have an immediate negative impact on current period earnings. As a result, myopic managers may have incentive to cut R&D expenses to meet current earnings target. Indeed, previous studies show that managers opportunistically reduce R&D spending (real earnings management) to window-dress short-term firm performance when they approach retirement (Dechow and Sloan 1991), when firms face small earnings declines (Baber, Fairfield and Haggard 1991), and before IPO (Darrough and Rangan 2005).

Compensation committees apparently recognize this potential pitfall. Cheng (2004) suggests that compensation contracts may reward managers who take on R&D projects. Using a sample period later than that of Dechow and Sloan (1991), he finds that managers do not cut R&D expenditure when they approach retirement or when firms miss earnings thresholds. His interpretation of the result is that optimized compensation contracts curb myopic R&D cuts.

2.2. CLASSIFICATION SHIFTING

"Earnings management is...purposeful intervention in the external financial reporting external process with intent to obtain some private gain"

--Schipper (1989)

As an earnings management tool, classification shifting is distinct from accrual management and the manipulation of real activities in two ways. First, classification shifting does not allow managers to boost current period GAAP earnings *per se*⁵. Instead

⁵Classification shifting may help to increase GAAP earnings when coupled with real earnings management. For example, I posit that if managers cut R&D (real earnings management) and also engage in CSR, D

it affects investors' assessment of firms by rearranging components of GAAP earnings, because individual components of the income statement are meant to be informative beyond aggregate earnings (FASB Accounting Concept No. 5; Lipe 1986; Elliot and Hanna 1996). Second, unlike accruals management, classification shifting is not associated with accrual reversal.

McVay (2006) and Fan et al. (2010) find evidence that managers shift core expenses to special items to overstate core earnings. In the same vein, Barua et al. (2010)'s finding is consistent with managers shift core expenses to discontinued operations. Other studies find that managers adapt their classification shifting behaviors to new disclosure environments as the regime changes (Kolev, Marquardt and McVay 2008; Anatharaman, Darrrough and Lee 2012).

My study differs from McVay (2006), Fan et al. (2010), and Barua et al. (2010) in that I examine classification shifting among different core expenses. Nonetheless, this study shares one common theme with the previous classification shifting literature: managers tend to shift expenses from categories that strongly and negatively influence investor's valuation of the firms to categories that do not have such an impact.

R&D levels would appear to be normal, ordinary expense would decrease and GAAP earnings would increase.

SECTION 3. HYPOTHESES DEVELOPMENT

Previous studies have shown that *ceteris paribus*, the market gives higher valuation to R&D expenses than to other operating expenses (Bublitz and Ettredge 1989; Chauvin and Hirschey 1993). As a result, managers may have incentives to label other operating expenses as R&D expenses. As the hypothetical illustration demonstrated in Figure 1, this switch will not result in a change in core earnings. Nevertheless, it will increase R&D, which is seen by investors as investments, and decrease other operating expenses.

Several mechanisms may prevent such classification shifting behavior. First, auditors might be able to detect and stop such manipulation before the public release of financial statements. Second, regulators have incentives to verify R&D expenditures that qualify for the R&D tax credit. Third, investors may see through this behavior and correctly price the company, rendering R&D classification shifting futile.

Nevertheless, it could be potentially difficult to detect CSRD, as managers have discretion in categorizing R&D expenses. Thus, I state my main hypothesis in alternative form:

Hypothesis 1: Managers classify other operating expenses (OXBRD) as R&D expenses.

Managers weigh the expected benefits and costs as they deliberate whether to engage in classification shifting. In addition to the cost of detection, classification shifting using R&D expenses increases investor expectation for future periods. I predict CSRD behavior would increase as the expected benefits of CSRD rise and as the expected cost decreases.

Specifically, theory predicts that the manager who plans to retire has fewer incentives to act in the best interest of the firm than the manager who plans to stay (e.g., Smith and Watts 1982; Dechow and Sloan 1991; Gibbons and Murphy 1992). As the manager approaches retirement, the tie between future firm performance and manager's personal wealth weakens, so high investor expectation of the firm subsequent to classification shifting is less costly to the managers. Holding the benefits of classification shifting constant, I posit that managers will classification-shift more as they are close to retirement.

The benefits of over-reporting of R&D are expected to be particularly high when it allows the firm to divert investor attention to less than expected earnings (Skaife et al. 2012). Therefore, holding the cost of shifting constant, I expect managers to classification-shift to a greater degree when earnings miss analyst forecasts.

***Hypothesis 2a:** Managers classify more OXBRD as R&D when they approach retirement.*

***Hypothesis 2b:** Managers classify more OXBRD as R&D when earnings miss analyst forecasts.*

Manager's inclination to shift other expenses to R&D is likely to be affected by their ability to do accrual manipulation. When accrual management becomes more costly, managers are more likely to switch to other forms of earnings management, including CSRD.

To the extent that managers have already managed accruals upward in previous time periods, their ability to further manage accruals upward in the current time period is constrained. As an alternative, managers may classification shift to a greater degree.

Previous studies suggest that managers engage in less accrual manipulation during the fourth quarter because of auditors' scrutiny. As a result, managers who wish to window-dress firm performance may resort to CSRD. On the other hand, CSRD might be more difficult during the fourth quarter precisely because annual financial statements are audited. I write hypothesis 3 in alternative form:

***Hypothesis 3a:** Managers classify more OXBRD as R&D when they have previously managed accruals upward.*

***Hypothesis 3b:** Managers classify more OXBRD as R&D during the fourth quarter.*

CSRD may be less convincing if the company does not regularly incur R&D expenditures. As R&D increases relative to total assets, it will be easier for managers to shift other expenses to R&D without being detected. I present hypothesis 4 in alternative form:

***Hypothesis 4:** Managers classify more expense as R&D when R&D percentage relative to total asset increases.*

How do investors respond to CSRD? Do investors correctly price the firm that engages in this type of maneuver? The efficient market theory predicts that investors who follow the firm's performance should be able to discern earnings manipulations from available information. Nonetheless, managers have discretion in defining R&D expenses.

In addition, classification shifting does not change core earnings, nor does it create abnormal accruals. So it might be difficult for investors to detect this without examining the detail record of R&D expenses.

I present hypothesis 5 in null form. It is important to note that the test of hypothesis 5 is a joint test of the validity of the hypothesis and the effectiveness of my method to detect firms that might have engaged CSRD (suspect firms).

Hypothesis 5: Ceteris Paribus, the market values firms that engages in CSRD similarly to other firms in the period of classification shifting

How does CSRD affect future firm performance and future stock returns? Unlike *bona fide* R&D expenditures, OXBRDs classified as R&D expenses will not create intangible assets. So *ceteris paribus*, firms with "shifted" R&D expenses are likely to see lower future earnings and likely to experience lower stock returns than similar firms with authentic R&D. I state hypothesis 6 in alternative form:

Hypothesis 6: Ceteris paribus, the firms that classify OXBRD as R&D expense see worse future earnings performance and lower future stock returns than the firms that do not.

SECTION 4. DATA AND METHODOLOGY

Data are obtained for the years 1975 to 2011 from the Annual and Quarterly Compustat File, ExecuComp database, CRSP database, and I/B/E/S Split-Unadjusted File. Each firm-year observation is required to have sufficient data to test hypothesis 1. Firms are required to report R&D expense that exceeds 0.5% of sales. Firms that had a fiscal-year-end change are deleted to help ensure that years are comparable. I also impose a minimum requirement of 15 observations per industry per fiscal year in order to ensure a sufficiently large pool to estimate expected expenses. Industries are as defined in Fama and French (1997).

Table 1 provides the detail of the sample selection procedure, and the sample composition by industry. Table 2 provides descriptive statistics for these variables, lists the definitions of variables used in the analyses, and presents correlations among the main variables.

Table 1 and 2 here

Measuring CSR expense:

I expect change in other operating expenses in year t to be decreasing in discretionary change in R&D expense (R&D minus predicted R&D) in year t if managers are shifting expenses. In order to be consistent with previous studies, I also model the level of those expenses and examine the relation between the discretionary components. Change models are in general less plagued with correlated omitted variable issues, so I choose the change model to be my main test and supplement it with the level model.

Estimation Models:

To estimate the discretionary R&D and discretionary other expenses, I run a regression of R&D or other expenses on predictive variables, and take the residual as discretionary expenses. Regressions are estimated by industry and fiscal year excluding firm *i*. To select control variables, I draw on previous literature (Darrough and Rangan 2005; Fan et al. 2010; and Anatharaman, Darrough and Lee 2012). I attempt to control for individual firm performance as well as for macroeconomic and industry shocks.

Model of Discretionary Changes in R&D Expense:

$$\begin{aligned} \Delta R \& D_t = & \alpha + \lambda_1 R \& D_{t-1} + \lambda_2 \Delta R \& D_{t-1} + \lambda_3 Ind \Delta R \& D_t + \sum \lambda Profitability_Measures \\ & + \sum \lambda Cashflows_Measures + \sum \lambda Investment_Choices \\ & + \sum \lambda Other_Characteristics + \varepsilon_t \end{aligned} \tag{1}$$

Dependent variable:

$$\Delta R \& D_t = \text{change in R\&D expense (Compustat item XRD).}$$

Control Variables:

$$R \& D_{t-1} = \text{lagged R\&D expense}$$

$$\Delta R \& D_{t-1} = \text{lagged change in R\&D expense}$$

Profitability_Measures :

$$\begin{aligned} \Delta ROAB_t = & \text{change in return over assets before R\&D expense} \\ & \text{(Compustat item (IBCOM+XRD)/lagged AT)} \end{aligned}$$

$NEG\Delta$ = dummy variable that equals 1 when $\Delta ROAB_t$ is negative, and 0 otherwise

$NEG\Delta * \Delta ROAB$ = interaction term

$\Delta SALES_t$ = change in sales revenue (Compustat SALE)

$SALES_{t-1}$ = lagged sales

$ACCRUALS$ = current accruals

Cashflows _ Measures

$\Delta CASH_t$ = change in cash (Compustat item CHE)

ΔOCF_t = change in operating cash flow (Compustat item OCF)

OCF_{t-1} = lagged operating cash flow

$\Delta FINCF_t$ = change in financing cash flow (Compustat item FINCF)

Investment _ Choices

$\Delta CAPX_t$ = change in capital expenditures (Compustat CAPX)

ΔPPE_t = change in property plant and assets (Compustat PPE)

$\Delta INTAN_t$ = change in intangible assets (Compustat INTAN)

Other _ Characteristics

ΔLEV_t = change in leverage (Compustat LT/AT)

$RETURNS_t$ = annual stock returns (CRSP)

where all variables are scaled by lagged asset except for $NEG\Delta$, $\Delta SALES$, ΔLEV and $RETURNS$.

My first two control variables are lagged R&D and lagged change in R&D. I include these two variables because R&D expense is persistent, and the annual change in R&D can be part of an overall trend.

Next I include profitability measures: $\Delta ROAB_t$, $NEG\Delta_t * \Delta ROAB_t$, $NEG\Delta_t$, $\Delta SALES_t$, and lagged $SALES$, as company's profitability level would likely affect R&D investment. Accrual component of earnings is a predictive variable for firm's future performance and may reflect the development stage of the firm. Thus, I include accrual variables in my estimation model.

The level of cash affects manager's investment decisions, so I also include cash and cashflow variables in my model: $\Delta CASH_t$, ΔOCF_t , OCF_{t-1} , and ΔFCF_t .

The next set of variables speaks to investment choices. Capital expenditure is an alternative to R&D investment in manager's decision making. Therefore, I include $CAPX$ and long term assets (PPE) in my model. I also include intangible ($INTAN$) in the model, as the level of intangible assets reflect how firm acquire intangibles: either through internal $R\&D$ (which in general does not change the recorded intangible assets level) or through purchasing other firms.

The final set of variables includes other firm characteristics. I use leverage to capture corporate capital structure, and current period return to capture news conveyed in market information. Each of the variables is also described in detail in Table 2 panel B.

The term ε_t in the above model is the discretionary component of $\Delta R\&D_t$.

Model of Discretionary R&D Expense:

$$\begin{aligned} R \& D_t = \alpha + \lambda_1 R \& D_{t-1} + \lambda_2 IndR \& D_t + \sum \lambda Profitability_Measures \\ & + \sum \lambda Cashflows_Measures + \sum \lambda Investment_Choices \\ & + \sum \lambda Other_Characteristics + \varepsilon_t \end{aligned}$$

(2)

Dependent Variables:

$$R \& D_t = \text{R\&D expense in year } t \text{ (Compustat item XRD).}$$

Control Variables:

$$R \& D_{t-1} = \text{lagged R\&D expense}$$

Profitability_Measures :

$$ROAB_t = \text{change in return over assets before R\&D expense} \\ \text{(Compustat item (IBCOM+XRD))}$$

$$NEG = \text{dummy variable that equals 1 when } ROAB_t \text{ is negative,} \\ \text{and 0 otherwise}$$

$$NEG * ROAB = \text{interaction term}$$

$$SALES_{t-1} = \text{lagged sales/lagged AT}$$

$$ACCRUALS_t = \text{current accruals}$$

Cashflows_Measures

$$CASH_t = \text{cash in year } t \text{ (Compustat item CHE)}$$

OCF_t	=	operating cash flow in year t (Compustat item OCF)
OCF_{t-1}	=	lagged operating cash flow
$FINCF_t$	=	change in financing cash flow in year t (Compustat item FINCF)

Investment _ Choices

$CAPX_t$	=	capital expenditures in year t (Compustat CAPX)
PPE_t	=	property plant and assets in year t (Compustat PPE)
$INTAN_t$	=	intangible assets in year t (Compustat INTAN)

Other _ Characteristics

LEV_t	=	leverage in year t (Compustat LT/AT)
$RETURNS$	=	annual stock returns (CRSP)

Where all variables are scaled by lagged asset except for *NEG*, *SALES*, *LEV* and *RETURNS*. I use the same rationale to choose control variables for the level model as for the change model. However, I use the level instead of the change of these variables.

Table 3 here

To estimate discretionary $\Delta OXBRD$, $\Delta SGABRD$ and $\Delta COGS$, I use similar approaches to choose control variables. (The regression statistics of the following models are presented in appendix 4.)

Model of Discretionary Changes in Operating Expense before R&D

$$\begin{aligned}\Delta OXBRD_t = & \alpha + \lambda_1 OXBRD_{t-1} + \lambda_2 \Delta OXBRD_{t-1} + \lambda_3 Ind \Delta OXBRD + \sum \lambda Profitability_Measures \\ & + \sum \lambda Cashflows_Measures + \sum \lambda Investment_Choices \\ & + \sum \lambda Other_Characteristics + \varepsilon_t\end{aligned}\tag{3}$$

Model of Discretionary Changes in SG&A Expense before R&D:

$$\begin{aligned}\Delta SGABRD_t = & \alpha + \lambda_1 SGABRD_{t-1} + \lambda_2 \Delta SGABRD_{t-1} + \lambda_3 Ind \Delta SGABRD \\ & + \sum \lambda Profitability_Measures + \sum \lambda Cashflows_Measures \\ & + \sum \lambda Investment_Choices + \sum \lambda Other_Characteristics + \varepsilon_t\end{aligned}\tag{4}$$

Model of Discretionary Changes in Cost of Goods Sold (COGS):

$$\begin{aligned}\Delta COGS_t = & \lambda_1 COGS_{t-1} + \lambda_2 \Delta COGS_{t-1} + \lambda_3 Ind \Delta COGS_t + \sum \lambda Profitability_Measures \\ & + \sum \lambda Cashflows_Measures + \sum \lambda Investment_Choices \\ & + \sum \lambda Other_Characteristics + \varepsilon_t\end{aligned}\tag{5}$$

SECTION 5. EMPIRICAL RESULTS

First, I examine hypothesis 1 by regressing discretionary changes or levels of R&D ($Disc\Delta R\&D$ and $DiscR\&D$) on changes or levels of other operating expenses (operating expense before R&D: $OXBRD$) and control variables. Besides the control variables that already appeared in equation (1) and (2), I also include market to book (MB), log market value ($SIZE$), earnings to price (EP) and dividend to price (DP) ratios, and (changes in) GDP in the following models.

$$\begin{aligned}
 Disc\Delta RD_t = & \alpha + \lambda_1 \Delta OXBRD_t + \lambda_2 R\&D_{t-1} + \lambda_3 Ind\Delta R\&D_t + \sum \lambda Profitability_Measures \\
 & + \sum \lambda Cashflows_Measures + \sum \lambda Investment_Choices + \sum \lambda Other_Characteristics \\
 & + \varepsilon_t
 \end{aligned}
 \tag{6}$$

$$\begin{aligned}
 DiscRD_t = & \alpha + \lambda_1 OXBRD_t + \lambda_2 R\&D_{t-1} + \lambda_3 IndR\&D_t + \sum \lambda Profitability_Measures \\
 & + \sum \lambda Cashflows_Measures + \sum \lambda Investment_Choices + \sum \lambda Other_Characteristics \\
 & + \varepsilon_t
 \end{aligned}
 \tag{7}$$

Where I include four more variables of “other firm characteristics”:

EP_t = Earnings per share divided by price (Compustat item
EPSPX/PRCC_C)

$D2P_t$ = Dividend per share divided by price (Compustat item
DVPXS_C/PRCC_C)

GDP_t = GDP of year t

Or ΔGDP_t = Δ GDP of year t

Table 4 here

If managers classify other operating expenses as R&D, then I expect to find a significantly negative relation between discretionary *R&D* and *OXBRD*. Table 4 reports regression results from equation (6) and (7), and regression on two samples: (1) all Compustat firms, (2) those firms with higher than 100,000 lagged assets, respectively. For equation (6), the coefficient on $\Delta OXBRD_t$ is negative and significant for both complete samples ($\lambda_1 = -0.011$, $t = 7.12$) and the subsample of larger firms ($\lambda_1 = -0.064$, $t = 17.1$). For equation (7), the coefficient on $OXBRD_t$ is also negative and significant on both complete samples ($\lambda_1 = -0.034$, $t = 11.47$) and the larger sample ($\lambda_1 = -0.091$, $t = 18.07$). Therefore, my results appear to be consistent with H1, and are also robust to different samples and different models.⁶

The negative association between *OXBRD* and discretionary *R&D* is consistent with classification shifting, but may be due to other reasons as well. For example, if managers have a “fixed budget” for total operating expenses, then when one component increases, the others have to decrease, creating a negative association. I conduct four tests to differentiate the “fixed budget” from “classification shifting” explanations.

⁶ As a sensitivity test, I directly regress (changes in) R&D on (changes in) OXBRD and control variables, and also find a negative and significant association between (changes in) R&D and (changes in) OXBRD. The test results are presented in Appendix 1. My inference remains the same if I decompose OXBRD into discretionary and non-discretionary components, and examine the association between discretionary (changes in) R&D and discretionary (changes in) OXBRD (Untabulated). In addition, I also obtained two-way (time-series and cross-section) cluster robust residuals as presented in Appendix 2. My inference is unchanged.

First, if fixed budget for total operating expense is the underlying reason for the negative association between discretionary *R&D* and *OXBRD*, then I would expect to find similar negative associations between discretionary SG&A expense before R&D (*SGABRD*) and operating expense before *SGABRD* (*OXBS*), and between discretionary *COGS* and operating expenses before *COGS* (*OXBC*). So next I take the discretionary component of changes in *SGABRD* and *COGS* from equation (4) and (5), and run them on changes in *OXBS*, *OXBC* and control variables:

Table 5 here

The first two columns of Table 5 examine the association between discretionary $\Delta SGABRD$ and $\Delta OXBS$ for the complete sample and the larger sample. The coefficients on $\Delta OXBS$ are consistently positive and significant. The next two columns test the association between discretionary $\Delta COGS$ and $\Delta OXBC$. Similarly, I find the coefficients to be significantly positive. These results argue against the existence of a fixed budget for total operating expense.

Second, I argue that if fixed budget causes the negative association between discretionary *R&D* and *OXBRD*, then I expect to see a negative association between discretionary *R&D* and *OXBRD*, as well as when *OXBRD* increases and discretionary *R&D* decreases. In fact, I believe the negative association should be even stronger as *OXBRD* increases, because *OXBRD* is a more persistent expense than *R&D* is. On the contrary, if this negative association is due to classification shifting, then it is easy to see why managers would want to shift other operating expenses to *R&D*, as *R&D* expense is valued higher by investors, but not *vice versa*. As the result, the negative association between discretionary *R&D* and *OXBRD* should be stronger when discretionary *R&D* is

positive. As such, I run equation (6) and (7) conditioning on the level of discretionary *R&D*:

Table 6 here

I find significantly negative coefficients on the interaction term $\Delta OXBRD * PosdARD$ ($\Delta OXBRD$ is multiplied by an indicator variable that equals 1 when discretionary change in *R&D* is positive) and $OXBRD * PosdRD$. These results suggest that in general *OXBRD* expenses are shifted to *R&D*, rather than the other way around, consistent with the classification shifting hypothesis. The negative and significant coefficients on $\Delta OXBRD$ and $OXBRD$ either indicate that classification shifting from *R&D* to other operating expenses does exist on a smaller scale; Or that some other mechanisms besides classification shifting can cause the negative association.

Third, I look at the associations between discretionary changes in *R&D* and components of operating expenses separately. Managers may be able to convince auditors that certain *SG&A* expense can be categorized as research and development expense, but it is relatively difficult to shift *COGS* to *R&D*. If classification shifting hypothesis explains much of the negative association, I would expect to find a stronger negative association between $SGABRD$ and discretionary *R&D* than between *COGS* and discretionary *R&D*. I carry out the next two tests:

Table 7 here

Consistent with the classification shifting hypothesis, I find a significantly negative association between $\Delta SGABRD$ and discretionary $\Delta R\&D$ ($\lambda_1 = -0.014$, $t=3.25$), and only a marginally significantly negative association between $\Delta COGS$ and discretionary

$\Delta R\&D$ ($\lambda_1 = -0.005$, $t = -1.68$). The results indicate that classification shifting plays an important role in explaining the negative association between $\Delta OXBRD$ and discretionary $\Delta R\&D$.

Fourth, if the increase in R&D associated with the decrease in OXBRD is due to management manipulation, then I would expect to see a reversal in the subsequent period. Therefore, I regress discretionary (changes in) $R\&D$ in year $t+1$ on (changes in) $OXBRD$ and control variables. In Table 8, I show that the coefficients on $\Delta OXBRD$ (column 1) and $OXBRD$ (column 2) are both significant and positive, consistent with the increase in R&D reverse in year $t+1$.

Table 8 here

Mergers and acquisitions may change the business nature of the company. To confirm that my results are not driven by M&A activities, I conduct sensitivity tests excluding in-process R&D from calculating $R\&D$ and discretionary $R\&D$. The results are unchanged (Appendix 3).

Hypothesis 2a posits that classification shifting will be more pronounced when managers approach retirement. Departing managers may have a reduced interest in company's future intangible assets and care less about potential stock price reversals. As the cost of classification shifting decreases, holding the benefit of shifting constant, I expect to find more evidence of shifting. I create an indicator variable, which equals 1 when managers are 63 or above and retiring that year, and interact it with $\Delta OXBRD$. I include both the indicator variable and the interaction term in the following regression:

Table 9 here

In Table 9, the coefficient on $\Delta OXBRD * retire$ is negative and significant, consistent with hypothesis 2a. An examination of the *R&D* and *OXBRD* level around retirement years shows that those years see lower *OXBRD* but regular *R&D* expenditures, which is also consistent with the classification shifting hypothesis.

Hypothesis 2b predicts that CSRD will be more pervasive in periods when manager need to justify missing forecasted earnings targets by over-reporting R&D. To test hypothesis 2b, I create an indicator variable (*Missing*) that equals one when firms miss the analyst forecasts by one cent or more, and zero otherwise. Then I interact the indicator variable with $\Delta OXBRD$. I include both the indicator variable and interaction term in the following regressions:

Table 10 here

Table 10 reports the regression of *DiscAR&D* on $\Delta OXBRD$, *Missing*, $\Delta OXBRD * Missing$ and control variables. The significantly negative coefficient ($\lambda_1 = -0.034$, $t=4.43$) on $\Delta OXBRD * Missing$ is consistent with managers shifting more OXBRD to R&D when earnings miss analyst forecast targets, thus consistent with Hypothesis 2b.

Hypothesis 3a suggests that managers who are more constrained in their ability to manipulate accruals because of previous accrual manipulation are more likely to resort to CSRD. First, CSRD shifts expenses to a category which is valued higher by investors; second, managers may cut R&D to boost current period earnings, and camouflage the cut by shifting OXBRD to R&D. Following Fan et al. (2010), I measure managers' accrual manipulation constraint using net operating assets (*NOA*) at the beginning of the period. Firms that have reported positive accruals in prior periods usually have higher net operating assets (Barton and Simko 2002). I define *highNOA* as an indicator variable that

equals one when a firm's *NOA* is higher than the industry median (zero otherwise), interact it with $\Delta OXBRD$ or $OXBRD$, and include them in the following regressions:

Table 11 here

In the first column I see a significantly negative coefficient on $\Delta OXBRD * highNOA$ ($\lambda_1 = -0.009$, $t=3.21$), indicating that managers engage in more classification shifting when their ability to do accrual management is constrained. In the level model (second column), the sign of the coefficient on $OXBRD * highNOA$ is negative as expected, but is not significant. Overall as the change model is less concerned with the omitted correlated variable problem, I place more weight on the change model result, which is consistent with hypothesis 3a.

According to hypothesis 3b, fourth quarter should see more classification shifting than interim quarters do because accrual management is constrained, yet managers have more incentives to convey positive signals to investors. I use the following models to estimate the discretionary (changes in) R&D:

$$\begin{aligned} \Delta R\&D_q = & \alpha + \beta_1 R\&D_{q-4} + \beta_2 R\&D_{q-1} + \beta_3 \Delta R\&D_{q-4} + \beta_4 \Delta ROAB_q + \beta_4 NEG\Delta_q * \Delta ROAB_q \\ & + \beta_5 NEG\Delta_q + \beta_6 \Delta SALES_q + \beta_7 SALES_{t-1} + \beta_8 ACCRUALS_q + \beta_9 \Delta CASH_q \\ & + \beta_{10} \Delta OCF_q + \beta_{11} OCF_{q-4} + \beta_{12} \Delta FCF_q + \beta_{13} \Delta CAPX_q + \beta_{14} \Delta PPE_q + \beta_{15} \Delta INTAN_q \\ & + \beta_{16} \Delta LEV_q + \beta_{17} RETURNS_q + \varepsilon_q \end{aligned}$$

(8)

$$\begin{aligned} R\&D_q = & \alpha + \beta_1 R\&D_{q-4} + \beta_2 R\&D_{q-1} + \beta_3 \Delta R\&D_{q-4} + \beta_4 ROAB_q + \beta_5 NEG * ROAB_q + \beta_6 NEG \\ & + \beta_7 SALES_q + \beta_8 ACCRUALS_q + \beta_9 CASH_q + \beta_{10} OCF_q + \beta_{11} FCF_q + \beta_{12} CAPX_q + \beta_{13} PPE_q \\ & + \beta_{14} INTAN_q + \beta_{15} LEV_q + \beta_{16} RETURNS_q + \varepsilon_q \end{aligned}$$

(9)

I use the following models to test hypothesis 3b:

$$\begin{aligned}
Disc\Delta RD_q = & \alpha + \beta_1\Delta OXBRD_q + \beta_2RD_{q-4} + \beta_3RD_{q-1} + \beta_4\Delta ROAB_{q-q-4} + \beta_5\Delta ROAB_{q-q-1} \\
& + \beta_6NEG\Delta * \Delta ROAB_{q-q-4} + \beta_7NEG\Delta + \beta_8\Delta SALES_{q-q-4} + \beta_9SALES_{q-q-1} \\
& + \beta_{10}ACCUALS_q + \beta_{11}\Delta CHE_q + \beta_{12}\Delta OCF_q + \beta_{13}OCF_{q-1} + \beta_{14}\Delta FCF_q + \beta_{15}\Delta LEV_q \\
& + \beta_{14}\Delta CAPX_q + \beta_{15}\Delta PPE_q + \beta_{16}\Delta INTAN_q + \beta_{17}MB_{q-1} + \beta_{18}SIZE_{q-1} + \beta_{19}EP_q \\
& + D2P_q + RETURNS_q + \Delta GDP_q + \varepsilon_q
\end{aligned}$$

(10)

$$\begin{aligned}
DiscRD_q = & \alpha + \beta_1OXBRD_q + \beta_2RD_{q-4} + \beta_3RD_{q-1} + \beta_4ROAB_q + \beta_5NEG * ROAB_q + \beta_6NEG \\
& + \beta_7\Delta SALES_{q-4} + \beta_8SALES_q + \beta_9ACCUALS_q + \beta_{10}\Delta CHE_q + \beta_{12}\Delta OCF_q \\
& + \beta_{13}OCF_{q-1} + \beta_{14}\Delta FCF_q + \beta_{15}\Delta LEV_q + \beta_{16}\Delta CAPX_q + \beta_{17}\Delta PPE_q + \beta_{18}\Delta INTAN_q \\
& + \beta_{19}MB_{q-4} + \beta_{20}SIZE_{q-4} + \beta_{21}EP_q + D2P_q + RETURNS_q + GDP_q + \varepsilon_q
\end{aligned}$$

(11)

Table 12 here

Table 12 reports the test results of model (10) and (11). Consistent with managers engaging in more classification shifting at fiscal year end, the coefficients on $\Delta OXBRD * Q4$ (column 1) and $OXBRD * Q4$ (column 2) are both negative and significant.

Hypothesis 4 predicts that CSR D should increase as R&D increases relative to asset. The intuition is that if a firm's regular R&D level is low, then only a small amount of expense can be shifted to R&D without raising suspicions. As R&D increases relative to asset, managers can shift a larger percentage of other operating expenses to R&D. I create an indicator variable that equals 1 when R&D scaled by lagged asset is above the industry median, and zero otherwise. I interact this indicator variable with $OXBRD$, and add the indicator and interaction term to equation (7):

Table 13 here

Table 13 presents the result of the test about the R&D level and classification shifting. The coefficient on $OXB RD * HighRD$ is negative and significant ($\beta_2 = -0.004$, $t = 2.81$), indicating that as R&D intensities increase, managers classify more expenses as R&D, consistent with hypothesis 4.

Hypothesis 5 looks at the market valuation of firms that engage in CSR. To test hypothesis 5 I need first to identify firms that classification-shift to R&D. If firms engage in CSR, they would experience a discretionary increase in $R\&D$ and a simultaneous decrease in $OXB RD$ s. But firms with a discretionary increase in $R\&D$ coupled with a decrease in $OXB RD$ might simply be switching to a high-tech business model, which is not an uncommon phenomenon in recent years. Thus, I also examine internally generated and externally raised cash flow to differentiate firms that are expanding R&D projects, and those suspect firms that are unlikely to have enough internal and/or external cash for increased R&D expenditures.

To be categorized as a “suspect” CSR firm, the firm must simultaneously satisfy the following four conditions: (1) an above 0.5*median increase in discretionary $R\&D$; (2) an above 0.5* median decrease in discretionary $OXB RD$; (3) a below average change in current year cash holding; and (4) a below average change in net stock issuance.

The matched control firms are selected according to the following procedures: control firms must simultaneously satisfy the following four conditions: (1) an above 0.5*median increase in discretionary $R\&D$; (2) a below 0.5* median decrease, or an increase in discretionary $OXB RD$; (3) a below average change in current year cash holding; and (4) a below average change in net stock issuance. I then match control firms with suspect firms based on size, industry, and ROA. I create an indicator variable that

equals 1 when firm-year is a suspect, and 0 if firm-year is a matched control firms. (The descriptive statistics of the suspect and control firms are presented in appendix 5.)

Table 14 here

In Table 14, Panel A, I examine the current period stock return of suspect firms relative to control firms, using Fama-Macbeth monthly regression (Li 2012). The coefficient on "*Suspect*" is negative but insignificant. This means I am not able to find evidence that the market detects CSRD when it takes place.

To test the prediction of hypothesis 6 about the suspect firm's future performance, I run Fama-Macbeth annual regression of t+1 to t+5 future annual ROA on "*Suspect*" indicator variable and control variables. The results are presented in Panel B, Column 1. The coefficient on "*Suspect*" is negative and significant, indicating that suspect firms' future ROAs deteriorate.

To test the prediction of hypothesis 6 about suspect firms' future stock returns, I run Fama-Macbeth monthly regression of t+1 to t+5 future stock returns on the "*Suspect*" indicator variable and control variables. The results are presented in Table 14 Panel B Column 2. The coefficient on "*Suspect*" is significantly negative for matched sample, indicating that firms that engage in CSRD are valued less by investors in future periods. The coefficient of negative 0.006 indicates that a "*Suspect*" firm on average experiences 7.4% lower return relative to a control firm every year.

Overall I fail to find the evidence that the market respond to CSRD when it happens, but do find that it prices in such manipulation in subsequent periods.

SECTION 6.CONCLUSION

This study examines classification shifting of other operating expenses as R&D expenses. This maneuver does not change GAAP earnings like accruals management does, nor does it change core earnings like classification shifting using special items or discontinued operations does. Nevertheless, R&D and other operating expenses have different information content. CSRD creates false expectations for investors, therefore, leads to capital market inefficiency.

Using models that predict changes and levels of R&D, I find that other operating expenses are decreasing in discretionary (change in) R&D expense, and that the unexpectedly high R&D expense decreases in the following year. I further verify that the negative association is mainly due to shifting from other operating expense to R&D, and that the associations between most other pairs of expenses (which are valued similarly) are positive.

I find the evidence of classification shifting increasing as earnings approach zero growth threshold or analyst forecasts, as managers approach retirement, as manager's ability to manipulate accrual becomes more constrained, and as R&D increases relative to total assets. *Ex-ante* identified suspect firms see similar stock returns as control firms in the event year, but experience poorer future operating performance and lower future returns. Overall, my results provide broad support for the existence of classification shifting from other operating expenses to R&D expenses.

My results are relevant for financial reporting regulators, accounting practitioners, and investors. Accrual management receives much attention in both academic and business world. The public's knowledge about accrual management might explains why

larger firms (which are under more regulatory and investor scrutiny) engage in less accrual manipulation than smaller firms do (Yu 2008, Burgstahler, Hail and Leuz 2006), and why accrual management is less evident in audited fourth quarter than in interim quarters (Jones and Bublitz 1990). *Ex ante* identification of suspect firms for shifting expenses to R&D could lead to an early detection and prevention of fraudulent financial reporting.

There are several possible directions for future research. For example, do managers CSRD to a greater degree before issuing equity (Rangan 1998)? How does analyst following affect manager's classification shifting? How does a manager's annual incentive compensation contract affect their CSRD behavior? These questions are left for future research.

FIGURE 1
 CSR illustration

Hypothetical Income Statement
 Example Company

<hr/>			
Operating Revenue			
Sales Revenue		100,000	
Operating Expenses			
Other operating expenses (COGS, SG&A)	50,000	35,000	
Research and Development (R&D) Expense	10,000	25,000	
Operating Income		40,000	
<hr/>			
Special Items or Discontinued Operations			
Property Losses Due to Hurricane Sandy		4,000	
<hr/>			
Net Income		36,000	

TABLE 1*Sample Composition*

Panel A: Sample Selection

Description	No. of Observations
1950-2011 compustat firms that has non-missing lag asset:	223853
negative R&D or SG&A or COGS	(20987)
no stock price info:	(9063)
missing R&D information or average R&D<0.5%Sales:	(139191)
missing variables to estimate discretionary Δ R&D:	(30697)
too few companies in industry	(8466)
cannot converge to estimate discretionary Δ R&D	(380)
Observations before 1975	(897)
full sample	14172
lag asset <100,000	(7623)
sample of larger firms	7099

Panel B: No. of Observation by Industry

SIC Industry	No. of Observations
283 Pharmaceuticals	2614
355 Special Industry Machinery	344
356 General Industrial Machinery and Equipment	198
357 Computer and Office Equipment	1550
366 Communications Equipment	1492
367 Electronic Components and Accessories	1694
371 Motor Vehicles and Motor Vehicle Equipment	635
382 Laboratory Apparatus and Analytical Control	1532
384 Surgical, Medical, and Dental Instruments and Supplies	1755
737 Computer Softwares	2908
Total Sample	14772

TABLE 2
Descriptive statistics

Panel A: Reports the descriptive statistics of the main variables used in this paper. Sample period is 1975-2011. Except for the last six variables, all variables are scaled by t-1 asset. Except for stock returns, all variables are winsorized at top and bottom percentile.

	Mean	StdDev	Min	1 st Pctl	Q1	Median	Q3	99 th Pctl	Max
<i>R&D</i>	0.132	0.137	0.000	0.004	0.050	0.099	0.164	0.740	1.444
$\Delta R\&D$	0.009	0.075	-1.020	-0.218	-0.005	0.005	0.022	0.291	0.747
<i>OXBRD</i>	0.878	0.575	0.011	0.058	0.489	0.772	1.117	3.160	4.184
$\Delta OXBRD$	0.058	0.287	-10.025	-0.839	-0.027	0.052	0.150	0.910	1.693
<i>SGABRD</i>	0.339	0.262	0.000	0.006	0.169	0.276	0.427	1.412	2.094
$\Delta SGABRD$	0.025	0.112	-0.775	-0.347	-0.009	0.018	0.055	0.390	0.876
<i>COGS</i>	0.519	0.428	0.000	0.000	0.218	0.419	0.705	2.178	3.363
$\Delta COGS$	0.035	0.189	-1.234	-0.569	-0.018	0.025	0.090	0.682	1.374
<i>DiscR&D</i>	-0.001	0.056	-0.583	-0.157	-0.018	-0.001	0.015	0.180	0.734
$\text{Disc}\Delta R\&D$	-0.001	0.048	-0.552	-0.141	-0.016	0.000	0.014	0.151	0.736
$\text{Disc}\Delta OXBRD$	0.001	0.144	-4.736	-0.404	-0.033	0.001	0.036	0.393	3.001
$\text{Disc}\Delta SGABRD$	0.000	0.060	-0.777	-0.180	-0.020	0.000	0.020	0.189	0.756
$\text{Disc}\Delta COGS$	-0.003	0.066	-0.720	-0.227	-0.024	0.000	0.023	0.176	0.546
<i>ROAB</i>	0.067	0.260	-1.848	-0.951	-0.003	0.107	0.201	0.566	0.717
<i>OCF</i>	0.460	0.319	-1.167	-0.277	0.270	0.416	0.604	1.484	1.946
ΔOCF	0.058	0.196	-0.826	-0.446	-0.028	0.040	0.121	0.809	1.388
<i>FINCF</i>	0.105	0.383	-0.334	-0.264	-0.025	0.001	0.065	1.973	5.521
$\Delta FINCF$	0.040	0.347	-1.017	-0.706	-0.052	0.000	0.061	1.565	5.174
<i>CASH</i>	0.332	0.354	0.000	0.002	0.090	0.241	0.461	1.732	4.665
$\Delta CASH$	0.042	0.274	-0.684	-0.455	-0.054	0.005	0.077	1.184	4.248
ΔLEV	0.065	0.363	-3.340	-0.407	-0.033	0.020	0.092	1.158	17.416
$\Delta CAPX$	0.004	0.043	-0.230	-0.113	-0.010	0.001	0.014	0.169	0.363
<i>SALE</i>	0.919	0.506	0.000	0.000	0.574	0.870	1.192	2.520	3.254
$\Delta SALE$	0.099	0.289	-1.054	-0.625	-0.027	0.072	0.205	1.112	2.101
<i>ACCRUAL</i>	0.048	0.295	-1.143	-0.620	-0.070	0.029	0.125	1.161	3.328
<i>INTAN</i>	0.126	0.217	0.000	0.000	0.000	0.027	0.161	0.988	1.937
<i>PPE</i>	0.388	0.268	0.008	0.024	0.188	0.330	0.524	1.266	1.732
<i>CF</i>	0.120	0.248	-1.614	-0.807	0.042	0.154	0.249	0.636	0.786
<i>STK</i>	0.075	0.304	-0.313	-0.184	0.000	0.004	0.025	1.610	4.706
<i>SIZE</i>	19.108	2.205	12.439	14.728	17.522	18.947	20.494	24.929	26.775
<i>MB</i>	3.518	5.947	-54.102	-11.089	1.358	2.360	4.217	28.705	66.225
AT_{t-1}	2044.6	14876.6	0.312	2.312	30.011	104.936	456.517	31321	479921
<i>RETURN</i>	0.144	0.961	-0.986	-0.852	-0.339	-0.037	0.334	4.050	18.614
<i>D2P</i>	0.005	0.013	0.000	0.000	0.000	0.000	0.000	0.059	0.225
<i>EP</i>	-0.136	0.657	-13.851	-2.465	-0.092	0.017	0.053	0.195	0.417

Panel B: Variable description. Except for the last six variables, all variables are scaled by t-1 asset. Except for stock returns, all variables are winsorized at top and bottom percentile.

<i>R&D</i>	Research and development expense
$\Delta R\&D$	Change in research and development expense
<i>OXBRD</i>	Operating expenses excluding R&D expense
$\Delta OXBRD$	Change in operating expenses excluding R&D expense
<i>SGABRD</i>	SG&A expenses excluding R&D expense
$\Delta SGABRD$	Change in SG&A expenses excluding R&D expense
<i>DiscR&D</i>	Discretionary R&D expense
<i>DiscΔR&D</i>	Discretionary change in R&D expense
<i>DiscΔOXBRD</i>	Discretionary change in operating expenses excluding R&D expense
<i>DiscΔSGABRD</i>	Discretionary change in SG&A expenses other than R&D expense
<i>DiscΔOXBS</i>	Discretionary change in operating expenses excluding "other" SG&A expense
<i>DiscΔCOGS</i>	Discretionary change in cost of goods sold
<i>DiscΔOXBC</i>	Discretionary change in operating expenses excluding COGS
<i>ROAB</i>	Return over assets before R&D expense
$\Delta ROAB$	Change in ROAB
<i>NEG</i>	Dummy variable that equals 1 when ROA is less than zero, and 0 otherwise
<i>NEGA</i>	Dummy variable that equals 1 when ROA decreases, and 0 otherwise
<i>OCF</i>	Operating cash flow before R&D expense
ΔOCF	Change in operating cash flow before R&D expense
<i>FINCF</i>	Financing cash flow
$\Delta FINCF$	Change in financing cash flow
<i>CASH</i>	Cash and cash equivalent (Compustat item CHE)
$\Delta CASH$	Change in cash and cash equivalent
ΔLEV	Change in leverage (Compustat item LT divided by Compustat item AT)
$\Delta CAPX$	Change in capital expenditure (compustat item CAPX)
<i>SALE</i>	Sales
$\Delta SALE$	Change in sales
<i>COGS</i>	Cost of goods sold
$\Delta COGS$	Change in cost of goods sold
<i>ACCRUAL</i>	dWC + dNCO + dFIN
<i>INTAN</i>	Intangible asset (Compustat item INTAN)
<i>PPE</i>	Property plant and equipment (Compustat item PPEGT)
<i>CF</i>	Cash raised from operating income before R&D expense (Compustat item IB + DP + XRD)
<i>STK</i>	Net stock issuance (Compustat item SSTK-PRSTKC)
<i>SIZE</i>	Natural log of market value of equity
<i>MB</i>	Market-to-Book Ratio, defined as Market Value (PRCC_C * CSHO) divided by Book Value (CEQ)
<i>AT_{t-1}</i>	Book value of total lagged asset
<i>RETURN</i>	May to April excess compound stock return
<i>D2P</i>	Dividend per share over price
<i>EP</i>	Earnings per share over price

Panel C: Pearson(upper diagonal)/Spearman(lower diagonal) Correlations of the main variables used in this paper. Sample period is 1975-2011. Except for the last three variables, all variables are scaled by t-1 asset. Except for stock returns, all variables are winsorized at top and bottom percentile.

	<i>R&D</i>	$\Delta R\&D$	<i>OXBRD</i>	$\Delta OXBRD$	<i>DiscR&D</i>	<i>Disc</i> $\Delta R\&D$	<i>ROAB</i>	<i>OCF</i>
<i>R&D</i>	1.000	0.332	0.004	-0.005	0.382	0.320	-0.189	0.207
$\Delta R\&D$	0.291	1.000	0.023	0.144	0.625	0.598	0.080	0.107
<i>OXBRD</i>	-0.055	0.040	1.000	0.368	-0.024	-0.032	-0.009	0.311
$\Delta OXBRD$	0.022	0.302	0.350	1.000	-0.019	-0.056	0.156	0.160
<i>DiscR&D</i>	0.212	0.453	-0.007	0.030	1.000	0.660	0.018	0.047
<i>Disc</i> $\Delta R\&D$	0.208	0.404	-0.015	-0.034	0.498	1.000	0.058	0.051
<i>ROAB</i>	0.152	0.283	0.096	0.287	0.094	0.058	1.000	0.206
<i>OCF</i>	0.346	0.226	0.415	0.250	0.065	0.051	0.206	1.000
<i>FINCF</i>	0.314	0.149	0.102	0.181	-0.068	-0.018	-0.169	-0.007
<i>CASH</i>	0.393	0.143	-0.299	0.035	-0.004	0.047	0.188	0.126
<i>SALE</i>	-0.043	0.145	0.880	0.398	0.034	0.036	0.439	0.564
<i>COGS</i>	-0.257	0.014	0.847	0.291	-0.003	-0.027	0.136	0.150
<i>ACCRUAL</i>	0.002	0.241	0.105	0.339	0.020	0.028	0.461	0.173
<i>MB</i>	0.270	0.251	-0.050	0.242	0.036	0.055	0.222	0.240
<i>SIZE</i>	-0.054	0.156	-0.304	0.133	0.039	0.036	0.365	0.004
<i>RETURN</i>	-0.031	-0.017	0.028	0.065	0.021	0.024	0.251	0.154

	<i>FINCF</i>	<i>CASH</i>	<i>SALE</i>	<i>COGS</i>	<i>ACCRUAL</i>	<i>MB</i>	<i>SIZE</i>	<i>RETURN</i>
<i>R&D</i>	0.528	0.421	-0.064	-0.193	0.082	0.193	-0.083	0.029
$\Delta R\&D$	0.174	0.160	0.091	0.028	0.206	0.099	0.093	-0.065
<i>OXBRD</i>	0.158	-0.123	0.892	0.853	0.133	0.012	-0.277	0.052
$\Delta OXBRD$	0.132	0.082	0.404	0.321	0.239	0.093	0.105	0.024
<i>DiscR&D</i>	-0.002	0.004	0.013	-0.015	0.024	0.041	0.033	-0.004
<i>Disc</i> $\Delta R\&D$	0.038	0.048	0.007	-0.029	0.012	0.049	0.025	0.005
<i>ROAB</i>	-0.401	0.021	0.361	0.119	0.265	-0.039	0.307	0.112
<i>OCF</i>	0.034	0.154	0.341	0.055	0.121	0.049	-0.004	0.102
<i>FINCF</i>	1.000	0.587	-0.023	-0.027	0.278	0.179	-0.061	0.045
<i>CASH</i>	0.237	1.000	-0.128	-0.252	0.296	0.169	0.058	0.119
<i>SALE</i>	-0.014	-0.253	1.000	0.829	0.229	0.009	-0.098	0.090
<i>COGS</i>	-0.040	-0.411	0.825	1.000	0.109	-0.080	-0.182	0.034
<i>ACCRUAL</i>	0.086	0.118	0.249	0.116	1.000	0.117	0.159	0.085
<i>MB</i>	0.190	0.244	0.012	-0.173	0.218	1.000	0.125	-0.062
<i>SIZE</i>	-0.088	0.118	-0.093	-0.183	0.227	0.307	1.000	0.140
<i>RETURN</i>	-0.072	0.081	0.128	0.042	0.150	-0.134	0.280	1.000

TABLE 3

Models of Discretionary Change in R&D and Operating Expenses before R&D (Estimated by Industry and Year)

Panel A: Model of Expected Change in R&D Expense					
PredVar	N	MEAN	MEDIAN	STD	Percent Significant
<i>Intercept</i>	221	0.001	0.001	0.027	0.257
<i>R&D_{t-1}</i>	221	-0.043	-0.064	0.207	0.479
<i>ΔR&D_{t-1}</i>	221	0.032	0.033	0.440	0.431
<i>ΔROAB_t</i>	221	0.049	0.008	0.191	0.368
<i>NegΔ_t</i>	218	0.019	0.018	0.029	0.491
<i>NegΔ*ΔROAB_t</i>	220	0.025	0.020	0.858	0.409
<i>ΔSALES_t</i>	221	0.007	0.015	0.055	0.385
<i>SALES_{t-1}</i>	221	-0.003	-0.003	0.022	0.267
<i>ACCRUAL_t</i>	221	0.012	0.015	0.083	0.340
<i>ΔCash_t</i>	221	0.003	0.006	0.097	0.347
<i>ΔOCF_t</i>	221	0.066	0.043	0.145	0.465
<i>ΔFINCF_t</i>	187	0.029	0.017	0.096	0.419
<i>ΔLEV_t</i>	221	0.009	0.009	0.086	0.358
<i>ΔCAPX_t</i>	221	0.059	0.062	0.263	0.299
<i>ΔPPE_t</i>	221	0.033	0.037	0.151	0.295
<i>ΔINTAN_t</i>	221	0.029	0.013	0.889	0.319
<i>Return_t</i>	221	0.000	-0.001	0.020	0.274
<i>EP_t</i>	221	-0.012	-0.008	0.076	0.348
<i>ADJRSQ</i>	227	0.001	0.596	0.027	

Panel B: Model of Expected R&D Expense

PredVar	N	MEAN	MEDIAN	STD	Percent Significant
<i>Intercept</i>	227	0.002	-0.001	0.052	0.257
<i>RD_{t-1}</i>	227	0.778	0.750	0.408	0.942
<i>ROAB_t</i>	227	0.134	0.128	0.250	0.526
<i>Neg_t</i>	218	0.022	0.027	0.065	0.412
<i>Neg*ROAB_t</i>	222	-0.074	-0.060	0.905	0.406
<i>SALES_t</i>	227	-0.014	-0.006	0.042	0.355
<i>ACCRUAL_t</i>	227	0.000	0.001	0.092	0.376
<i>Cash_t</i>	227	-0.011	-0.007	0.101	0.344
<i>OCF_t</i>	227	0.035	0.025	0.075	0.431
<i>FINCF_t</i>	193	0.071	0.078	0.101	0.578
<i>LEV_t</i>	227	0.000	-0.007	0.054	0.286
<i>CAPX_t</i>	227	0.046	0.071	0.251	0.318
<i>INTAN_t</i>	227	0.000	0.000	0.002	0.157
<i>Return_t</i>	227	-0.001	-0.003	0.023	0.327
<i>Return_{t-1}</i>	227	0.001	-0.002	0.028	0.321
<i>EP_t</i>	227	-0.028	-0.018	0.174	0.393
<i>ADJRSQ</i>	227	0.002	0.870	0.104	

TABLE 4
OLS Regression of Changes and Levels of Discretionary R&D Expenses on Operating Expenses before R&D

Independent Variables	Predicted Sign	Dependent Variables							
		<i>DiscΔR&D_t</i>				<i>DiscR&D_t</i>			
		Full Sample		AT _{t-1} >100,000		Complete Sample		AT _{t-1} >100,000	
		Coefficient	(t-value)	Coefficient	(t-value)	Coefficient	(t-value)	Coefficient	(t-value)
<i>Intercept</i>		-0.013*	(-1.93)	-0.017**	(-2.44)	-0.007	(-1.22)	0.004	(-0.55)
ΔOXBRD_t	-	-0.011***	(-7.12)	-0.064***	(-17.1)				
OXBRD_t	-					-0.034***	(-11.47)	-0.091***	(-18.07)
<i>R&D_{t-1}</i>		-0.020***	(-5.99)	-0.036***	(-5.85)	-0.009**	(-2.21)	-0.082***	(-10.68)
<i>ΔROAB_t</i>		-0.002	(-1.33)	0.000	(0.000)				
<i>NEGΔ_t*ΔROAB_t</i>		0.001	(-0.46)	0.005	(-1.24)				
<i>NEGΔ_t</i>		-0.004***	(-4.44)	-0.009***	(-9.71)				
<i>ROAB_t</i>						-0.029***	(-7.5)	-0.005	(-0.65)
<i>NEG_t*ROAB_t</i>						-0.001	(-0.52)	0.020***	(-4.14)
<i>NEG_t</i>						-0.001	(-0.89)	0.003**	(-2.2)
<i>ΔSALES_t</i>		-0.005***	(-2.61)	0.042***	(-10.43)	0.028***	(-8.61)	0.086***	(-16.16)
<i>SALES_{t-1}</i>		-0.002**	(-2.43)	0.002	(-1.5)	0.029***	(-9.68)	0.090***	(-17.71)
<i>ACCRUAL_t</i>		0.000	(-0.12)	0.002	(-0.74)	0.005***	(-2.7)	0.003	(-1.05)
<i>ΔCASH_t</i>		-0.011***	(-5.32)	-0.017***	(-5.86)	-0.020***	(-8.44)	-0.029***	(-8.65)
<i>ΔOCF_t</i>		0.034***	(-13.47)	0.020***	(-4.79)	0.031***	(-10.58)	0.006	(-1.17)
<i>OCF_{t-1}</i>		0.017***	(-12.01)	0.016***	(-8.9)	0.009***	(-5.29)	-0.005**	(-2.05)
<i>ΔFINCF_t</i>		0.010***	(-6.23)	-0.001	(-0.42)	0.002	(-0.82)	-0.025***	(-8.85)
<i>ΔCAPX_t</i>		-0.028***	(-3.02)	-0.051***	(-4.24)	-0.008	(-0.75)	-0.055***	(-3.92)
<i>ΔINTAN_t</i>		-0.002*	(-1.85)	-0.009***	(-4.23)	0.001	(-0.72)	-0.001	(-0.53)
<i>ΔLEV_t</i>		0.000	(-0.13)	0.002	(-0.74)	0.005***	(-3.57)	0.015***	(-5.19)
<i>MB_{t-1}</i>		0.000***	(-3.64)	0.000	(-1.04)	0.000***	(-4.35)	0.000	(-0.66)
<i>SIZE_{t-1}</i>		0.001***	(-3.13)	0.001***	(-3.1)	0.000	(-0.33)	-0.001**	(-2.09)
<i>EP_t</i>		-0.002**	(-2.39)	-0.002***	(-2.77)	0.000	(-0.45)	-0.003***	(-3.34)
<i>D2P_t</i>		-0.034	(-1.05)	-0.053*	(-1.7)	0.025	(-0.66)	-0.023	(-0.64)
<i>ΔGDP_t</i>		-0.949	(-1.15)	-0.806	(-1.09)	0.342***	(-3.34)	-0.003***	(-3.37)
Adj R ²		0.0244		0.0897		0.0279		0.1043	
N		14722		7099		14679		7084	

Variable definitions are in Table 2, Panel B. In column 1 and 2, the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. In column 3 and 4, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE 5

Regression of Discretionary Changes in COGS and SGA before R&D on Changes in Operating Expenses before COGS (OXBC) and SGA (OXBS)

Independent Variables	Predicted Sign	Dependent Variables							
		<i>DiscΔSGABRD</i>				<i>DiscΔCOGS</i>			
		Complete Sample		<i>AT_{t-1}</i> > 100,000		Complete Sample		<i>AT_{t-1}</i> > 100,000	
	Coefficient	T	Coefficient	T	Coefficient	T	Coefficient	T	
<i>Intercept</i>		0.017**	(1.98)	0.035***	(3.82)	-0.013	(-1.53)	-0.015*	(-1.67)
<i>ΔOXBS_t</i>	?	0.078***	(40.61)	0.129***	(25.75)				
<i>SGABRD_{t-1}</i>		0.004*	(1.75)	0.015***	(4.29)				
<i>ΔOXBC_t</i>	?					0.123***	(27.78)	0.073***	(7.77)
<i>COGS_{t-1}</i>						-0.005***	(-3.27)	-0.003	(-1.18)
<i>ΔROAB_t</i>		0.004**	(2.31)	0.019***	(6.9)	0.017***	(9.81)	0.020***	(7.3)
<i>NEG_t*ΔROAB_t</i>		-0.009***	(-3.08)	-0.002	(-0.37)	-0.011***	(-3.7)	0.011**	(2.23)
<i>NEG_t</i>		-0.009***	(-7.36)	-0.013***	(-10.5)	0.005***	(4.46)	0.002*	(1.7)
<i>ΔSALES_t</i>		-0.060***	(-22.69)	-0.107***	(-20.16)	0.060***	(26.96)	0.068***	(18.71)
<i>SALES_{t-1}</i>		0.001	(0.84)	-0.002	(-1.18)	0.005***	(2.7)	0.000	(0.07)
<i>ACCRUAL_t</i>		0.001	(0.41)	0.003	(0.88)	-0.010***	(-4.6)	-0.010***	(-2.85)
<i>ΔCACH_t</i>		0.001	(0.38)	0.003	(0.89)	0.044***	(16.8)	0.047***	(12.18)
<i>ΔOCF_t</i>		0.009***	(2.91)	0.015***	(2.84)	-0.240***	(-71.17)	-0.278***	(-46.66)
<i>OCF_{t-1}</i>		-0.008***	(-3.51)	-0.016***	(-5.23)	-0.006***	(-3)	-0.001	(-0.49)
<i>ΔFINCF_t</i>		0.002	(0.78)	-0.008**	(-2.55)	-0.036***	(-17.69)	-0.045***	(-13.55)
<i>ΔLEV_t</i>		-0.001	(-0.77)	-0.004	(-1.1)	0.001	(0.74)	0.015***	(4.62)
<i>ΔCAPX_t</i>		-0.017	(-1.41)	-0.023	(-1.49)	-0.043***	(-3.63)	-0.016	(-1.04)
<i>ΔINTAN_t</i>		-0.001	(-0.68)	0.000	(0.12)	0.002	(0.94)	-0.010***	(-3.38)
<i>MB_{t-1}</i>		0.000***	(4.51)	0.000	(0.17)	-0.000	(-1.4)	-0.000***	(-2.99)
<i>SIZE_{t-1}</i>		-0.001***	(-2.91)	-0.001***	(-3.11)	-0.000	(-0.15)	0.000	(1.03)
<i>EP_t</i>		0.001	(0.66)	-0.003**	(-2.53)	-0.001	(-1.27)	-0.002	(-1.44)
<i>D2P_t</i>		-0.050	(-1.14)	0.014	(0.33)	0.037	(0.89)	-0.025	(-0.62)
<i>ΔGDP_t</i>		1.010	(0.95)	-0.272	(-0.29)	2.697**	(2.56)	2.716***	(2.81)
Adj R ²		0.1059		0.1036		0.2779		0.2809	
N		14110		6777		14455		6959	

Variable definitions are in Table 2, Panel B. In column 1 and 2, the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year-quarter, excluding firm *i*. In column 3 and 4, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year-quarter, excluding firm *i*. Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses.***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE 6

Regression of Discretionary (Changes in) R&D Expense on (Changes in) Operating Expense before R&D Conditional on Signs of Discretionary (Changes in) R&D

Independent Variables	Predicted Sign	Dependent Variables			
		<i>Disc</i> Δ R&D		<i>Disc</i> R&D	
		Coefficient	T	Coefficient	T
<i>Intercept</i>		-0.031***	(-5.76)	-0.038***	(-7.62)
Δ OXB <i>RD</i> _{<i>t</i>}		-0.004**	(-2.41)		
Δ OXB <i>RD</i> * <i>Posd</i> Δ R <i>D</i> _{<i>t</i>}	-	-0.011***	(-6.16)		
<i>Posd</i> Δ R <i>D</i> _{<i>t</i>}		0.055***	(84.34)		
OXB <i>RD</i> _{<i>t</i>}				-0.024***	(-9.18)
OXB <i>RD</i> * <i>Posd</i> R <i>D</i> _{<i>t</i>}	-			-0.012***	(-9.18)
<i>Posd</i> R <i>D</i> _{<i>t</i>}				0.070***	(50.33)
Δ ROA <i>B</i> _{<i>t</i>}		-0.001	(-1.28)		
NEGA <i>t</i> * Δ ROA <i>B</i> _{<i>t</i>}		0.004**	(2.01)		
NEGA <i>t</i>		0.002***	(2.92)		
ROA <i>B</i> _{<i>t</i>}				-0.021***	(-6.61)
NEG <i>t</i> *ROA <i>B</i> _{<i>t</i>}				-0.002	(-1.2)
NEG <i>t</i>				0.004***	(4.03)
R&D _{<i>t-1</i>}		-0.016***	(-6)	-0.016***	(-4.92)
Δ SALES _{<i>t</i>}		-0.002	(-1.3)	0.024***	(8.76)
SALES _{<i>t-1</i>}		-0.001	(-1.13)	0.026***	(10.44)
ACCRUAL _{<i>t</i>}		0.001	(0.39)	0.006***	(3.64)
Δ CASH _{<i>t</i>}		-0.008***	(-4.92)	-0.010***	(-4.84)
Δ OCF _{<i>t</i>}		0.025***	(12.21)	0.021***	(8.63)
OCF _{<i>t-1</i>}		0.008***	(7.01)	0.004**	(2.46)
Δ FINCF _{<i>t</i>}		0.008***	(6.27)	0.000	(0.13)
Δ LEV _{<i>t</i>}		0.000	(0.05)	0.004***	(3.15)
Δ CAPX _{<i>t</i>}		-0.008	(-1.09)	-0.000	(-0.05)
Δ INTAN _{<i>t</i>}		-0.001	(-1.45)	0.001	(0.47)
MB _{<i>t-1</i>}		0.000***	(3.21)	0.000***	(4.01)
SIZE _{<i>t-1</i>}		0.000	(1.22)	-0.000	(-0.29)
EP _{<i>t</i>}		-0.001	(-1.2)	0.001	(1.38)
D2P _{<i>t</i>}		-0.049*	(-1.85)	0.018	(0.57)
Δ GDP _{<i>t</i>}		-0.718	(-1.06)	3.48	(0.76)
Adj R ²		0.3459		0.3201	
N		14722		14679	

Variable definitions are in Table 2, Panel B. In column 1, the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm i . In column 2, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm i . Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE 7
Regression of Discretionary Changes in R&D Expense on Change in SGA before R&D and Change in Cost of Goods Sold

Independent Variables	Predicted Sign	Dependent Variables			
		<i>DiscΔR&D_t</i>		<i>DiscR&D_t</i>	
		Coefficient	T	Coefficient	T
<i>Intercept</i>		-0.012*	(-1.88)	-0.012*	(-1.8)
<i>ΔSGABRD_t</i>	-	-0.014***	(-3.25)		
<i>ΔCOGS_t</i>	?			-0.005*	(-1.68)
<i>R&D_{t-1}</i>		-0.019***	(-5.72)	-0.019***	(-5.67)
<i>ΔROAB_t</i>		-0.002	(-1.18)	-0.001	(-1.01)
<i>NEGΔ_t*ΔROAB_t</i>		0.001	(0.24)	0.001	(0.33)
<i>NEGΔ_t</i>		-0.004***	(-4.7)	-0.004***	(-4.84)
<i>ΔSALES_t</i>		-0.013***	(-7.43)	-0.009***	(-2.96)
<i>SALES_{t-1}</i>		-0.002**	(-2.54)	-0.002**	(-2.16)
<i>ACCRUAL_t</i>		0.001	(0.32)	0.000	(0.07)
<i>ΔCASH_t</i>		-0.011***	(-5.44)	-0.010***	(-5.1)
<i>ΔOCF_t</i>		0.038***	(14.39)	0.033***	(11.49)
<i>OCF_{t-1}</i>		0.017***	(11.79)	0.016***	(11.32)
<i>ΔFINCF_t</i>		0.010***	(6.29)	0.009***	(5.73)
<i>ΔLEV_t</i>		-0.000	(-0.12)	-0.000	(-0.05)
<i>ΔCAPX_t</i>		-0.027***	(-2.99)	-0.029***	(-3.13)
<i>ΔINTAN_t</i>		-0.002*	(-1.84)	-0.002*	(-1.72)
<i>MB_{t-1}</i>		0.000***	(3.85)	0.000***	(3.68)
<i>SIZE_{t-1}</i>		0.001***	(3.08)	0.001***	(3)
<i>EP_t</i>		-0.002**	(-2.38)	-0.002**	(-2.44)
<i>D2P_t</i>		-0.035	(-1.09)	-0.035	(-1.07)
<i>ΔGDP_t</i>		-0.961	(-1.17)	-0.954	(-1.16)
Adj R ²		0.0217		0.0213	
N		14722		14722	

Variable definitions are in Table 2, Panel B. In column 1, the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. In column 2, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE 8

Regression of Year $t+1$ Discretionary (Changes in) R&D Expense on (Changes in) Operating Expenses before R&D

Independent Variables	Predicted Sign	Dependent Variables			
		$DiscdR\&D_{t+1}$		$DiscR\&D_{t+1}$	
		Coefficient	T	Coefficient	T
Intercept		-0.021***	(-4.82)	-0.017***	(-2.74)
$\Delta OXBRD$	+	0.004**	(1.98)		
$OXBRD$	+			0.013***	(4.36)
$\Delta ROAB_t$		0.001	(0.5)		
$NEGA_t * \Delta ROAB_t$		-0.003	(-1.08)		
$NEGA_t$		-0.003***	(-3.04)		
$ROAB_t$				0.012***	(2.96)
$NEG_t * ROAB_t$				-0.002	(-0.83)
NEG_t				-0.006***	(-4.48)
$R\&D_{t-1}$		0.019***	(5.37)	0.032***	(7.63)
$\Delta SALES_t$		-0.007***	(-3.1)	-0.015***	(-4.6)
$SALES_{t-1}$		0.004***	(4.38)	-0.013***	(-4.26)
$ACCRUAL_t$		-0.002	(-0.87)	0.000	(0.23)
$\Delta CASH_t$		0.009***	(4.02)	0.012***	(5.1)
ΔOCF_t		0.009***	(3.37)	-0.003	(-1.05)
OCF_{t-1}		0.005***	(3.58)	0.003*	(1.79)
$\Delta FINCF_t$		0.005***	(2.73)	-0.002	(-1.13)
ΔLEV_t		-0.003**	(-2.22)	-0.001	(-0.92)
$\Delta CAPX_t$		0.002	(0.25)	0.000	(0)
$\Delta INTAN_t$		-0.001	(-1)	-0.001	(-0.53)
MB_{t-1}		-0.000	(-0.78)	0.000**	(1.99)
$SIZE_{t-1}$		0.001***	(3.14)	0.001**	(2.22)
EP_t		0.003***	(3.51)	0.005***	(4.59)
$D2P_t$		0.008	(0.27)	-0.007	(-0.19)
Adj R ²		0.0163		0.0173	
N		13256		13328	

Variable definitions are in Table 2, Panel B. In column 1, the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm i . In column 2, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm i . Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE 9

Regression of Discretionary Changes in R&D Expense on Changes in Operating Expenses before R&D Conditional on CEO Retirement

Dependent Variable: $Disc\Delta R\&D_t$			
PredVar	Pred Sign	Coefficient	T
<i>Intercept</i>		0.002	(0.18)
$\Delta OXBRD_t$		0.013	(1.57)
$\Delta OXBRD_t * Retire_t$	-	-0.048***	(-2.74)
<i>Retire_t</i>		0.001	(0.41)
$R\&D_{t-1}$		-0.004	(-0.34)
$\Delta ROAB_t$		-0.015***	(-2.97)
$NEGA_t * \Delta ROAB_t$		0.013*	(1.91)
$NEGA_t$		-0.018***	(-9.19)
$\Delta SALES_t$		-0.030***	(-3.59)
$SALES_{t-1}$		0.004**	(2.03)
$ACCRUAL_t$		-0.001	(-0.24)
$\Delta CASH_t$		0.005	(0.79)
ΔOCF_t		0.014*	(1.67)
OCF_{t-1}		0.001	(0.27)
$\Delta FINCF_t$		0.007	(1.45)
ΔLEV_t		-0.005	(-0.9)
$\Delta CAPX_t$		-0.025	(-1.15)
$\Delta INTAN_t$		0.008	(1.18)
MB_{t-1}		0.001***	(2.89)
$SIZE_{t-1}$		0.000	(0.21)
EP_t		-0.009**	(-2.32)
$D2P_t$		-0.036	(-0.63)
ΔGDP_t		-0.018	(-0.26)
Adj R ²		0.0635	
N		1683	

Retire is an indicator variable that equals one when manager is 63 or older, and zero otherwise. Other variable definitions are in Table 2, Panel B. the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses.***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE 10

*Regression of Discretionary (Changes in) R&D on (Changes in) Operating Expense before R&D
Conditioning on Missing Analysts' Forecast*

<i>DepVariablesDiscΔR&D_t</i>			
<i>IndVariables</i>	<i>PredSign</i>	<i>Coefficient</i>	<i>T</i>
<i>Intercept</i>		-0.017*	(-1.68)
<i>ΔOXBRD_t</i>		-0.059***	(-11.46)
<i>ΔOXBRD*Missing</i>	-	-0.034***	(-4.43)
<i>Missing</i>		0.003**	(2.27)
<i>R&D_{t-1}</i>		-0.010***	(-7.11)
<i>ΔROAB_t</i>		-0.042***	(-4.79)
<i>NEGΔ_t*ΔROAB_t</i>		0.006	(1.26)
<i>NEGΔ_t</i>		-0.002	(-0.34)
<i>ΔSALES_t</i>		0.040***	(6.96)
<i>SALES_{t-1}</i>		0.003*	(1.67)
<i>ACCRUAL_t</i>		-0.002	(-0.63)
<i>ΔCASH_t</i>		-0.022***	(-5.42)
<i>ΔOCF_t</i>		0.013**	(2.08)
<i>OCF_{t-1}</i>		0.020***	(7.54)
<i>ΔFINCF_t</i>		0.003	(0.83)
<i>ΔLEV_t</i>		0.003	(0.91)
<i>ΔCAPX_t</i>		-0.035**	(-2.03)
<i>ΔINTAN_t</i>		-0.005*	(-1.83)
<i>MB_{t-1}</i>		0.000*	(1.67)
<i>SIZE_{t-1}</i>		0.001*	(1.72)
<i>EP_t</i>		-0.005***	(-2.79)
<i>D2P_t</i>		-0.210***	(-3.96)
<i>ΔGDP_t</i>		-0.453	(-0.47)
Adj R ²		0.0993	
N		3522	

Missing is an indicator variable that equals one when actual earnings are less than analysts' forecast, and zero otherwise. Other variable definitions are in Table 2, Panel B. the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE 11

Regression of Discretionary (Changes in) R&D Expense on (Changes in) Other Operating Expenses Conditioning on Levels of Previous Accrual Manipulation

Independent Variables	Predicted Sign	Dependent Variables			
		<u>DiscΔR&D_t</u>		<u>DiscR&D_t</u>	
		Coefficient	T	Coefficient	T
<i>Intercept</i>		-0.012*	(-1.84)	-0.007	(-1.25)
$\Delta OXBRD_t$		-0.010***	(-5.7)		
$\Delta OXBRD_t * highNOA_t$	-	-0.009***	(-3.21)		
$OXBRD_t$				-0.034***	(-10.98)
$OXBRD_t * highNOA_t$	-			-0.001	(-0.38)
$highNOA_t$		0.001	(1.03)	-0.001	(-0.68)
$R\&D_{t-1}$		-0.020***	(-6.1)	-0.009**	(-2.22)
$\Delta ROAB_t$		-0.001	(-1.1)		
$Neg\Delta_t * \Delta ROAB_t$		0.001	(0.37)		
$Neg\Delta_t$		-0.004***	(-4.3)		
$ROAB_t$				-0.029***	(-7.49)
$Neg_t * ROAB_t$				-0.001	(-0.53)
Neg_t				-0.001	(-0.9)
$\Delta SALES_t$		-0.004*	(-1.85)	0.029***	(8.76)
$SALES_{t-1}$		-0.002**	(-2.16)	0.029***	(9.66)
$ACCRUAL_t$		0.000	(0.04)	0.006***	(2.94)
$\Delta Cash_t$		-0.011***	(-5.47)	-0.020***	(-8.19)
ΔOCF_t		0.034***	(13.34)	0.031***	(10.57)
OCF_{t-1}		0.017***	(11.94)	0.009***	(5.28)
$\Delta FINCF_t$		0.010***	(6.42)	0.002	(0.97)
ΔLEV_t		0.000	(0.43)	0.005***	(3.75)
$\Delta CAPX_t$		-0.027***	(-2.98)	-0.007	(-0.65)
$\Delta INTAN_t$		-0.002*	(-1.94)	0.001	(0.63)
MB_{t-1}		0.000***	(3.57)	0.000***	(4.35)
$Size_{t-1}$		0.001***	(2.89)	0.000	(0.4)
EP_t		-0.002***	(-2.66)	0.000	(0.42)
$D2P_t$		-0.034	(-1.04)	0.022	(0.58)
ΔGDP_t		-0.946	(-1.15)	0.367	(0.85)
Adj R ²		0.025		0.0279	
N		14722		14679	

I measure the level of previous accrual manipulation by beginning of the year net operating asset. $NOA = (ACT - CHE - LCT + DLC) / ASSET$. In column 1, the dependent variable is discretionary change in R&D, defined as the change in R&D minus expected (nondiscretionary) change in R&D, where the expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm i . In column 2, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where the expected R&D is calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm i . Other variable definitions are in Table 2, Panel B. Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE12

Regression of (Changes in) Discretionary R&D Expense on (Changes in) Other Operating Expenses (Quarterly Earnings)

Independent Variables	Predicted Sign	Dependent Variables			
		$\underline{Disc\Delta R\&D_t}$		$\underline{DiscR\&D_t}$	
		Coefficient	T	Coefficient	T
<i>Intercept</i>		-0.003***	(-3.63)	0.005***	(8.31)
$\Delta OXBRD_t$		-0.006***	(-3.63)		
$\Delta OXBRD * Q4_t$	-	-0.022***	(-6.96)		
$OXBRD_t$				-0.023***	(-18.46)
$OXBRD * Q4_t$	-			-0.007***	(-4.32)
$Q4_t$		0.000	(0.55)	0.000	(0.39)
$R\&D_{t-1}$		0.020***	(4.26)	-0.007**	(-2.57)
$\Delta ROAB_t$		0.001	(1.1)		
$Neg\Delta_t * \Delta ROAB_t$		-0.000	(-0.01)		
$Neg\Delta_t$		0.000***	(.)		
$ROAB_t$				-0.001	(-1.3)
$Neg_t * ROAB_t$				-0.003	(-1.22)
Neg_t				-0.001***	(-3.95)
$\Delta SALES_t$		-0.003	(-0.82)	0.008***	(4.16)
$SALES_{t-1}$		0.003**	(2.03)	0.013***	(11.67)
$ACCRUAL_t$		0.008***	(4.01)	0.000	(0.28)
$\Delta Cash_t$		-0.001	(-1.59)	-0.001*	(-1.65)
ΔOCF_t		0.015***	(4.88)	-0.010***	(-5.98)
OCF_{t-1}		0.001	(0.41)	-0.001	(-1.28)
$\Delta FINCF_t$		0.008***	(5.99)	0.009***	(13.04)
ΔLEV_t		-0.000	(-0.23)	0.002**	(2.43)
$\Delta CAPX_t$		0.011	(0.84)	0.032***	(4.19)
$\Delta INTAN_t$		-0.001	(-1.32)	0.001***	(3.39)
MB_{t-1}		0.000	(0.57)	0.000**	(2.38)
$Size_{t-1}$		0.000**	(1.98)	-0.001***	(-8.4)
EP_t		-0.001	(-1.46)	-0.001***	(-3.17)
$D2P_t$		-0.014*	(-1.66)	-0.004	(-0.86)
Adj R ²		0.021		0.0237	
N		28131		29413	

In column 1, the dependent variable is the discretionary change in R&D, defined as the change in R&D minus the expected (nondiscretionary) change in R&D, where the expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year-quarter, excluding firm *i*. In column 2, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where the expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year-quarter, excluding firm *i*. *Q4* is a dummy variable that equals one if the quarter is at fiscal year end, and zero otherwise. Other variable definitions are in Table 2, Panel B. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE13

Regression of Discretionary R&D Expense on Operating Expenses before R&D Conditioning on R&D Level

Dependent Variable: <i>DiscR&D_t</i>			
IndVar	Pred Sign	Coefficient	T
<i>Intercept</i>		-0.012**	(-2.02)
<i>OXBRD_t</i>		-0.028***	(-9.12)
<i>OXBRD*HighRD_t</i>	-	-0.004***	(-2.81)
<i>HighRD_t</i>		0.021***	(10.66)
<i>RD_{t-1}</i>		-0.031***	(-7.37)
<i>ROAB_t</i>		-0.036***	(-9.36)
<i>Neg_t*ROAB_t</i>		0.001	(0.6)
<i>Neg_t</i>		-0.004***	(-3)
<i>ΔSALES_t</i>		0.026***	(7.99)
<i>SALES_{t-1}</i>		0.028***	(9.28)
<i>ACCRUAL_t</i>		0.005***	(2.8)
<i>ΔCash_t</i>		-0.018***	(-7.5)
<i>ΔOCF_t</i>		0.030***	(10.16)
<i>OCF_{t-1}</i>		0.006***	(3.26)
<i>ΔFINCF_t</i>		0.000	(0.23)
<i>ΔLEV_t</i>		0.005***	(3.49)
<i>ΔCAPX_t</i>		-0.010	(-0.93)
<i>ΔINTAN_t</i>		0.001	(0.9)
<i>MB_{t-1}</i>		0.000***	(4.1)
<i>Size_{t-1}</i>		-0.000	(-0.62)
<i>EP_t</i>		0.001	(0.71)
<i>D2P_t</i>		0.077**	(2.04)
<i>ΔGDP_t</i>		-0.248	(-0.37)
Adj R ²		0.0408	
N		14679	

the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. The test variable: HighD is a dummy variable that equals one if R&D expenditure is more than 5% of lag asset, and zero otherwise. Other variable definitions are in Table 2, Panel B. Year dummies are included in regression. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

TABLE 14

Capital Market Reaction of CSR.D.Suspect is a Dummy Variable that Equals One if $\text{disc}\Delta RD > 0$, $\Delta OXBRD < 0$, and $\Delta CF + \Delta STK < \text{industrial mean of } \Delta CF + \Delta STK$; and Equals Zero Otherwise.

Panel A: Fama-Macbeth Regression of Current Year Monthly Return of Suspect and Control Firms.

PredVar	<i>Return_t</i>	
	Coefficient	T
<i>Intercept</i>	-0.148***	(-3.18)
<i>Suspect</i>	-0.009	(-0.83)
<i>ROA_t</i>	0.032	(0.47)
<i>ACCRUAL_t</i>	0.011	(0.59)
<i>beta_t</i>	0.024***	(3.39)
<i>MB_t</i>	-0.018*	(-1.69)
<i>Size_t</i>	0.019***	(3.04)
Adj R ²	0.089	(1.03)
N	1236	

Panel B: Fama-Macbeth Regression of Year +1 to Year +5 ROA (annual) and Year +1 to Year +5 StockReturn (monthly) of Suspect and Control Firms.

PredVar	t+1 to +5 ROA		t+1to+5 Return	
	Coefficient	T	Coefficient	T
<i>Intercept</i>	-2.381	(-1.49)	-0.015	(-0.94)
<i>Suspect</i>	-0.098*	(-1.74)	-0.006**	(-2.12)
<i>ROA_t</i>	2.376	(0.83)	0.204*	(1.81)
<i>ACCRUAL_t</i>	-0.628	(-0.47)	-0.094	(-0.99)
<i>beta_t</i>	2.371	(1.54)	0.007	(1.17)
<i>MB_t</i>	-0.061	(-1.21)	-0.001	(-1.64)
<i>Size_t</i>	0.052	(1.01)	0.001	(1.32)
Adj R ²	0.177**	(2.45)	0.100***	(6.94)
N	474		5429	

APPENDIX 1

Regression of (Changes in) R&D Expenses on (Changes in) Other Operating Expenses

Independent Variables	Predicted SIGN	Dependent Variables			
		<u>DiscΔR&D$_t$</u>		<u>DiscR&D$_t$</u>	
		Coefficient	T	Coefficient	T
<i>Intercept</i>		0.014	(1.52)	0.007	(0.83)
$\Delta OXBRD_t$	-	-0.033***	(-11.07)		
$OXBRD_{t-1}$	-			-0.056***	(-12.58)
$R\&D_{t-1}$		-0.192***	(-39.72)	0.748***	(133.83)
$\Delta ROAB_t$		-0.004**	(-2.23)		
$NEG\Delta_t * \Delta ROAB_t$		0.003	(0.83)		
$NEG\Delta_t$		0.037***	(28.05)		
$ROAB_t$				-0.001	(-0.14)
$NEG_t * ROAB_t$				-0.024***	(-7.2)
NEG_t				0.037***	(19.22)
$\Delta SALES_t$		0.032***	(8.97)	0.045***	(8.99)
$SALES_{t-1}$		-0.015***	(-10.92)	0.036***	(7.94)
$ACCRUAL_t$		0.021***	(8.45)	0.024***	(8.24)
$\Delta CASH_t$		-0.005	(-1.55)	-0.001	(-0.4)
ΔOCF_t		0.068***	(17.99)	0.073***	(16.97)
OCF_{t-1}		0.038***	(17.45)	0.040***	(15.68)
$\Delta FINCF_t$		0.041***	(17.05)	0.042***	(15.12)
$\Delta CAPX_t$		0.016***	(7.8)	0.025***	(10.34)
$\Delta INTAN_t$		0.111***	(7.85)	0.116***	(7.25)
ΔLEV_t		0.002	(1.08)	0.007***	(3.08)
MB_{t-1}		0.001***	(6.09)	0.001***	(6.5)
$SIZE_{t-1}$		0.001**	(2.47)	-0.000	(-0.77)
EP_t		-0.002**	(-2.29)	0.001	(0.5)
$D2P_t$		-0.192***	(-3.95)	-0.040	(-0.73)
ΔGDP_t		-6.417***	(-5.61)	-1.851	(-0.57)
Adj R ²		0.2964		0.7275	
N		12237		12237	

Variable definitions are in Table 2, Panel B. In column 1, the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. In column 2, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

APPENDIX 2

Two-way Cluster Robust Regression of Changes and Levels of Discretionary R&D Expenses on Operating Expenses before R&D

Independent Variables	Dependent Variables			
	<i>Disc</i> Δ R&D _{<i>t</i>}		<i>Disc</i> R&D _{<i>t</i>}	
	Coefficient	(t-value)	Coefficient	(t-value)
<i>Intercept</i>	-0.016**	(-2.23)	0.001	(0.15)
Δ <i>OXBRD</i> _{<i>t</i>}	-0.018***	(-3.4)		
<i>OXBRD</i> _{<i>t-1</i>}			-0.027***	(-4.6)
<i>R&D</i> _{<i>t-1</i>}	-0.010	(-1.19)	0.003	(0.29)
Δ <i>ROAB</i> _{<i>t</i>}	-0.002	(-0.66)		
<i>NEG</i> Δ _{<i>t</i>} * Δ <i>ROAB</i> _{<i>t</i>}	-0.006	(-1.04)		
<i>NEG</i> Δ _{<i>t</i>}	-0.003*	(-1.72)		
<i>ROAB</i> _{<i>t</i>}			-0.002	(-0.38)
<i>NEG</i> _{<i>t</i>} * <i>ROAB</i> _{<i>t</i>}			-0.006	(-0.77)
<i>NEG</i> _{<i>t</i>}			-0.001	(-0.39)
Δ <i>SALES</i> _{<i>t</i>}	0.015***	(2.84)	0.025***	(4.21)
<i>SALES</i> _{<i>t-1</i>}	0.008***	(3.8)	0.024***	(3.97)
<i>ACCRUAL</i> _{<i>t</i>}	0.007**	(2.53)	0.012**	(2.41)
Δ <i>CASH</i> _{<i>t</i>}	-0.005*	(-1.69)	-0.010**	(-2.02)
Δ <i>OCF</i> _{<i>t</i>}	-0.004	(-0.86)	-0.015***	(-2.59)
<i>OCF</i> _{<i>t-1</i>}	-0.013***	(-3.82)	-0.010**	(-2.56)
Δ <i>FINCF</i> _{<i>t</i>}	-0.003	(-1.3)	-0.010***	(-2.88)
Δ <i>CAPX</i> _{<i>t</i>}	0.002	(0.63)	0.019***	(3.82)
Δ <i>INTAN</i> _{<i>t</i>}	-0.009	(-0.76)	0.011	(0.74)
Δ <i>LEV</i> _{<i>t</i>}	-0.004	(-1.42)	-0.001	(-0.16)
<i>MB</i> _{<i>t-1</i>}	0.000	(1.43)	-0.001	(-1.34)
<i>SIZE</i> _{<i>t-1</i>}	0.001***	(2.73)	0.000	(0.12)
<i>EP</i> _{<i>t</i>}	0.000	(0.53)	0.000	(0.52)
<i>D2P</i> _{<i>t</i>}	-0.003	(-0.99)	-0.001	(-0.77)
Δ <i>GDP</i> _{<i>t</i>}	-0.024	(-0.81)	0.010	(0.67)
N	13959		13954	

Result of two-way cluster robust regression. In column 1, the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. In column 2, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

APPENDIX 3

Excluding In-process R&D: Repeat OLS Regression of Changes and Levels of Discretionary R&D Expenses on Operating Expenses before R&D

Independent Variables	Predicted Sign	Dependent Variables			
		<i>DiscΔR&D_t</i>		<i>DiscR&D_t</i>	
		Coefficient	T	Coefficient	T
<i>Intercept</i>		-0.008	(-1)	0.004	(0.57)
$\Delta OXBRD_t$	-	-0.025***	(-9.93)		
<i>OXBRD_t</i>	-			-0.037***	(-10.46)
<i>R&D_{t-1}</i>		-0.028***	(-7.18)	-0.019***	(-4.56)
$\Delta ROAB_t$		-0.001	(-0.6)		
<i>NEGΔ_t*ΔROAB_t</i>		-0.004	(-1.13)		
<i>NEGΔ_t</i>		-0.003***	(-2.98)		
<i>ROAB_t</i>				-0.029***	(-6.34)
<i>NEG_t*ROAB_t</i>				0.001	(0.31)
<i>NEG_t</i>				-0.002	(-1.06)
$\Delta SALES_t$		0.002	(0.56)	0.026***	(6.58)
<i>SALES_{t-1}</i>		-0.003***	(-2.59)	0.032***	(8.99)
<i>ACCRUAL_t</i>		-0.000	(-0.08)	0.006***	(2.6)
$\Delta CASH_t$		-0.011***	(-4.18)	-0.022***	(-8.15)
ΔOCF_t		0.034***	(10.56)	0.035***	(10.12)
<i>OCF_{t-1}</i>		0.020***	(10.79)	0.011***	(5.26)
$\Delta FINCF_t$		0.012***	(5.95)	0.004**	(2.03)
$\Delta CAPX_t$		-0.001	(-0.77)	0.009***	(4.88)
$\Delta INTAN_t$		-0.033***	(-2.75)	-0.019	(-1.52)
ΔLEV_t		-0.004**	(-2.21)	0.003*	(1.65)
<i>MB_{t-1}</i>		0.000***	(4.52)	0.000***	(4.09)
<i>SIZE_{t-1}</i>		0.001**	(2.42)	-0.000	(-1.61)
<i>EP_t</i>		-0.001	(-1.49)	0.001	(0.51)
<i>D2P_t</i>		-0.057	(-1.38)	0.001	(0.01)
ΔGDP_t		-1.928**	(-1.97)		-0.129 (-1.34)
Adj R ²			0.0269		0.0293
N			12234		12212

Variable definitions are in Table 2, Panel B. In column 1, the dependent variable is discretionary change in R&D, defined as change in R&D minus expected (nondiscretionary) change in R&D, where expected change in R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. In column 2, the dependent variable is discretionary R&D, defined as R&D minus expected (nondiscretionary) R&D, where expected R&D are calculated using the coefficients from the model shown in table 3, estimated for each industry-year, excluding firm *i*. All variables are winsorized at the 1st and 99th percentile. Amounts reported are regression coefficients with t-statistics in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively, for a two-tailed test.

APPENDIX 4

Model of estimating Discretionary OXBRD, Discretionary SG&A and Discretionary COGS.

Panel A: Model of Expected Change in Operating Expenses Excluding R&D

PredVar	MEAN	STD	Percent Significant
<i>Intercept</i>	-0.032	0.272	0.287
$\Delta OXBRD_{t-1}$	0.015	0.243	0.370
$OXBRD_{t-1}$	-0.005	0.224	0.408
$\Delta ROAB_t$	-0.367	2.142	0.720
$NEGA_t$	0.009	0.063	0.303
$NEGA * \Delta ROAB_t$	-0.058	3.626	0.439
$\Delta SALES_t$	0.826	0.411	0.993
$SALES_{t-1}$	0.023	0.220	0.391
$ACCRUAL_t$	-0.055	0.810	0.329
$\Delta CASH_t$	-0.041	0.511	0.391
ΔOCF_t	-0.007	0.489	0.436
OCF_{t-1}	0.001	0.254	0.360
$\Delta FINCF_t$	0.039	0.584	0.357
ΔLEV_t	0.061	0.901	0.336
$\Delta CAPX_t$	-0.124	2.513	0.325
$\Delta INTAN_t$	-0.181	5.017	0.339
$RETURN_t$	-0.017	0.068	0.311
EP_t	0.042	0.192	0.354

Panel B: Model of Expected Change in XSGABRD
(SGA Expenses Excluding R&D)

PredVar	MEAN	STD	Percent Significant
<i>Intercept</i>	-0.012	0.038	0.304
<i>SGABRD</i> _{<i>t-1</i>}	-0.045	0.225	0.449
Δ <i>SGABRD</i> _{<i>t-1</i>}	0.006	0.275	0.300
Δ <i>ROAB</i> _{<i>t</i>}	-0.113	0.261	0.498
<i>NEGA</i> _{<i>t</i>}	0.005	0.036	0.246
<i>NEGA</i> * Δ <i>ROAB</i>	-0.026	1.307	0.457
Δ <i>SALES</i> _{<i>t</i>}	0.106	0.131	0.709
<i>SALES</i> _{<i>t-1</i>}	-0.003	0.036	0.279
<i>ACCRUAL</i> _{<i>t</i>}	0.043	0.185	0.393
Δ <i>CASH</i> _{<i>t</i>}	-0.034	0.169	0.385
Δ <i>OCF</i> _{<i>t</i>}	0.314	0.344	0.721
<i>OCF</i> _{<i>t-1</i>}	0.059	0.151	0.563
Δ <i>FINCF</i> _{<i>t</i>}	0.052	0.213	0.450
Δ <i>LEV</i> _{<i>t</i>}	0.036	0.182	0.364
Δ <i>CAPX</i> _{<i>t</i>}	0.083	0.484	0.251
Δ <i>DLTT</i> _{<i>t</i>}	-0.029	0.209	0.312
Δ <i>PPE</i> _{<i>t</i>}	-0.031	0.276	0.336
Δ <i>INTAN</i> _{<i>t</i>}	0.008	1.071	0.312
<i>RETURN</i> _{<i>t</i>}	-0.008	0.035	0.271
<i>RETURN</i> _{<i>t-1</i>}	-0.002	0.034	0.271
<i>EP</i> _{<i>t</i>}	0.015	0.134	0.312

Panel C: Model of Expected Change in
COGS

PredVar	MEAN	STD	Percent Significant
<i>Intercept</i>	-0.009	0.060	0.420
<i>COGS</i> _{<i>t-1</i>}	0.001	0.138	0.543
Δ <i>COGS</i> _{<i>t-1</i>}	-0.016	0.345	0.554
Δ <i>ROAB</i> _{<i>t</i>}	-0.134	0.350	0.743
<i>NEGA</i> _{<i>t</i>}	0.013	0.267	0.391
<i>NEGA</i> * Δ <i>ROAB</i>	0.140	1.262	0.515
Δ <i>SALES</i> _{<i>t</i>}	0.331	0.315	0.938
<i>SALES</i> _{<i>t-1</i>}	0.002	0.116	0.489
Δ <i>SALES</i> _{<i>t-1</i>}	0.022	0.249	0.504
<i>ACCRUAL</i> _{<i>t</i>}	0.026	0.391	0.475
Δ <i>CASH</i> _{<i>t</i>}	-0.064	0.368	0.645
Δ <i>OCF</i> _{<i>t</i>}	0.427	0.381	0.822
Δ <i>FINCF</i> _{<i>t</i>}	0.097	0.299	0.489
Δ <i>LEV</i> _{<i>t</i>}	0.010	0.138	0.504
Δ <i>CAPX</i> _{<i>t</i>}	-0.080	0.512	0.406
Δ <i>PPE</i> _{<i>t</i>}	-0.017	0.234	0.482
<i>RETURN</i> _{<i>t</i>}	-0.012	0.035	0.471
<i>RETURN</i> _{<i>t-1</i>}	-0.004	0.060	0.428
<i>EP</i> _{<i>t</i>}	0.002	0.185	0.457

APPENDIX 5

Summery Statistics of Suspect and Matched Control Firms

Panel A: Suspect Firms

	Mean	StdDev	Min	1 st Pctl	Q1	Median	Q3	99 th Pctl	Max
<i>R&D</i>	0.368	0.306	0.007	0.013	0.144	0.279	0.498	1.478	1.634
<i>OXBRD</i>	0.555	0.451	0.032	0.034	0.207	0.454	0.795	2.196	2.770
<i>SGABRD</i>	0.376	0.275	0.036	0.051	0.198	0.323	0.479	1.759	1.953
<i>COGS</i>	0.519	0.466	0.000	0.000	0.193	0.384	0.715	2.533	2.866
<i>DiscR&D</i>	0.080	0.114	-0.105	-0.071	0.012	0.048	0.109	0.569	0.752
<i>DiscΔR&D</i>	0.094	0.095	0.004	0.008	0.032	0.065	0.116	0.464	0.834
<i>DiscΔOXBRD</i>	-0.099	0.089	-0.587	-0.488	-0.126	-0.071	-0.041	-0.014	-0.013
<i>DiscΔSGABRD</i>	-0.045	0.271	-3.255	-0.535	-0.057	-0.024	0.004	0.531	1.163
<i>DiscΔCOGS</i>	0.012	0.129	-0.477	-0.275	-0.047	0.002	0.046	0.429	0.582
<i>ROAB</i>	-0.112	0.441	-2.408	-1.787	-0.247	-0.040	0.170	0.641	0.698
<i>OCF</i>	0.201	0.611	-1.461	-1.308	-0.251	0.275	0.618	1.639	1.879
<i>ΔOCF</i>	-0.010	0.299	-0.953	-0.844	-0.119	0.007	0.120	0.825	0.974
<i>FINCF</i>	0.355	0.702	-0.318	-0.234	0.000	0.066	0.470	3.118	6.103
<i>ΔFINCF</i>	0.048	0.674	-1.095	-0.986	-0.233	-0.007	0.193	2.886	5.346
<i>CASH</i>	0.508	0.529	0.002	0.006	0.146	0.367	0.676	2.410	4.024
<i>ΔCASH</i>	0.043	0.468	-0.696	-0.654	-0.170	-0.037	0.075	2.029	3.158
<i>ΔLEV</i>	0.049	0.294	-1.501	-0.801	-0.050	0.019	0.111	0.971	1.831
<i>ΔCAPX</i>	0.001	0.043	-0.128	-0.125	-0.013	0.000	0.014	0.153	0.363
<i>ΔSALE</i>	0.015	0.287	-1.065	-0.754	-0.097	0.035	0.152	0.826	1.060
<i>ACCRUAL</i>	0.024	0.491	-1.133	-0.876	-0.206	-0.012	0.133	2.272	2.400
<i>CF</i>	-0.032	0.362	-1.536	-1.136	-0.165	0.012	0.209	0.657	0.768
<i>STK</i>	0.138	0.335	-0.243	-0.203	0.000	0.012	0.130	1.729	2.079
<i>SIZE</i>	18.354	1.709	14.017	14.570	17.316	18.215	19.134	23.194	24.755
<i>MB</i>	3.640	10.130	-78.890	-39.043	1.562	3.615	6.647	25.180	72.738
<i>AT_{t-1}</i>	318.324	1709.357	1.071	2.179	18.598	37.111	104.162	3667.675	25575.000
<i>RETURN</i>	-0.059	0.916	-0.929	-0.909	-0.541	-0.276	0.160	2.789	8.420

Panel B: Matched Control Firms

	Mean	StdDev	Min	1 st Pctl	Q1	Median	Q3	99 th Pctl	Max
<i>R&D</i>	0.349	0.287	0.007	0.008	0.138	0.251	0.502	1.280	1.497
<i>OXBRD</i>	0.625	0.533	0.025	0.034	0.261	0.453	0.828	2.264	2.685
<i>SGABRD</i>	0.421	0.325	0.041	0.059	0.198	0.323	0.534	1.569	1.965
<i>COGS</i>	0.508	0.449	0.000	0.000	0.163	0.384	0.743	2.147	2.153
<i>DiscR&D</i>	0.071	0.094	-0.111	-0.092	0.009	0.042	0.111	0.370	0.396
<i>DiscΔR&D</i>	0.088	0.079	0.006	0.009	0.035	0.059	0.110	0.377	0.403
<i>DiscΔOXBRD</i>	0.056	0.072	-0.038	-0.030	0.006	0.039	0.086	0.322	0.399
<i>DiscΔSGABRD</i>	0.032	0.103	-0.602	-0.228	-0.008	0.015	0.055	0.428	0.428
<i>DiscΔCOGS</i>	0.051	0.150	-0.808	-0.411	-0.008	0.035	0.124	0.505	0.723
<i>ROAB</i>	-0.093	0.327	-1.662	-1.543	-0.202	-0.054	0.111	0.490	0.897
<i>OCF</i>	0.196	0.630	-1.532	-1.396	-0.209	0.287	0.613	1.833	1.996
<i>ΔOCF</i>	0.053	0.345	-0.953	-0.794	-0.124	0.027	0.152	1.322	1.453
<i>FINCF</i>	0.398	0.836	-0.280	-0.278	0.000	0.044	0.470	3.712	7.333
<i>ΔFINCF</i>	0.069	0.721	-0.986	-0.869	-0.278	-0.025	0.124	2.581	5.528
<i>CASH</i>	0.604	0.725	0.002	0.003	0.178	0.423	0.690	3.767	4.902
<i>ΔCASH</i>	0.091	0.660	-0.654	-0.603	-0.210	-0.060	0.070	2.979	4.004
<i>ΔLEV</i>	0.078	0.308	-0.739	-0.498	-0.024	0.019	0.112	1.066	2.867
<i>ΔCAPX</i>	0.000	0.044	-0.203	-0.116	-0.012	0.000	0.012	0.150	0.363
<i>ΔSALE</i>	0.017	0.282	-0.863	-0.792	-0.081	0.010	0.109	1.019	1.334
<i>ACCRUAL</i>	-0.011	0.496	-0.918	-0.860	-0.252	-0.063	0.111	2.289	3.383
<i>CF</i>	-0.042	0.313	-1.437	-1.437	-0.147	-0.001	0.148	0.581	0.964
<i>STK</i>	0.080	0.199	-0.287	-0.205	0.000	0.011	0.057	1.044	1.044
<i>SIZE</i>	18.451	1.754	14.315	14.958	17.183	18.259	19.137	25.000	25.628
<i>MB</i>	4.125	11.398	-78.890	-53.816	1.645	3.205	6.847	37.639	52.361
<i>AT_{t-1}</i>	515.895	3012.659	2.767	2.892	18.823	45.759	112.552	26176.500	29163.000
<i>RETURN</i>	-0.084	1.005	-0.903	-0.849	-0.561	-0.304	0.035	5.722	7.225

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