Over-Reporting of R&D by Classification Shifting within Core Earnings

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Abstract

This study investigates *classification shifting* from other operating expenses to *R&D* (CSRD) 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 are consistent with managers opportunistically engage in CSRD. 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 CSRD. 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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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 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* (CSRD)." Not only do managers have the incentive to engage in CSRD, 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. As a result, managers have substantial discretion in classifying other operating expenses as R&D 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 Sbaraglia 2010),

[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.

expense shifting within core earnings remains uninspected. 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 regulator'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 might make 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 CSRD. The two most well-known approaches are accrual management and real earnings management. Compared to these two approaches, CSRD 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, CSRD 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; Darrough and Rangan 2005), CSRD 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, CSRD and other forms of earnings management could be used in conjunction: For example even if real R&D is cut, CSRD 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. [3]

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

[3] As a sensitivity test, I also run time-series regressions. The results are listed in Appendix 1, and are consistent with classification shifting.

between R&D and OXBRD after controlling for other firm characteristics.) This association is consistent with managers classifying other operating expenses as R&D.[4]

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 CSRD, 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 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 would 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

[4] I 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.

rather than COGS as R&D expense.[5] 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 also find a stronger negative association between discretionary change in R&D and change in OXBRD when managers are close to retirement. 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 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

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

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 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 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" CSRD firms by examining the discretionary changes in R&D and OXBRD, current year cash holding, and current year net stock issuance. The suspect CSRD 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 illustrate 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.

2. Prior Studies and Hypotheses

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). 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 Wangerin 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 incurred[1]. Nevertheless the market still value R&D as an investment rather than an expense (Bublitz et al. 1989; Chauvin et al. 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 et al. 1991), when firms face small earnings declines (Baber, Fairfield and Haggard 1991), and before IPO (Darrough et al. 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 et al. (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*[6]. Instead it affects investors' perception 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

[6] Classification 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 CSRD, R&D levels would appear to be normal, ordinary expense would decrease and GAAP earnings would increase.

managers adapt their classification shifting behaviors to new disclosure environments as the regime changes (Kolev, Marquardt and McVay 2008; Anatharaman, Darrough 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.

2.3 HYPOTHESES DEVELOPMENT

Previous studies have shown that c*eteris paribus*, the market gives higher valuation to R&D expenses than to other operating expenses (Bublitz et al. 1989; Chauvin et al. 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 personal cost of classification shifting decreases. Holding the benefits of classification shifting constant, I posit that managers will classification-shift more as they approach closer 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 on less than optimal 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, which includes 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 CSRD.

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.*

3. 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 from t-1 to t or from t to t+1 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 CSRD 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:

$$\Delta R\&D_t = \alpha + \lambda_1 R\&D_{t-1} + \lambda_2 \Delta R\&D_{t-1} + \lambda_3 Ind\Delta R\&D_t + \sum \lambda\ Profitability\_Measures + \sum \lambda\ Cashflows\_Measures + \sum \lambda\ Investment\_Choices + \sum \lambda\ Other\_Characteristics \quad (1)$$

Dependent variable:

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

Control Variables:

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

$Profitability\_Measures$:

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

$NEG\Delta$	=	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*Δ, Δ*SALES*, Δ*LEV 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:

$$R\&D_t = \alpha + \lambda_1 R\&D_{t-1} + \lambda_2 IndR\&D_t + \sum \lambda \ Profitability\_Measures + \sum \lambda \ Cashflows\_Measures + \sum \lambda \ Investment\_Choices + \sum \lambda \ Other\_Characteristics \quad (2)$$

Dependent Variables:

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

Control Variables:

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

$Profitability\_Measures$:

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

NEG	=	dummy variable that equals 1 when $ROAB_t$ is negative, and 0 otherwise
$NEG * ROAB$	=	interaction term
$SALES_{t-1}$	=	lagged sales/lagged AT
$ACCRUALS_t$	=	current accruals

$Cashflows\_Measures$

$CASH_t$	=	cash in year *t* (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.

Model of Discretionary Changes in Operating Expense before R&D

$$\Delta OXBRD_t = \alpha + \lambda_1 OXBRD_{t-1} + \lambda_2 \Delta OXBRD_{t-1} + \lambda_3 Ind\Delta OXBRD + \sum \lambda\ Profitability\_Measures + \sum \lambda\ Cashflows\_Measures + \sum \lambda\ Investment\_Choices + \sum \lambda\ Other\_Characteristics \quad (3)$$

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

$$\Delta SGABRD_t = \alpha + \lambda_1 SGABRD_{t-1} + \lambda_2 \Delta SGABRD_{t-1} + \lambda_3 Ind\Delta SGABRD + \sum \lambda\ Profitability\_Measures$$
$$+ \sum \lambda\ Cashflows\_Measures + \sum \lambda\ Investment\_Choices + \sum \lambda\ Other\_Characteristics \quad (4)$$

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

$$\Delta COGS_t = \lambda_1 COGS_{t-1} + \lambda_2 \Delta COGS_{t-1} + \lambda_2 Ind\Delta COGS_t + \sum \lambda\ Profitability\_Measures$$
$$+ \sum \lambda\ Cashflows\_Measures + \sum \lambda\ Investment\_Choices + \sum \lambda\ Other\_Characteristics \quad (5)$$

Table 3 here

4. Empirical Results

First, I examine hypothesis 1 by regressing discretionary changes or levels of R&D (*Disc*Δ*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.

$$Disc\Delta RD_t = \alpha + \lambda_1 \Delta \mathrm{OXBRD}_t + \lambda_2 R\&D_{t-1} + \lambda_3 Ind\Delta R\&D_t + \sum \lambda\ Profitability\_Measures$$
$$+ \sum \lambda\ Cashflows\_Measures + \sum \lambda\ Investment\_Choices + \sum \lambda\ Other\_Characteristics \quad (6)$$

$$DiscRD_t = \alpha + \lambda_1 \mathrm{OXBRD}_t + \lambda_2 R\&D_{t-1} + \lambda_3 IndR\&D_t + \sum \lambda\ Profitability\_Measures$$
$$+ \sum \lambda\ Cashflows\_Measures + \sum \lambda\ Investment\_Choices + \sum \lambda\ Other\_Characteristics \quad (7)$$

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 = ΔGDP 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 ΔOXBRD_t is negative and significant for both complete samples (λ_1=-0.011, t=7.12) and the subsample of larger firms (λ_1=-0.064, t=17.1), For equation (7), the coefficient on $OXBRD_t$ is also negative and significant on both complete samples (λ_1= -0.034, t=11.47) and the larger sample (λ_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.[7]

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.

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

[7] I also run modified models by firm (time-series regressions) and also find a negative and significant association between discretionary (changes) in R&D and (changes in) OXBRD. The test results are presented in Appendix 2.

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 *ΔSGABRD* and *ΔOXBS* for the complete sample and the larger sample. The coefficients on *ΔOXBS* are consistently positive and significant. The next two columns test the association between discretionary *ΔCOGS* and *ΔOXBC*. 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 when discretionary *R&D* increases and *OXBRD* decreases, 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 *ΔOXBRD*PosdΔRD* (*ΔOXBRD* 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 *ΔOXBRD* 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 *ΔSGABRD* and discretionary *ΔR&D* (λ_1 = - 0.014, t=3.25), and only a marginally significantly negative association between *ΔCOGS* and discretionary *ΔR&D* (λ_1 = - 0.005, t= - 1.68). The results indicate that classification shifting plays an important role in explaining the negative association between *ΔOXBRD* and discretionary *ΔR&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 *ΔOXBRD* (column 1) and *OXBRD* (column 2) are both significantly 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 *ΔOXBRD*. I include both the indicator variable and the interaction term in the following regression:

Table 9 here

In Table 9, the coefficient on Δ*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* expenditure, 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 target by over-reporting R&D. To test hypothesis 2b, I create indicator variable (*Missing*) that equals one when firms miss the analyst forecast by one cent or more, and zero otherwise. I then interact the indicator variable with *ΔOXBRD*. I include both the indicator variable and interaction term in the following regressions:

Table 10 here

Table 10 reports the regression of *DiscΔR&D* on Δ*OXBRD*, *Missing*, Δ*OXBRD***Missing* and control variables. The significantly negative coefficient (λ_1 = - 0.034, t=4.43) on Δ*OXBRD*Missing* is consistent with managers shifting more OXBRD to R&D when earnings miss analyst forecast target, 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 h*ighNOA* as an indicator variable that equals one when a firm's *NOA* is higher than the industry median (zero otherwise), interact it with *ΔOXBRD* or *OXBRD*, and include them in the following regressions:

Table 11 here

In the first column I see a significantly negative coefficient on Δ*OXBRD*highNOA* (λ_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:

$$\begin{aligned}\Delta \text{R\&D}_q = {} & \alpha + \beta_1 \text{R\&D}_{q-4} + \beta_2 \text{R\&D}_{q-1} + \beta_3 \Delta \text{R\&D}_{q-4} + \beta_4 \Delta \text{ROAB}_q + \beta_4 \text{NEG}\Delta_q {*} \Delta \text{ROAB}_q + \beta_5 \text{NEG}\Delta_q \\ & + \beta_6 \Delta \text{SALES}_q + \beta_7 \text{SALES}_{t-1} + \beta_8 \text{ACCRUALS}_q + \beta_9 \Delta \text{CASH}_q + \beta_{10} \Delta \text{OCF}_q + \beta_{11} \text{OCF}_{q-4} + \beta_{12} \Delta \text{FCF}_q \\ & + \beta_{13} \Delta \text{CAPX}_q + \beta_{14} \Delta \text{PPE}_q + \beta_{15} \Delta \text{INTAN}_q + \beta_{16} \Delta \text{LEV}_q + \beta_{17} \text{RETURNS}_q + \varepsilon_q \end{aligned} \tag{8}$$

$$\begin{aligned}\text{R\&D}_q = {} & \alpha + \beta_1 \text{R\&D}_{q-4} + \beta_2 \text{R\&D}_{q-1} + \beta_3 \Delta \text{R\&D}_{q-4} + \beta_4 \text{ROAB}_q + \beta_5 \text{NEG*ROAB}_q + \beta_6 \text{NEG} + \beta_7 \text{SALES}_q \\ & + \beta_8 \text{ACCRUALS}_q + \beta_9 \text{CASH}_q + \beta_{10} \text{OCF}_q + \beta_{11} \text{FCF}_q + \beta_{12} \text{CAPX}_q + \beta_{13} \text{PPE}_q + \beta_{14} \text{INTAN}_q \\ & + \beta_{15} \text{LEV}_q + \beta_{16} \text{RETURNS}_q + \varepsilon_q \end{aligned} \tag{9}$$

I use the following models to test hypothesis 3b:

$$\begin{aligned} Disc\Delta RD_q = {} & \alpha + \beta_1 \Delta \text{OXBRD}_q + \beta_2 \text{RD}_{q-4} + \beta_3 \text{RD}_{q-1} + \beta_4 \Delta \text{ROAB}_{q\sim q-4} + \beta_5 \Delta \text{ROAB}_{q\sim q-1} + \beta_6 \text{NEG}\Delta {*} \Delta \text{ROAB}_{q\sim q-4} \\ & + \beta_7 \text{NEG}\Delta + \beta_8 \Delta \text{SALES}_{q\sim q-4} + \beta_9 \text{SALES}_{q\sim q-1} + \beta_{10} \text{ACCUALS}_q + \beta_{11} \Delta \text{CHE}_q + \beta_{12} \Delta \text{OCF}_q + \beta_{13} \text{OCF}_{q-1} \\ & + \beta_{14} \Delta \text{FCF}_q + \beta_{15} \Delta \text{LEV}_q + \beta_{14} \Delta \text{CAPX}_q + \beta_{15} \Delta \text{PPE}_q + \beta_{16} \Delta \text{INTAN}_q + \beta_{17} \text{MB}_{q-1} + \beta_{18} \text{SIZE}_{q-1} + \beta_{19} \text{EP}_q \\ & + \text{D2P}_q + \text{RETURNS}_q + \Delta \text{GDP}_q + \varepsilon_q \end{aligned} \tag{10}$$

$$\begin{aligned} DiscRD_q = {} & \alpha + \beta_1 \text{OXBRD}_q + \beta_2 \text{RD}_{q-4} + \beta_3 \text{RD}_{q-1} + \beta_4 \text{ROAB}_q + \beta_5 \text{NEG*ROAB}_q + \beta_6 \text{NEG} + \beta_7 \Delta \text{SALES}_{q-4} \\ & + \beta_8 \text{SALES}_q + \beta_9 \text{ACCUALS}_q + \beta_{10} \Delta \text{CHE}_q + \beta_{12} \Delta \text{OCF}_q + \beta_{13} \text{OCF}_{q-1} + \beta_{14} \Delta \text{FCF}_q + \beta_{15} \Delta \text{LEV}_q \\ & + \beta_{16} \Delta \text{CAPX}_q + \beta_{17} \Delta \text{PPE}_q + \beta_{18} \Delta \text{INTAN}_q + \beta_{19} \text{MB}_{q-4} + \beta_{20} \text{SIZE}_{q-4} + \beta_{21} \text{EP}_q + \text{D2P}_q + \text{RETURNS}_q \\ & + \text{GDP}_q + \varepsilon_q \end{aligned} \tag{11}$$

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 Δ*OXBRD*Q4* (column 1) and *OXBRD*Q4* (column 2) are both negative and significant.

Hypothesis 4 predicts that CSRD should increase as R&D increases relative to asset. The intuition is that if 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 *OXBRD*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 CSRD. To test hypothesis 5 I need first to identify firms that classification-shift to R&D. If firms engage in CSRD, they are likely to experience a discretionary increase in *R&D* and a simultaneous decrease in *OXBRD*s. But firms with a discretionary increase in *R&D* coupled with a decrease in *OXBRD* 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 expenditure.

To be categorized as a “suspect” CSRD 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 *OXBRD*; (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) a above 0.5*median increase in discretionary *R&D*; (2) a below 0.5* median decrease, or an increase in discretionary *OXBRD*; (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.

Table 14 here

In Table 14, Panel A, I examine the current period stock return of suspect firms relative control firms, using Fama-Macbeth annual regression. The coefficient on "*Suspect*" is negative but insignificant. This means I find no 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 ROA on "*Suspect*" indicator variable and control variables. The results are presented in Panel B, Column 1. The coefficient on "*Suspect*" is negatively 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 "*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.

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.

5. 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 forecasted, 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 received 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 avenues 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.

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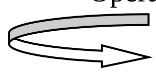
FIGURE 1
CSRD illustration

Hypothetical Income Statement
Example Company



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	
Special Items or Discontinued Operations		
Property Losses Due to Hurricane Sandy	4,000	
Net Income	36,000	

TABLE 1

Sample Composition

Panel A: Sample Selection

Description	No. of Observations
1975-2011 compustat firms that has non-missing lag asset:	195459
no SGA expense	(35016)
no stock price info:	(80626)
lack R&D information:	(41978)
missing variables to estimate non-discretionary R&D:	(2838)
cannot converge to estimate unexpected dRD and unexpected dOEXP	(20279)
full sample	14722
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
R&D	0.132	0.137	0.000	0.004	0.050	0.099	0.164	0.740	1.444
ΔR&D	0.009	0.075	-1.020	-0.218	-0.005	0.005	0.022	0.291	0.747
OXBRD	0.878	0.575	0.011	0.058	0.489	0.772	1.117	3.160	4.184
ΔOXBRD	0.058	0.287	-10.025	-0.839	-0.027	0.052	0.150	0.910	1.693
SGABRD	0.339	0.262	0.000	0.006	0.169	0.276	0.427	1.412	2.094
ΔSGABRD	0.025	0.112	-0.775	-0.347	-0.009	0.018	0.055	0.390	0.876
COGS	0.519	0.428	0.000	0.000	0.218	0.419	0.705	2.178	3.363
ΔCOGS	0.035	0.189	-1.234	-0.569	-0.018	0.025	0.090	0.682	1.374
DiscR&D	-0.001	0.056	-0.583	-0.157	-0.018	-0.001	0.015	0.180	0.734
DiscΔR&D	-0.001	0.048	-0.552	-0.141	-0.016	0.000	0.014	0.151	0.736
DiscΔOXBRD	0.001	0.144	-4.736	-0.404	-0.033	0.001	0.036	0.393	3.001
DiscΔSGABRD	0.000	0.060	-0.777	-0.180	-0.020	0.000	0.020	0.189	0.756
DiscΔCOGS	-0.003	0.066	-0.720	-0.227	-0.024	0.000	0.023	0.176	0.546
ROAB	0.067	0.260	-1.848	-0.951	-0.003	0.107	0.201	0.566	0.717
OCF	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
FINCF	0.105	0.383	-0.334	-0.264	-0.025	0.001	0.065	1.973	5.521
ΔFINCF	0.040	0.347	-1.017	-0.706	-0.052	0.000	0.061	1.565	5.174
CASH	0.332	0.354	0.000	0.002	0.090	0.241	0.461	1.732	4.665
ΔCASH	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
ΔCAPX	0.004	0.043	-0.230	-0.113	-0.010	0.001	0.014	0.169	0.363
SALE	0.919	0.506	0.000	0.000	0.574	0.870	1.192	2.520	3.254
ΔSALE	0.099	0.289	-1.054	-0.625	-0.027	0.072	0.205	1.112	2.101
ACCRUAL	0.048	0.295	-1.143	-0.620	-0.070	0.029	0.125	1.161	3.328
INTAN	0.126	0.217	0.000	0.000	0.000	0.027	0.161	0.988	1.937
PPE	0.388	0.268	0.008	0.024	0.188	0.330	0.524	1.266	1.732
CF	0.120	0.248	-1.614	-0.807	0.042	0.154	0.249	0.636	0.786
STK	0.075	0.304	-0.313	-0.184	0.000	0.004	0.025	1.610	4.706
SIZE	19.108	2.205	12.439	14.728	17.522	18.947	20.494	24.929	26.775
MB	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
RETURN	0.144	0.961	-0.986	-0.852	-0.339	-0.037	0.334	4.050	18.614
D2P	0.005	0.013	0.000	0.000	0.000	0.000	0.000	0.059	0.225
EP	-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.

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

Panel C: Pearson (upper)/Spearman (lower) 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.

	R&D	*ΔR&D*	*OXBRD*	*ΔOXBRD*	*DiscR&D*	*DiscΔR&D*	*ROAB*	*OCF*	*FINCF*	*CASH*	*SALE*	*COGS*	*ACCRUAL*	*MB*	*SIZE*	*RETURN*
R&D	1.000	0.332	0.004	-0.005	0.382	0.320	-0.189	0.207	0.528	0.421	-0.064	-0.193	0.082	0.193	-0.083	0.029
ΔR&D	0.291	1.000	0.023	0.144	0.625	0.598	0.080	0.107	0.174	0.160	0.091	0.028	0.206	0.099	0.093	-0.065
OXBRD	-0.055	0.040	1.000	0.368	-0.024	-0.032	-0.009	0.311	0.158	-0.123	0.892	0.853	0.133	0.012	-0.277	0.052
ΔOXBRD	0.022	0.302	0.350	1.000	-0.019	-0.056	0.156	0.160	0.132	0.082	0.404	0.321	0.239	0.093	0.105	0.024
DiscR&D	0.212	0.453	-0.007	0.030	1.000	0.660	0.018	0.047	-0.002	0.004	0.013	-0.015	0.024	0.041	0.033	-0.004
DiscΔR&D	0.208	0.404	-0.015	-0.034	0.498	1.000	0.058	0.051	0.038	0.048	0.007	-0.029	0.012	0.049	0.025	0.005
ROAB	0.152	0.283	0.096	0.287	0.094	0.058	1.000	0.206	-0.401	0.021	0.361	0.119	0.265	-0.039	0.307	0.112
OCF	0.346	0.226	0.415	0.250	0.065	0.051	0.206	1.000	0.034	0.154	0.341	0.055	0.121	0.049	-0.004	0.102
FINCF	0.314	0.149	0.102	0.181	-0.068	-0.018	-0.169	-0.007	1.000	0.587	-0.023	-0.027	0.278	0.179	-0.061	0.045
CASH	0.393	0.143	-0.299	0.035	-0.004	0.047	0.188	0.126	0.237	1.000	-0.128	-0.252	0.296	0.169	0.058	0.119
SALE	-0.043	0.145	0.880	0.398	0.034	0.036	0.439	0.564	-0.014	-0.253	1.000	0.829	0.229	0.009	-0.098	0.090
COGS	-0.257	0.014	0.847	0.291	-0.003	-0.027	0.136	0.150	-0.040	-0.411	0.825	1.000	0.109	-0.080	-0.182	0.034
ACCRUAL	0.002	0.241	0.105	0.339	0.020	0.028	0.461	0.173	0.086	0.118	0.249	0.116	1.000	0.117	0.159	0.085
MB	0.270	0.251	-0.050	0.242	0.036	0.055	0.222	0.240	0.190	0.244	0.012	-0.173	0.218	1.000	0.125	-0.062
SIZE	-0.054	0.156	-0.304	0.133	0.039	0.036	0.365	0.004	-0.088	0.118	-0.093	-0.183	0.227	0.307	1.000	0.140
RETURN	-0.031	-0.017	0.028	0.065	0.021	0.024	0.251	0.154	-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 Δ in R&D Expense

Pred Var	MEAN	STD	Percent Significant
Intercept	0.001	0.027	0.257
$R\&D_{t-1}$	-0.043	0.207	0.479
$\Delta R\&D_{t-1}$	0.032	0.440	0.431
$\Delta ROAB_t$	0.049	0.191	0.368
$NEG\Delta_t$	0.019	0.029	0.491
$NEG\Delta * \Delta ROAB_t$	0.025	0.858	0.409
$\Delta SALES_t$	0.007	0.055	0.385
$SALES_{t-1}$	-0.003	0.022	0.267
$ACCRUAL_t$	0.012	0.083	0.340
$\Delta CASH_t$	0.003	0.097	0.347
ΔOCF_t	0.066	0.145	0.465
$\Delta FINCF_t$	0.029	0.096	0.419
ΔLEV_t	0.009	0.086	0.358
$\Delta CAPX_t$	0.059	0.263	0.299
ΔPPE_t	0.033	0.151	0.295
$\Delta INTAN_t$	0.029	0.889	0.319
$RETURN_t$	0.000	0.020	0.274
EP_t	-0.012	0.076	0.348

Panel B: Model of Expected R&D Expense

Pred Var	MEAN	STD	Percent Significant
Intercept	0.002	0.052	0.257
$R\&D_{t-1}$	0.778	0.408	0.942
$ROAB_t$	0.134	0.250	0.526
NEG_t	0.022	0.065	0.412
$NEG*ROAB_t$	-0.074	0.905	0.406
$SALE_t$	-0.014	0.042	0.355
$ACCRUAL_t$	0.000	0.092	0.376
$CASH_t$	-0.011	0.101	0.344
OCF_t	0.035	0.075	0.431
$FINCF_t$	0.071	0.101	0.578
LEV_t	0.000	0.054	0.286
$CAPX_t$	0.046	0.251	0.318
$INTAN_t$	0.000	0.002	0.157
$RETURN_t$	-0.001	0.023	0.327
$RETURN_{t-1}$	0.001	0.028	0.321
EP_t	-0.028	0.174	0.393

TABLE 4

OLS Regression of Changes and Levels of Discretionary R&D Expenses on Operating Expenses Before R&D

		Dependent Variables							
		DiscΔR&D$_t$				*DiscR&D $_t$*			
Independent	Predicted	Full Sample		AT $_{t-1}$>100,000		Complete Sample		AT$_{t-1}$>100,000	
Variables	Sign	Coefficient	(t-value)	Coefficient	(t-value)	Coefficient	(t-value)	Coefficient	(t-value)
Intercept		-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)**
R&D$_{t-1}$		-0.020***	(-5.99)	-0.036***	(-5.85)	-0.009**	(-2.21)	-0.082***	(-10.68)
ΔROAB$_t$		-0.002	(-1.33)	0.000	0.000				
*NEGΔ$_t$*ΔROAB$_t$*		0.001	-0.46	0.005	-1.24				
NEGΔ$_t$		-0.004***	(-4.44)	-0.009***	(-9.71)				
ROAB$_t$						-0.029***	(-7.5)	-0.005	(-0.65)
*NEG$_t$*ROAB$_t$*						-0.001	(-0.52)	0.020***	-4.14
NEG$_t$						-0.001	(-0.89)	0.003**	-2.2
ΔSALES$_t$		-0.005***	(-2.61)	0.042***	-10.43	0.028***	-8.61	0.086***	-16.16
SALES$_{t-1}$		-0.002**	(-2.43)	0.002	-1.5	0.029***	-9.68	0.090***	-17.71
ACCRUAL$_t$		0.000	(-0.12)	0.002	-0.74	0.005***	-2.7	0.003	-1.05
ΔCASH$_t$		-0.011***	(-5.32)	-0.017***	(-5.86)	-0.020***	(-8.44)	-0.029***	(-8.65)
ΔOCF$_t$		0.034***	-13.47	0.020***	-4.79	0.031***	-10.58	0.006	-1.17
OCF$_{t-1}$		0.017***	-12.01	0.016***	-8.9	0.009***	-5.29	-0.005**	(-2.05)
ΔFINCF$_t$		0.010***	-6.23	-0.001	(-0.42)	0.002	-0.82	-0.025***	(-8.85)
ΔCAPX$_t$		-0.028***	(-3.02)	-0.051***	(-4.24)	-0.008	(-0.75)	-0.055***	(-3.92)
ΔINTAN$_t$		-0.002*	(-1.85)	-0.009***	(-4.23)	0.001	-0.72	-0.001	(-0.53)
ΔLEV$_t$		0.000	-0.13	0.002	-0.74	0.005***	-3.57	0.015***	-5.19
MB$_{t-1}$		0.000***	-3.64	0.000	-1.04	0.000***	-4.35	0.000	(-0.66)
SIZE$_{t-1}$		0.001***	-3.13	0.001***	-3.1	0.000	-0.33	-0.001**	(-2.09)
EP$_t$		-0.002**	(-2.39)	-0.002***	(-2.77)	0.000	-0.45	-0.003***	(-3.34)
D2P$_t$		-0.034	(-1.05)	-0.053*	(-1.7)	0.025	-0.66	-0.023	(-0.64)
ΔGDP$_t$		-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-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*. 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)

		Dependent Variables							
		DiscΔSGABRD				*DiscΔCOGS*			
Independent	Predicted	Complete Sample		AT_{t-1}>100,000		Complete Sample		AT_{t-1}>100,000	
Variables	Sign	Coefficient	T	Coefficient	T	Coefficient	T	Coefficient	T
Intercept		0.017**	(1.98)	0.035***	(3.82)	-0.013	(-1.53)	-0.015*	(-1.67)
$\Delta OXBS_t$	**?**	**0.078*** **	**(40.61)**	**0.129*** **	**(25.75)**				
$SGABRD_{t-1}$		0.004*	(1.75)	0.015***	(4.29)				
$\Delta OXBC_t$	**?**					**0.123*** **	**(27.78)**	**0.073*** **	**(7.77)**
$COGS_{t-1}$						-0.005***	(-3.27)	-0.003	(-1.18)
$\Delta ROAB_t$		0.004**	(2.31)	0.019***	(6.9)	0.017***	(9.81)	0.020***	(7.3)
$NEG\Delta_t*\Delta ROAB_t$		-0.009***	(-3.08)	-0.002	(-0.37)	-0.011***	(-3.7)	0.011**	(2.23)
$NEG\Delta_t$		-0.009***	(-7.36)	-0.013***	(-10.5)	0.005***	(4.46)	0.002*	(1.7)
$\Delta SALES_t$		-0.060***	(-22.69)	-0.107***	(-20.16)	0.060***	(26.96)	0.068***	(18.71)
$SALES_{t-1}$		0.001	(0.84)	-0.002	(-1.18)	0.005***	(2.7)	0.000	(0.07)
$ACCRUAL_t$		0.001	(0.41)	0.003	(0.88)	-0.010***	(-4.6)	-0.010***	(-2.85)
$\Delta CACH_t$		0.001	(0.38)	0.003	(0.89)	0.044***	(16.8)	0.047***	(12.18)
ΔOCF_t		0.009***	(2.91)	0.015***	(2.84)	-0.240***	(-71.17)	-0.278***	(-46.66)
OCF_{t-1}		-0.008***	(-3.51)	-0.016***	(-5.23)	-0.006***	(-3)	-0.001	(-0.49)
$\Delta FINCF_t$		0.002	(0.78)	-0.008**	(-2.55)	-0.036***	(-17.69)	-0.045***	(-13.55)
ΔLEV_t		-0.001	(-0.77)	-0.004	(-1.1)	0.001	(0.74)	0.015***	(4.62)
$\Delta CAPX_t$		-0.017	(-1.41)	-0.023	(-1.49)	-0.043***	(-3.63)	-0.016	(-1.04)
$\Delta INTAN_t$		-0.001	(-0.68)	0.000	(0.12)	0.002	(0.94)	-0.010***	(-3.38)
MB_{t-1}		0.000***	(4.51)	0.000	(0.17)	-0.000	(-1.4)	-0.000***	(-2.99)
$SIZE_{t-1}$		-0.001***	(-2.91)	-0.001***	(-3.11)	-0.000	(-0.15)	0.000	(1.03)
EP_t		0.001	(0.66)	-0.003**	(-2.53)	-0.001	(-1.27)	-0.002	(-1.44)
$D2P_t$		-0.050	(-1.14)	0.014	(0.33)	0.037	(0.89)	-0.025	(-0.62)
ΔGDP_t		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*. 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

		Dependent Variables			
Independent	Predicted	*DiscΔR&D*		*DiscR&D*	
Variables	Sign	Coefficient	T	Coefficient	T
Intercept		-0.031***	(-5.76)	-0.038***	(-7.62)
$\Delta OXBRD_t$		-0.004**	(-2.41)		
$\Delta OXBRD*Posd\Delta RD_t$	**-**	**-0.011*****	**(-6.16)**		
$Posd\Delta RD_t$		0.055***	(84.34)		
$OXBRD_t$				-0.024***	(-9.18)
$OXBRD*PosdRD_t$	**-**			**-0.012*****	**(-9.18)**
$PosdRD_t$				0.070***	(50.33)
$\Delta ROAB_t$		-0.001	(-1.28)		
$NEG\Delta_t*\Delta ROAB_t$		0.004**	(2.01)		
$NEG\Delta_t$		0.002***	(2.92)		
$ROAB_t$				-0.021***	(-6.61)
NEG_t*ROAB_t				-0.002	(-1.2)
NEG_t				0.004***	(4.03)
$R\&D_{t-1}$		-0.016***	(-6)	-0.016***	(-4.92)
$\Delta SALES_t$		-0.002	(-1.3)	0.024***	(8.76)
$SALES_{t-1}$		-0.001	(-1.13)	0.026***	(10.44)
$ACCRUAL_t$		0.001	(0.39)	0.006***	(3.64)
$\Delta CASH_t$		-0.008***	(-4.92)	-0.010***	(-4.84)
ΔOCF_t		0.025***	(12.21)	0.021***	(8.63)
OCF_{t-1}		0.008***	(7.01)	0.004**	(2.46)
$\Delta FINCF_t$		0.008***	(6.27)	0.000	(0.13)
ΔLEV_t		0.000	(0.05)	0.004***	(3.15)
$\Delta CAPX_t$		-0.008	(-1.09)	-0.000	(-0.05)
$\Delta INTAN_t$		-0.001	(-1.45)	0.001	(0.47)
MB_{t-1}		0.000***	(3.21)	0.000***	(4.01)
$SIZE_{t-1}$		0.000	(1.22)	-0.000	(-0.29)
EP_t		-0.001	(-1.2)	0.001	(1.38)
$D2P_t$		-0.049*	(-1.85)	0.018	(0.57)
ΔGDP_t		-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-quarter, 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-quarter, 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.

TABLE 7

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

		Dependent Variables			
Independent	Predicted	*DiscΔR&D$_t$*		*DiscR&D$_t$*	
Variables	Sign	Coefficient	T	Coefficient	T
Intercept		-0.012*	(-1.88)	-0.012*	(-1.8)
ΔSGABRD$_t$	**-**	**-0.014*** **	**(-3.25)**		
ΔCOGS$_t$	**?**			**-0.005***	**(-1.68)**
R&D$_{t-1}$		-0.019***	(-5.72)	-0.019***	(-5.67)
Δ*ROAB$_t$*		-0.002	(-1.18)	-0.001	(-1.01)
*NEG*Δ$_t$*Δ*ROAB$_t$*		0.001	(0.24)	0.001	(0.33)
*NEG*Δ$_t$		-0.004***	(-4.7)	-0.004***	(-4.84)
Δ*SALES$_t$*		-0.013***	(-7.43)	-0.009***	(-2.96)
SALES$_{t-1}$		-0.002**	(-2.54)	-0.002**	(-2.16)
ACCRUAL$_t$		0.001	(0.32)	0.000	(0.07)
Δ*CASH$_t$*		-0.011***	(-5.44)	-0.010***	(-5.1)
Δ*OCF$_t$*		0.038***	(14.39)	0.033***	(11.49)
OCF$_{t-1}$		0.017***	(11.79)	0.016***	(11.32)
Δ*FINCF$_t$*		0.010***	(6.29)	0.009***	(5.73)
Δ*LEV$_t$*		-0.000	(-0.12)	-0.000	(-0.05)
Δ*CAPX$_t$*		-0.027***	(-2.99)	-0.029***	(-3.13)
Δ*INTAN$_t$*		-0.002*	(-1.84)	-0.002*	(-1.72)
MB$_{t-1}$		0.000***	(3.85)	0.000***	(3.68)
SIZE$_{t-1}$		0.001***	(3.08)	0.001***	(3)
EP$_t$		-0.002**	(-2.38)	-0.002**	(-2.44)
D2P$_t$		-0.035	(-1.09)	-0.035	(-1.07)
ΔGDP$_t$		-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-quarter, 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-quarter, 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.

TABLE 8

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

		Dependent Variables			
Independent	Predicted	$DiscdR\&D_t$		$DiscR\&D_t$	
Variables	Sign	Coefficient	T	Coefficient	T
Intercept		-0.021***	(-4.82)	-0.017***	(-2.74)
ΔOXBRD	+	0.004**	(1.98)		
OXBRD	+			0.013***	(4.36)
$\Delta ROAB_t$		0.001	(0.5)		
$NEG\Delta_t * \Delta ROAB_t$		-0.003	(-1.08)		
$NEG\Delta_t$		-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-quarter, 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-quarter, 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.

TABLE 9

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

Dependent Variable: D$isc\Delta R\&D_t$			
Pred Var	Pred Sign	Coefficient	T
Intercept		0.002	(0.18)
$\Delta OXBRD_t$		0.013	(1.57)
$\Delta OXBRD*Retire_t$	**-**	**-0.048*****	**(-2.74)**
$Retire_t$		0.001	(0.41)
$R\&D_{t-1}$		-0.004	(-0.34)
$\Delta ROAB_t$		-0.015***	(-2.97)
$NEG\Delta_t*\Delta ROAB_t$		0.013*	(1.91)
$NEG\Delta_t$		-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-quarter, 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.

TABLE 10

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

Dep Variables $Disc\Delta R\&D_t$			
Ind Variables	Pred Sign	Coefficient	T
Intercept		-0.017*	(-1.68)
$\Delta OXBRD_t$		-0.059***	(-11.46)
Δ*OXBRD*Missing*	**-**	**-0.034*****	**(-4.43)**
Missing		0.003**	(2.27)
$R\&D_{t-1}$		-0.010***	(-7.11)
$\Delta ROAB_t$		-0.042***	(-4.79)
$NEG\Delta_t * \Delta ROAB_t$		0.006	(1.26)
$NEG\Delta_t$		-0.002	(-0.34)
$\Delta SALES_t$		0.040***	(6.96)
$SALES_{t-1}$		0.003*	(1.67)
$ACCRUAL_t$		-0.002	(-0.63)
$\Delta CASH_t$		-0.022***	(-5.42)
ΔOCF_t		0.013**	(2.08)
OCF_{t-1}		0.020***	(7.54)
$\Delta FINCF_t$		0.003	(0.83)
ΔLEV_t		0.003	(0.91)
$\Delta CAPX_t$		-0.035**	(-2.03)
$\Delta INTAN_t$		-0.005*	(-1.83)
MB_{t-1}		0.000*	(1.67)
$SIZE_{t-1}$		0.001*	(1.72)
EP_t		-0.005***	(-2.79)
$D2P_t$		-0.210***	(-3.96)
ΔGDP_t		-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-quarter, 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.

TABLE 11

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

		Dependent Variables			
Independent	Predicted	$Disc\Delta R\&D_t$		$DiscR\&D_t$	
Variables	Sign	Coefficient	T	Coefficient	T
Intercept		-0.012*	(-1.84)	-0.007	(-1.25)
$\Delta OXBRD_t$		-0.010***	(-5.7)		
$\Delta OXBRD*highNOA_t$	**-**	**-0.009*** **	**(-3.21)**		
$OXBRD_t$				-0.034***	(-10.98)
$OXBRD*highNOA_t$	-			**-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 level of previous accrual manipulation by current net operating asset. NOA= (ACT-CHE-LCT+DLC)/ASSET. 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-quarter, 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-quarter, 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.

TABLE 12

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

		Dependent Variables			
Independent	Predicted	$Disc\Delta R\&D_t$		$DiscR\&D_t$	
Variables	Sign	Coefficient	T	Coefficient	T
Intercept		-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	

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-quarter, 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-quarter, 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.

TABLE 13

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

Dependent Variable: $DiscR\&D_t$

Ind Var	Pred Sign	Coefficient	T
Intercept		-0.012**	(-2.02)
$OXBRD_t$		-0.028***	(-9.12)
$OXBRD*HighRD_t$	**-**	**-0.004*****	**(-2.81)**
$HighRD_t$		0.021***	(10.66)
RD_{t-1}		-0.031***	(-7.37)
$ROAB_t$		-0.036***	(-9.36)
Neg_t*ROAB_t		0.001	(0.6)
Neg_t		-0.004***	(-3)
$\Delta SALES_t$		0.026***	(7.99)
$SALES_{t-1}$		0.028***	(9.28)
$ACCRUAL_t$		0.005***	(2.8)
$\Delta Cash_t$		-0.018***	(-7.5)
ΔOCF_t		0.030***	(10.16)
OCF_{t-1}		0.006***	(3.26)
$\Delta FINCF_t$		0.000	(0.23)
ΔLEV_t		0.005***	(3.49)
$\Delta CAPX_t$		-0.010	(-0.93)
$\Delta INTAN_t$		0.001	(0.9)
MB_{t-1}		0.000***	(4.1)
$Size_{t-1}$		-0.000	(-0.62)
EP_t		0.001	(0.71)
$D2P_t$		0.077**	(2.04)
ΔGDP_t		-0.248	(-0.37)
Adj R^2		0.0408	
N		14679	

TABLE 14

Capital Market Reaction of CSRD. Suspect is a Dummy Variable that Equals One if discΔRD>0, ΔOXBRD<0, and ΔCF+ΔSTK<industrial mean of ΔCF+ΔSTK; and Equals Zero Otherwise.

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

	$Return_t$	
Pred Var	Coefficient	T
Intercept	-0.128***	(-2.98)
Suspect	-0.005	(-0.73)
ROA_t	0.038	(0.59)
$ACCRUAL_t$	0.008	(0.46)
$beta_t$	0.022***	(3.32)
MB_t	-0.020*	(-1.74)
$Size_t$	0.019***	(3.04)
Adj R2	0.101	(1.28)
N	1142	

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

	t+1-+5 *ROA*		t+1-+5 *Return*	
Pred Var	Coefficient	T	Coefficient	T
Intercept	-2.381	(-1.49)	-0.014	(-0.9)
suspect	-0.098*	(-1.74)	-0.006***	(-2.23)
ROA_t	2.376	(0.83)	0.125	(1.54)
$ACCRUAL_t$	-0.628	(-0.47)	-0.115	(-1.03)
$beta_t$	2.371	(1.54)	0.007	(1.1)
MB_t	-0.061	(-1.21)	-0.001*	(-1.81)
$Size_t$	0.052	(1.01)	0.001	(1.2)
Adj R2	0.177**	(2.45)	0.100***	(6.94)
N	474		5523	

APPENDIX 1

OLS Regression of Changes and Levels of Discretionary R&D Expenses on Operating Expenses Before R&D (Discretionary R&D Expense are Estimated by Time Series)

		Dependent Variables			
Independent	Predicted	$\Delta R\&D_t$		$R\&D_t$	
Variables	Sign	Coefficient	T	Coefficient	T
Intercept		-0.003	(-0.98)	0.040***	(11.66)
$\boldsymbol{\Delta OXBRD_t}$	-	-0.014***	(-7.07)		
	-			-0.017***	(-24.3)
$R\&D_{t-1}$		-0.157***	(-51.54)	0.807***	(236.16)
$\Delta SALES_t$		0.008***	(4.1)	0.012***	(7.26)
$\Delta CASH_t$		-0.004*	(-1.92)	0.005**	(2.13)
ΔOCF_t		0.064***	(26.76)	0.063***	(24.13)
OCF_{t-1}		0.029***	(25.14)	0.036***	(28.01)
$\Delta FINCF_t$		0.042***	(27.53)	0.042***	(24.95)
$\Delta CAPX_t$		0.099***	(13.27)	0.100***	(12.16)
$\Delta INTAN_t$		0.011***	(10.53)	0.018***	(14.35)
ΔLEV_t		0.003*	(-1.75)	0.001	(0.98)
MB_{t-1}		0.001***	(12.43)	0.001***	(10.44)
$SIZE_{t-1}$		0.000	(0.74)	-0.001***	(-7.95)
Adj R^2		0.1748		0.7648	
N		26344		26344	

Variable definitions are in Table 2, Panel B. In column 1, the dependent variable is change in R&D, In column 2, the dependent variable is R&D. 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

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

		Dependent Variables			
Independent	Predicted	*DiscΔR&D*$_t$		*DiscR&D* $_t$	
Variables	SIGN	Coefficient	T	Coefficient	T
Intercept		0.014	(1.52)	0.007	(0.83)
Δ*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)
Δ*ROAB*$_t$		-0.004**	(-2.23)		
*NEG*Δ$_t$*Δ*ROAB*$_t$		0.003	(0.83)		
*NEG*Δ$_t$		0.037***	(28.05)		
ROAB$_t$				-0.001	(-0.14)
NEG$_t$**ROAB*$_t$				-0.024***	(-7.2)
NEG$_t$				0.037***	(19.22)
Δ*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)
Δ*CASH*$_t$		-0.005	(-1.55)	-0.001	(-0.4)
Δ*OCF*$_t$		0.068***	(17.99)	0.073***	(16.97)
OCF$_{t-1}$		0.038***	(17.45)	0.040***	(15.68)
Δ*FINCF*$_t$		0.041***	(17.05)	0.042***	(15.12)
Δ*CAPX*$_t$		0.016***	(7.8)	0.025***	(10.34)
Δ*INTAN*$_t$		0.111***	(7.85)	0.116***	(7.25)
Δ*LEV*$_t$		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)
Δ*GDP*$_t$		-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-quarter, 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-quarter, 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: $Disc\Delta R\&D_t$ Coefficient	T	Dependent Variables: $DiscR\&D_t$ Coefficient	T
Intercept		-0.008	(-1)	0.004	(0.57)
$\Delta \boldsymbol{OXBRD_t}$	-	-0.025***	(-9.93)		
$\boldsymbol{OXBRD_t}$	-			-0.037***	(-10.46)
$R\&D_{t-1}$		-0.028***	(-7.18)	-0.019***	(-4.56)
$\Delta ROAB_t$		-0.001	(-0.6)		
$NEG\Delta_t*\Delta ROAB_t$		-0.004	(-1.13)		
$NEG\Delta_t$		-0.003***	(-2.98)		
$ROAB_t$				-0.029***	(-6.34)
NEG_t*ROAB_t				0.001	(0.31)
NEG_t				-0.002	(-1.06)
$\Delta SALES_t$		0.002	(0.56)	0.026***	(6.58)
$SALES_{t-1}$		-0.003***	(-2.59)	0.032***	(8.99)
$ACCRUAL_t$		-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)
OCF_{t-1}		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)
MB_{t-1}		0.000***	(4.52)	0.000***	(4.09)
$SIZE_{t-1}$		0.001**	(2.42)	-0.000	(-1.61)
EP_t		-0.001	(-1.49)	0.001	(0.51)
$D2P_t$		-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-quarter, 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-quarter, 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

Pred Var	MEAN	STD	Percent Significant
Intercept	-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
$NEG\Delta_t$	0.009	0.063	0.303
$NEG\Delta * \Delta ROAB_t$	-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)

Pred Var	MEAN	STD	Percent Significant
Intercept	-0.012	0.038	0.304
$SGABRD_{t-1}$	-0.045	0.225	0.449
$\Delta SGABRD_{t-1}$	0.006	0.275	0.300
$\Delta ROAB_t$	-0.113	0.261	0.498
$NEG\Delta_t$	0.005	0.036	0.246
$NEG\Delta * \Delta ROAB$	-0.026	1.307	0.457
$\Delta SALES_t$	0.106	0.131	0.709
$SALES_{t-1}$	-0.003	0.036	0.279
$ACCRUAL_t$	0.043	0.185	0.393
$\Delta CASH_t$	-0.034	0.169	0.385
ΔOCF_t	0.314	0.344	0.721
OCF_{t-1}	0.059	0.151	0.563
$\Delta FINCF_t$	0.052	0.213	0.450
ΔLEV_t	0.036	0.182	0.364
$\Delta CAPX_t$	0.083	0.484	0.251
$\Delta DLTT_t$	-0.029	0.209	0.312
ΔPPE_t	-0.031	0.276	0.336
$\Delta INTAN_t$	0.008	1.071	0.312
$RETURN_t$	-0.008	0.035	0.271
$RETURN_{t-1}$	-0.002	0.034	0.271
EP_t	0.015	0.134	0.312

Panel C: Model of Expected Change in COGS

Pred Var	MEAN	STD	Percent Significant
Intercept	-0.009	0.060	0.420
$COGS_{t-1}$	0.001	0.138	0.543
$\Delta COGS_{t-1}$	-0.016	0.345	0.554
$\Delta ROAB_t$	-0.134	0.350	0.743
$NEG\Delta_t$	0.013	0.267	0.391
$NEG\Delta * \Delta ROAB$	0.140	1.262	0.515
$\Delta SALES_t$	0.331	0.315	0.938
$SALES_{t-1}$	0.002	0.116	0.489
$\Delta SALES_{t-1}$	0.022	0.249	0.504
$ACCRUAL_t$	0.026	0.391	0.475
$\Delta CASH_t$	-0.064	0.368	0.645
ΔOCF_t	0.427	0.381	0.822
$\Delta FINCF_t$	0.097	0.299	0.489
ΔLEV_t	0.010	0.138	0.504
$\Delta CAPX_t$	-0.080	0.512	0.406
ΔPPE_t	-0.017	0.234	0.482
$RETURN_t$	-0.012	0.035	0.471
$RETURN_{t-1}$	-0.004	0.060	0.428
EP_t	0.002	0.185	0.457