Master's Thesis of Business Administration

Accounting Conservatism and Real Earnings Management

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ABSTRACT

SFAS № 2 *Accounting for Research and Development Costs*, effective from 1975, requires the full expensing of R&D expenditure as incurred. Such conservative treatment creates unrecorded R&D reserves, which, as this paper shows, are positively associated with real earnings management through the reduction of R&D expense. In addition, this paper provides empirical evidence that before (after) the passage of SOX firms with more R&D reserves were more likely to engage in income-increasing (income-decreasing) real earnings management through cutting R&D expense. Also, firms with more R&D reserves and less accounting flexibility reduce R&D expense more, whereas firms with more R&D reserves and market-leader status reduce R&D expense less.

Keywords: *Unconditional accounting conservatism, R&D reserve, real earnings management*

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1. INTRODUCTION

Using a large sample of firms over 1975-2018, I study how unconditional accounting conservatism is related to real earnings management. The literature suggests that financial reporting has become more conservative over time (Givoly and Hayn, 2000; Watts, 2003b). Hence, it is important to understand the consequences of this increase in conservatism. Although the studies providing evidence of positive effects of accounting conservatism are abundant, the research on negative consequences of conservative reporting is relatively sparse.

Critics of accounting conservatism claim that it facilitates earnings management (Levitt, 1998). Yet, to the best of my knowledge, there is only one empirical evidence of this relation. Jackson and Liu (2010) documented a positive association between conservatism and accrual-based earnings management. In particular, they found that firms strategically build up reserves of bad debt expense that accumulate in the allowance account on the balance sheet. Subsequently, the firms release past over-accruals of bad debt expense into earnings in order to meet earnings benchmarks. In an attempt to extend this stream of research, in this paper I investigate how accounting conservatism is related to real earnings management.

Instead of using proxies for accounting conservatism that rely on aggregate accounting numbers, such as those developed by Basu (1997) and Khan and Watts (2009), I employ Jackson and Liu's (2010) approach and focus on conservatism in an individual account. This approach enables more precise modeling and inferences.

As documented in prior research, the increase in conservatism is considerably driven by accounting standards (Ryan and Zarowin, 2003). The

Financial Accounting Standards Board (FASB) released in October 1974 Statement of Financial Accounting Standards (SFAS) № 2 *Accounting for Research and Development Costs*, which requires the full expensing of R&D outlays in financial statements for fiscal years beginning on or after January 1, 1975. Such treatment of R&D expenditure is a vivid example of unconditional accounting conservatism.

Under SFAS № 2, the increase in R&D expenditure results in lower reported earnings. But at the same time, expensing R&D expenditure as incurred builds up unrecorded R&D reserves. These R&D reserves generate revenue in subsequent periods without matching additional new costs. When the firm decreases R&D investments, it releases previously accumulated reserves into earnings, thereby reporting higher income (Penman and Zhang, 2002). Unrecorded R&D reserves provide managers with flexibility to slow R&D and increase reported earnings in the future. Hence, I hypothesize that R&D reserves created by unconditional accounting conservatism are positively associated with real earnings management through the reduction of R&D expense.

To test my hypothesis I use a sample of 179,152 firm-year observations from 1975 to 2018. I measure unrecorded R&D reserves created by unconditional accounting conservatism using C-Score and Q-Score developed by Penman and Zhang (2002). I measure real earnings management through cutting R&D expense employing the model of abnormal R&D expense proposed by Gunny (2010). After controlling for accrual-based earnings management, size effect, growth opportunities, financial performance, leverage-related incentives, R&D intensity, time-variant and time-invariant unobservable factors, and clustering standard errors by firm, I find significantly positive association between C-Score (Q-Score) and abnormal R&D expense. These results indicate that firms with more R&D reserve created by conservative accounting treatment, that is, by immediate expensing of R&D investment, engage more in income-increasing real earnings management by reducing R&D expenditure.

Next, I conduct three additional tests. First, as it was documented by Cohen et al. (2008) that the level of real earnings management increased significantly after the passage of SOX, I examine whether and how the passage of SOX affected the relation between unconditional conservative accounting and real earnings management. I find significantly positive relation between C-Score (Q-Score) and abnormal R&D expense in the pre-SOX period, and the coefficients are stronger and larger in magnitude as compared to the main test coefficients. However, in the post-SOX period unconditional accounting conservatism is negatively associated with real earnings management. These results indicate that prior to the passage of SOX, firms with more R&D reserves created by conservative treatment of R&D expense were more likely to engage in *income-increasing* real earnings management by reducing R&D expenditure, but after the passage of SOX, firms with more R&D reserves tend to engage in *income-decreasing* real earnings management by spending on R&D more. Also, the findings of the subsample test suggest that the results in the main test were generally driven by observations in the pre-SOX period.

Second, I investigate how the relation between R&D reserves and abnormal R&D expenditure changes across firms, employing some of the costs of accrual-based and real earnings management identified by Zang (2012). I find that firms with more R&D reserves and less accounting flexibility due to engaging more in accrual-based earnings management in the past reduce R&D expense more. I also find that market-leaders engage less in real earnings management through cutting R&D when they have more R&D reserve created by conservative treatment of R&D expense.

Lastly, in an attempt to address concerns of biased coefficients recently voiced in the literature, I use alternative regression specification. Chen et al. (2018) argue that implementation of conventional two-step procedure, whereby the residuals from the first regression are used as the dependent variable in a second regression, frequently yields biased coefficients and standard errors of the second-step regressors that can lead to incorrect inferences. To generate unbiased estimates and reliable t-statistics, Chen et al. (2018) suggest regressing the residuals from a first-step regression on the combination of all second-step regressors, as well as all the first-step regressors. I follow this suggestion and find that the coefficients on the independent variables of my interest, C-Score and Q-score, keep being positive and significant. So, the effect of R&D reserves created by unconditionally conservative treatment of R&D expense on real earnings management through the reduction of R&D spending is robust to the recently proposed two-step regression procedure which is argued to eliminate biases in estimated coefficients.

This study contributes to the stream of research on the undesired consequences of accounting conservatism. Specifically, it contributes to a scarce research providing empirical evidence to the claims that accounting conservatism facilitates earnings management. The results of this study may be informative to standard setters, as they indicate that the intent of SFAS № 2 has not been completely fulfilled.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Real earnings management

Reported earnings are a primary concern for managers. As Dichev et al. (2013) found in their field study, CFOs of the great majority of public companies think that earnings play a very important role for investors when valuing the company, and CFOs fear that the firm's stock would be undervalued. Managers prefer a higher stock price and stock price is increasing in earnings (Fischer and Verrecchia 2000). Accordingly, firms manipulate earnings widely by using accrual-based or real earnings management methods.

Real earnings management is defined by Roychowdhury (2006, p. 336) as "management actions that deviate from normal business practices, undertaken with the primary objective of meeting certain earnings thresholds". Unlike accrual-based earnings management, real earnings management involves changing the firm's underlying operations and affects cash flows. Although it is harder to be detected by auditors and regulators, real earnings management reduces firm value and imposes greater long-term costs on the firm. One of the real earnings management techniques is cutting R&D investments. R&D expenditure should be expensed as incurred. Given that normally R&D expense is quite sizable amount, managers who are interested in reporting higher income can reduce expenses significantly by cutting R&D investment, especially when revenue is not to be generated by R&D immediately.

Definition of conservative accounting and its consequences

There are many definitions of conservative accounting introduced in accounting research. One of the most commonly used definitions is suggested by Basu (1997): accounting conservatism implies the asymmetrical verification requirements for gains and losses. It is "the accountant's tendency to require a higher degree of verification to recognize good news as gains than to recognize bad news as losses" (Basu, 1997, p. 7). This differential verification threshold results in asymmetric earnings timeliness with respect to gains versus losses. Penman and Zhang (2002, p. 238) define conservative accounting as "choosing accounting methods and estimates that keep the book values of net assets relatively low".

The accounting literature distinguishes two types of accounting conservatism (Scott, 2015, p. 234):

1) Conditional conservatism, whereby "an economic loss in value has already occurred, although it has not been realized".
2) Unconditional conservatism, under which "risky assets are valued at less than current value even though an economic gain or loss has not yet taken place".

Basu's definition of accounting conservatism corresponds to conditional conservatism, whereas Penman and Zhang's notion is more related to unconditional conservatism.

The literature suggests that financial reporting has become more conservative over time (Givoly and Hayn, 2000; Watts, 2003b). Hence, it is important to understand the consequences of this increase in conservatism. In fact, the studies investigating the effects of conservative reporting are abundant.

Conservatism is found to be positively related to firm value (Francis et al., 2013). Conservatism reduces information asymmetry between firms and shareholders and lowers cost of equity (Kim et al., 2013; Goh et al., 2017). Also, it lowers the likelihood that a firm's stock price would crash in the future (Kim and Zhang, 2016). Prior research documented that conservatism improves investment efficiency. Specifically, it alleviates debt-equity conflicts, enabling firms to access debt financing and mitigating underinvestment. Conservatism also reduces overinvestment (Lara et al., 2016). Conservatism is positively associated with asset productivity and probability of emerging from bankruptcy, conservative firms have shorter bankruptcy resolution (Donovan et al., 2015). Accounting conservatism mitigates the shortcomings of CEO overconfidence, such that firms with overconfident CEOs exhibit better cash flow performance if they practice conservative accounting (Hsu et al., 2017). There is the evidence that accounting conservatism is positively associated with the efficiency of the use of cash holdings, that is, the value of an additional dollar in cash holdings increases in accounting conservatism (Louis et al., 2012).

Given all these positive effects of conservatism, it is not surprising that it has been increasing. However, accounting conservatism may lead to negative consequences as well. The amount of studies investigating the dark side of conservative reporting is substantially smaller. For example, Kravet (2014) documented that accounting conservatism reduces managerial risk-taking. Other researchers found that firms with more conservative accounting have less persistent earnings and smaller pricing multiples on earnings, as compared to firms with less conservative accounting (Chen et al., 2014).

The practice of conservatism in accounting is claimed to produce higher-quality earnings. High-quality earnings have been defined in the literature as those that are derived under conservative accounting rules or the conservative application of relevant rules (Watts 2003a, 2003b). However, Penman and Zhang (2002) found that conservative accounting in combination with changes in investment leads to a low quality of earnings, where earnings quality is defined as the extent to which earnings are sustainable and indicative of future earnings. In particular, under conservative accounting, growth in investment reduces reported earnings and creates reserves, whereas reduction in investment releases reserves that were created previously, and increases earnings. Thus, if growth (reduction) in investment is temporary, then current earnings are depressed (inflated) temporarily too, and, therefore, of poor quality.

In this paper I try to extend the literature on the undesired consequences of accounting conservatism. I investigate whether accounting conservatism is associated with earnings management.

Accounting conservatism and earnings management

Critics of accounting conservatism claim that it facilitates earnings management (Levitt, 1998). Nonetheless, empirical evidence on this matter is very limited. To the best of my knowledge, there is only one empirical research studying this relation. Jackson and Liu (2010) empirically investigated the association between conservatism and accrual-based earnings management. Specifically, they focused on conservative accounting with respect to an individual accrual account – the allowance for uncollectible accounts, and found that firms strategically build up reserves of bad debt expense that accumulate in the allowance account on the balance sheet. Subsequently, the firms release past over-accruals of bad debt expense into earnings in order to meet earnings benchmarks.

Proxies for accounting conservatism developed by Basu (1997) and Khan and Watts (2009) are widely used in prior research. These proxies use aggregate accounting numbers to assess conservatism. But focusing on conservatism in an individual account, like Jackson and Liu (2010) did, enables more precise modeling and inferences. In this study, I employ Jackson and Liu's (2010) approach and I investigate an individual account – R&D expenditure. But in contrast to the situations when firms purposely understate assets on the balance sheet by conservative reporting in order to have opportunities to inflate earnings in the future by reversing those understatements, like in Jackson and Liu (2010), I focus on another contingency when firms are required to make conservative reporting.

Prior research found that the increase in conservatism is considerably driven by accounting standards (Ryan and Zarowin, 2003). One of them is SFAS № 2. In 1974 the FASB enacted SFAS № 2 which requires the full expensing of R&D outlays in financial statements for fiscal years beginning on or after January 1, 1975. A major premise for such accounting treatment was the absence of direct relationship between R&D costs and specific future revenue (Statement of Financial Accounting Standards № 2). Among the other reasons for the U.S. regulators' decision there were reliability and objectivity concerns with regard to the estimates required for R&D capitalization, as well as containing management's opportunistic behavior by constraining opportunities for earnings management

(Lev and Sougiannis, 1996). However, the intent of the standard setters might have not been fulfilled. In this paper I test whether unconditionally conservative accounting treatment of R&D expenditure mandated by GAAP facilitates earnings management.

When the firm increases R&D and, as required by SFAS № 2, expenses the related expenditure as incurred, rather than capitalizes and amortizes them, the reported earnings decrease. But at the same time, immediate expensing of R&D expenditure builds up so-called “hidden”, or “unrecorded” reserves[1] which will generate revenue in subsequent periods without matching additional new costs. When the firm decreases R&D investments, it releases the reserves into earnings, thereby reporting higher income (Penman and Zhang, 2002). The timing of releasing the reserves, that is, deciding on when to recognize revenue without recognizing expense, is a firm’s choice. Unrecorded R&D reserves provide managers with flexibility to slow R&D and increase reported earnings in the future.

Of course, the level of R&D investment in the past *per se* affects firm’s opportunities to reduce R&D in the present. The findings of prior research on R&D help understand why. First, R&D investment has a long-run effect on firm performance. Sougiannis (1994) documented that one-dollar increase in R&D expense results in a two-dollar increase in profit over a seven-year period and a five-dollar increase in market value. Eberhart et al. (2004) provide evidence that firms that unexpectedly increased their R&D expenditure by an economically significant amount experienced significantly positive long-term abnormal operating performance and abnormal stock returns over five-year period following the

[1] The reserves are hidden, or unrecorded, because they are not recorded on the balance sheet.

increase. Second, R&D-intensive firms are more resilient to trade shocks. Hombert and Matray (2018) empirically showed that the impact of an increase in import competition on firm performance as measured by sales growth or profitability is less adverse when the firm has ex ante invested more in R&D. This effect is explained by increased product differentiation allowed by R&D. Third, as documented by Cefis and Marsili (2006), innovation has a positive effect on the probability of firm's survival. Thus, R&D plays a crucial role in firm's long-term performance, market value, ability to cope with competition, and, eventually, to survive. Cutting R&D, like other real earnings management techniques, is costly and has long-lasting negative consequences. Hence, if the firm invested much in R&D in prior years, it can "afford" to slow R&D investment when it is needed to report higher income.

However, not only the level of R&D investment in the past *per se*, but also conservative treatment of R&D expenditure affects firm's opportunities for real earnings management through cutting R&D expense. Charging all R&D costs to expense when incurred enables firms to recognize revenue without matching additional costs in the following years. The effect of R&D investments on subsequent earnings is long-lived. According to Lev and Sougiannis (1996), the duration of R&D benefits (useful life of R&D) is 5-9 years, depending on the industry. Because, under conservative treatment of R&D expenditure mandated by SFAS № 2, the whole R&D expenditure is recognized in the first year, a firm can enjoy its benefits in the following 4-8 years without recognizing additional expense. Therefore, if a firm has large R&D reserve accumulated over past few years, it can recognize more revenue without matching cost if it slows R&D, and it has more flexibility to reduce R&D in the current period. In contrast, if R&D expenditures were capitalized and amortized (which is not a conservative treatment), firms would not have unrecorded R&D reserves but would have to recognize amortization expense of past R&D annually, and cutting R&D would not boost reported earnings much.

To demonstrate how conservative accounting treatment of R&D investment, that is, immediate expensing of the related costs, creates reserves, and how these reserves can be released into earnings, consider the example. When equipment is used for R&D, its purchase price should be expensed as incurred, although normally it is depreciated over its useful life. Assuming that the firm buys equipment every year, its purchase price is $500.000 and the useful life is five years, expenses will be recognized as given in Table 1:

(TABLE 1 here)

With conservative accounting treatment of R&D expenditure, the firm recognizes the cost of $500.000 in year *t* and reports lower earnings. It also creates reserves that are not recorded in the financial statements but will generate revenue in years *t+1* through *t+4* without recognizing additional cost. If, for example, in year *t+1* the firm needs to report higher earnings it can do so by releasing previously created reserves, that is, by slowing R&D in year *t+1*, recognizing revenue from R&D investments made in year *t* without recognizing any costs. The effect on reported earnings will be $500.000 increase.

In contrast, if R&D expenditures were capitalized and amortized, as they are when the equipment is used for operations, the cost of $100.000 would be recognized annually, and the reserves would not be created. Perhaps, in year *t* the firm would not report lower earnings but there will be less or no opportunity to increase reported earnings in the following years. If in year *t+1* the firm slows R&D, earnings will increase by only $100.000, and this increase will be offset by decrease in earnings due to $100.000 depreciation expense from R&D investment made in year *t.* Net effect on reported earnings will be zero.

Hence, I hypothesize that the firms having larger R&D reserves resulted from unconditional conservatism are more likely to engage in real earnings management by decreasing R&D expense.

Hypothesis: R&D reserves created by unconditional conservatism are positively associated with real earnings management through the reduction of R&D expense.

3. RESEARCH DESIGN

Data and sample selection

To examine the effect of unconditional conservative accounting on real earnings management I use the sample that consists of all firms with available data on Compustat from 1975 to 2018. Year 1975 is the beginning of my sample period because in that year GAAP mandate for the full expensing of R&D expenditure came into effect. As most studies investigating real earnings management do, I eliminate firms operating in financial industry (SIC 6000 – 7000) and utility industry (SIC 4400 – 5000) from my sample because these industries are highly regulated and follow accounting rules that differ from other industries. A vast number of observations on Compustat have missing values of R&D expense. I set R&D expense to zero when it is missing but a firm-year reports positive sales. Requiring the presence of all variables necessary to calculate my dependent, independent, and control variables yields the sample consisting of 79,152 firm-year observations. Table 2, panels A and B report the distribution of my sample by year and industry (based on two-digit SIC code), respectively. The most heavily represented industry is Business Services (12.80% of whole sample, SIC code 73), followed by Electronic and Other Electric Equipment (12.26% of whole sample, SIC code 36), and Instruments and Related Products (11.33% of whole sample, SIC code 38).

(TABLE 2 here)

Measurement of abnormal R&D expense

To obtain a proxy for real earnings management through reducing discretionary R&D expense I follow Gunny (2010). I estimate the normal, or expected, level of R&D expense employing the following model:

$$RD_t / A_{t-1} = \alpha_0 + \alpha_1\, 1 / A_{t-1} + \alpha_2 MV_t + \alpha_3 Q_t + \alpha_4 INT_t / A_{t-1} + \alpha_5 RD_{t-1} / A_{t-1} + \varepsilon_t \qquad (1),$$

where *RD* is R&D expense; *A* is total assets; *MV* is the natural logarithm of the market value of equity; *Q* is Tobin's Q, and *INT* is internal funds (see Appendix for variable definitions).

The independent variables in equation (1) are the factors that influence the level of R&D spending. The natural logarithm of the market value of equity is included to control for size. Tobin's Q indicates the marginal benefit to marginal cost of installing an additional unit of a new investment. Internal funds serve as a proxy for reduced funds available for investment. The previous year's R&D expense proxies for the firm's R&D opportunities.

Model (1) is estimated cross-sectionally for every year and industry (based on two-digit SIC code) with at least 15 observations. The residuals from model (1) proxy for real earnings management through R&D expense. For the ease of interpretation I multiply the residuals by -1, such that the higher values indicate more real earnings management by cutting R&D expense.

Measurement of R&D reserves created by unconditional accounting conservatism

I use two proxies for unconditional accounting conservatism developed by Penman and Zhang (2002) – C-Score and Q-Score.

The C-Score measures the effect of conservative accounting on the balance sheet. It is defined as the level of estimated unrecorded reserves created by conservative accounting treatment of inventories, R&D, and advertising relative to net operating assets:

$$\text{C-Score}_t = (INV_t^{res} + RD_t^{res} + ADV_t^{res}) / NOA_t \qquad (2)$$

As Penman and Zhang (2002) state, a subscore for each component of the reserve can be constructed as the estimated reserve from that component relative to

NOA. Each subscore can be used independently. Hence, I use the R&D component and my C-Score is measured as follows:

$$\text{C-Score}_t = \text{RD}_t^{\text{res}} / \text{NOA}_t \qquad (3),$$

where RD_t^{res} (R&D reserve) is the estimated amortized R&D assets that would have been on the balance sheet if R&D had not been expensed. It can be calculated by capitalizing R&D expenditure and then amortizing them using (1) amortization rates estimated by Lev and Sougiannis (1996), or (2) the sum-of-the-years' digits method over five years. All results presented further in this paper are based on the estimation of R&D reserves calculated by using the industry coefficients developed by Lev and Sougiannis. However, the results are qualitatively similar when using the sum-of-the-years' digits method over five years.

Another proxy for unconditional conservative accounting developed by Penman and Zhang (2002) – Q-Score – measures the effect of conservative accounting on earnings in the income statement. The Q-Score is calculated as given in the following equations:

$$Q\text{-}Score = 0.5 \times Q_t^A + 0.5 \times Q_t^B \qquad (4),$$

where

$$Q_t^A = RD_t^{res} / NOA_t - RD^{res}_{t-1} / NOA_{t-1} \qquad (5)$$

$$Q_t^B = RD_t^{res} / NOA_t - Industry\ median\ (RD_t^{res} / NOA_t) \qquad (6)$$

The Q_t^{A} is the change in the firm's conservatism score, C-Score, from year *t-1* to year *t*. If a firm builds up its R&D reserve at a rate faster than its net operating assets grow then its Q_t^{A} is positive, otherwise it is negative. The Q_t^{B} compares a firm's C-Score to the industry median (based on two-digit SIC code).

The C-Score measures a firm's reserves created by unconditional conservative accounting *per se*, whereas the Q-Score benchmarks a firm's conservatism score against its prior year's score and the industry median score. I use C-Score and Q-score as proxies for unconditional conservative accounting interchangeably.

Main regression model: unconditional conservatism and real earnings management

To test my hypothesis about the positive association between unconditional accounting conservatism and real earnings management I regress abnormal R&D expenditure on lagged C-Score (Q-Score) and control variables, as given in the following empirical model:

$$Abn\_R\&D_t = \beta_0 + \beta_1 C\text{-}Score_{t-1}\ (Q\text{-}Score_{t-1}) + \beta_2|Abn\_Accruals_t| + \beta_3 SIZE_{t-1} + \beta_4 MB_{t-1} + \beta_5 ADJ\_ROA_{t-1} + \beta_6 LEV_{t-1} + \beta_7 RD\_INT_t + \varepsilon_t \quad (7)$$

Control variables include firm's absolute value of abnormal accruals, size, market-to-book ratio, industry mean-adjusted return on assets, leverage, and R&D intensity for the year. The absolute value of abnormal accruals is included to control for the substitutive nature of accrual-based and real earnings management methods (Cohen et al., 2008; Zang, 2012). To estimate normal accruals I use the modified Jones model relying on Kim et al. (2012), where they include ROA_{t-1} as an additional regressor following Kothari et al. (2005):

$$TA_t / A_{t-1} = \gamma_0 + \gamma_1\, 1 / A_{t-1} + \gamma_2(\Delta REV_t - \Delta REC_t) / A_{t-1} + \gamma_3 PPE / A_{t-1} + ROA_{t-1} + \varepsilon_t \quad (8),$$

where *TA* is total accruals; *ΔREV* is change in revenues; *ΔREC* is change in accounts receivable; *PPE* is gross property, plant, and equipment; *ROA* is return on assets. Model (8) is estimated cross-sectionally for every year and industry (based two-digit SIC code) with at least 15 observations. The residuals from model (8) proxy for accrual-based earnings management.

SIZE, measured as the natural logarithm of the market value of equity, controls for firm size. Market-to-book ratio controls for growth opportunities. Industry-adjusted return on assets is included to address concerns that earnings management is correlated with financial performance. Leverage controls for the leverage-related incentives to manipulate earnings. Lastly, R&D intensity is included to control for a firm's R&D expenditure.

If, as I hypothesize, firms with more R&D reserves resulted from conservative treatment of R&D expense have more flexibility to inflate reported earnings by reducing R&D expenditure, the coefficient β_1 should be positive (recall that *Abn_R&D* was multiplied by -1). In an attempt to control for time-variant and time-invariant unobservable factors, I include year fixed effects and industry fixed effects (based on two-digit SIC code). Also, I cluster standard errors by firm. All continuous variables are winsorized at the top and bottom one percent of their distributions to avoid the influence of outliers.

4. RESULTS

Descriptive statistics

Table 3 reports the estimation results for the regression model (1) – the normal level of R&D expense. The reported coefficients and adjusted R-squared are the mean values of the coefficients and adjusted R-squared across industry-years. The number of industry-years for which model (1) was estimated in my sample period from 1975 to 2018 is 931. It far exceeds the number of industry years of 342 reported by Gunny (2010) for the sample period from 1988 to 2002. However, the signs are the same and the magnitude of mean coefficients and adjusted R-squared are similar to those of Gunny. The average adjusted R-squared is high (0.86) implying that the explanatory power of the model is substantial.

(TABLE 3 here)

Table 4 shows the results of cross-sectional estimation of model (8), which is the modified Jones model with inclusion of lagged return on assets, used to obtain normal accruals. The coefficients and adjusted R-squared reported in the table are the mean values across industry-years. The number of industry-years for which model (8) was estimated is 2,548. The mean coefficients and adjusted R-squared are in general comparable to those reported in prior research (Zang, 2002). The mean adjusted R-squared is 0.38 indicating a reasonable explanatory power of the model.

(TABLE 4 here)

Table 5, panel A shows descriptive statistics for the full sample of 79,152 firm-year observations (see Appendix for variable definitions). The mean (median) value of abnormal R&D expense which is multiplied by -1 is 0.011 (0.004), suggesting that, on average, my sample firms tend to manage earnings by cutting R&D expense. The mean (median) value of abnormal accruals is -0.002 (-0.001), whereas the mean (median) of the absolute value of abnormal accruals is 0.08 (0.05).

(TABLE 5 here)

For my main independent variables – C-Score and Q-Score, – the mean (median) is 0.43 (0.05) and 0.15 (0.00), respectively. The means of both C-Score and Q-Score are slightly higher, whereas the medians are lower than those reported by Penman and Zhang (2002) for the sample period from 1975 to 1997. However, I calculate C-Score and Q-Score using only R&D reserve, whereas Penman and Zhang use three reserves – inventory, R&D, and advertising. This can explain why my medians are lower. The median of C-Score of 0.05 suggests that net operating assets would have been 5% higher for the typical firm if the accounting treatment of R&D had not been unconditionally conservative and had not created reserves. The mean of 0.43, relative to the median, indicates the C-Scores are especially large for a relatively small number of firms, that is, the C-Scores are positively skewed, and they are more skewed in my sample, as compared to Penman and Zhang's sample. The mean of Q-Score of 0.15, relative to its median of 0.00 and 75^{th} percentile of 0.04, suggests that a small number of firms have a conservatism score higher than it was in the previous year and higher than the industry median.

With regard to control variables, the mean (median) value of *ADJ_ROA* is 0.33 (0.18) suggesting that, on average, my sample firms are more profitable than their industry peers. My sample firms' R&D expense is 7% of their net sales, on average.

The effect of R&D reserves on abnormal R&D expenditure

Table 6 reports the results of multiple regression analyses of abnormal R&D expenditure. Test statistics and significance levels are based on the standard errors corrected for heteroskedasticity by clustering at the firm level.

(TABLE 6 here)

Panel A of table 6 shows the estimation results of regression equation (7) when C-Score serves as a proxy for unconditional accounting conservatism, whereas in Panel B the proxy for unconditional accounting conservatism is Q-Score. In both cases the coefficients are positive and significant: 0.002 for C-Score and 0.004 for Q-Score. Yet, the coefficient on Q-Score is stronger than on C-Score. T-statistics is 4.00 and 2.47, respectively. These coefficients indicate that firms with more R&D reserve created by conservative accounting treatment, that is, by immediate expensing of R&D investment, engage more in income-increasing real earnings management by reducing R&D expenditure. I obtain these results after controlling for accrual-based earnings management, size effect, growth opportunities, financial performance, leverage-related incentives, and R&D intensity. The coefficient on the absolute value of abnormal accruals, |*Abn_accruals*|, is insignificant, consistent with Kim et al. (2012). The coefficient on *SIZE* is significantly positive. T-statistics is 5.38 and 5.41 when the main independent variable is C-Score and Q-Score, accordingly. This indicates that larger firms manipulate earnings upward more. The coefficient on *LEV* is positive and significant with t-statistics of 4.11 and 4.16 for C-Score and Q-Score specifications, correspondingly. These results suggest that firms with more long-term debt are more likely to cut R&D expense. The coefficient on *RD_INT* is significantly negative indicating that firms with high R&D intensity in the current year are less prone to manage earnings.

5. ADDITIONAL TESTS

Subsample test: the effect of R&D reserves on abnormal R&D expenditure in pre- and post-SOX period

Cohen et al. (2008) documented that accrual-based earnings management declined significantly after the passage of SOX in 2002. In contrast, the level of real earnings management increased significantly. These findings suggest that firms switched from accrual-based to real earnings management practices following the passage of SOX, likely, because the latter are harder to detect. In an attempt to examine whether and how the passage of SOX affected the relation between unconditional conservative accounting and real earnings management I divide my sample period into two periods: (1) the period before the passage of SOX – from 1975 to 2001 (pre-SOX period), and (2) the period after the passage of SOX – from 2002 to 2018 (post-SOX period). Next, I estimate the regression model (7) for two subsamples separately.

Panels B and C of table 5 report descriptive statistics for two time periods. Table 7 presents the results of multiple regression analyses of abnormal R&D

expenditure for pre- and post-SOX observations. Test statistics and significance levels are based on the standard errors corrected for heteroskedasticity by clustering at the firm level.

(TABLE 7 here)

In the pre-SOX period, the coefficients on both C-Score (0.02, t-stat = 8.39) and Q-Score (0.03, t-stat = 9.14) are positive and strongly significant. The magnitudes of the coefficients, as well as t-statistics are much larger than those obtained for the full sample. However, in the post-SOX period the proxies for unconditional accounting conservatism have significantly negative coefficients: -0.002 (t-stat = -4.28) and -0.002 (t-stat = -2.57) for C-Score and Q-Score, respectively. These results indicate that prior to the passage of SOX, firms with more R&D reserves created by conservative treatment of R&D expense were more likely to engage in *income-increasing* real earnings management by reducing R&D expenditure. But after the passage of SOX, firms with more R&D reserves tend to engage in *income-decreasing* real earnings management by spending on R&D more. Also, the findings of the subsample test suggest that the results in the main test were generally driven by observations in the pre-SOX period. Yet, my results are consistent with the findings of Cohen et al. (2008). Although Cohen et al. (2008) found a decline in real earnings management after the passage of SOX, this result was obtained when they used the aggregate measure of real earnings management (the sum of abnormal discretionary expense, production costs, and CFO). When they estimated the regression using an individual metrics, they found that in the post-SOX period firms engaged less in real earnings management through cutting discretionary expense (cf. tables 2 and 4 in Cohen et al., 2008).

Cross-sectional variation in the effect of R&D reserves on abnormal R&D expenditure

Zang (2012) found that firms trade off accrual-based and real earnings management methods based on their relative costs. That is, firms engage more in real earnings management when its cost is relatively low and/or when the cost of accrual-based earnings management is relatively high. I employ some of the costs identified by Zang (2021) and investigate how the relation between R&D reserves and abnormal R&D expenditure changes across firms. In particular, I use one of the costs of real earnings management – firm's competitive status in the industry, and one of the costs of accrual-based earnings management – firm's accounting flexibility determined by its accounting choices in previous periods. With regard to these costs, Zang (2012) found that firms with market-leader status and firms with lower accounting flexibility have a higher level of real-earnings management.

Following Zang (2012), I measure a firm's competitive status in the industry as its market share at the beginning of the year, that is, the ratio of a firm's sales to the total sales of its industry (based on three-digit SIC code). Then I create an indicator variable, *Market_share_Dummy*, that equals to 1 if the ratio of a company's market share is above the median of the corresponding industry-year, and 0 otherwise. To measure a firm's accounting flexibility, I use the proxy suggested by Zang (2012) that captures accrual-based earnings management in previous periods – net operating assets at the beginning of the year. The logic behind the choice of this proxy is that abnormal accruals reflected in past earnings are also reflected in net operating assets; therefore, net operating assets are overstated when firms manipulated earnings through accruals in prior years, and indicate lower accounting flexibility. I create an indicator variable, *NOA_Dummy*, that equals to 1 if net operating assets divided by lagged sales are above the median of the corresponding industry-year, and 0 otherwise.

To examine how the relation between R&D reserves and abnormal R&D expenditure changes depending on these two firm characteristics, I include in regression model (7) *Market_share_Dummy* and *NOA_Dummy* variables, as well as their interaction with my main independent variable – C-Score or Q-score.

$$\begin{aligned} Abn\_R\&D_t = {} & \lambda_0 + \lambda_1 C\text{-}Score_{t-1}\ (Q\text{-}Score_{t-1}) + \lambda_2 |Abn\_Accruals_t| + \lambda_3 SIZE_{t-1} \\ & + \lambda_4 MB_{t-1} + \lambda_5 ADJ\_ROA_{t-1} + \lambda_6 LEV_{t-1} + \lambda_7 RD\_INT_t \\ & + \lambda_8 Market\_share_{t-1}\_Dummy + \lambda_9 NOA_{t-1}\_Dummy \\ & + \lambda_{10} C\text{-}Score_{t-1}\ (Q\text{-}Score_{t-1}) \times Market\_share_{t-1}\_Dummy \\ & + \lambda_{11} C\text{-}Score_{t-1}\ (Q\text{-}Score_{t-1}) \times NOA_{t-1}\_Dummy + \varepsilon_t \end{aligned} \tag{9}$$

The coefficient on the interaction terms, λ_{10} and λ_{11}, are expected to be positive if firms with more R&D reserves and having a market-leader status and less accounting flexibility engage more in real earnings management by reducing R&D expense. Table 8 presents the estimation results of equation (9).

(TABLE 8 here)

As in Zang (2012), *Market_share_Dummy* and *NOA_Dummy* have positive and significant coefficients in both specifications (when the proxy for unconditional conservatism is C-Score and Q-Score). This means that firms in my sample cut R&D expense more to increase earnings if they are market-leaders and when they have lower accounting flexibility due to doing more accrual-based earnings management in the past. The interaction terms *C-Score* × *NOA_Dummy* and *Q-Score* × *NOA_Dummy* also have significantly positive coefficients: 0.01 (t-stat = 7.98) and 0.02 (t-stat = 7.42), respectively, meaning that firms with more R&D reserves and less accounting flexibility reduce R&D expense more. However, the coefficients on *C-Score* × *Market_share_Dummy* and *Q-Score* × *Market_share_Dummy* are significantly negative: -0.004 (t-stat = -4.45) and -0.009 (t-stat = -5.44), accordingly. These coefficients indicate that market-leaders engage less in real earnings management through cutting R&D when they have more R&D reserve created by conservative treatment of R&D expense. This finding is opposite to my expectation and could be explained by the conjecture that market leaders having a high level of R&D investment in prior years need to keep up investing in R&D so as to maintain their status in the market.

Addressing concerns of biased coefficients

In my main test I employed the two-step procedure which is commonly used in accounting empirical research on earnings management: (1st step) ordinary least squares regression is used to decompose a dependent variable into its expected and unexpected components; (2nd step) the residuals from the first regression (unexpected component) are used as the dependent variable in a second regression. However, Chen et al. (2018) argue that implementation of this two-step procedure frequently yields biased coefficients and standard errors of the second-step regressors that can lead to incorrect inferences. Therefore, they suggest researchers to exercise caution when relying on the results in prior literature that were obtained by using the aforementioned two-step regression procedure. Also, they urge researchers to refrain from using it and suggest several solutions to eliminate the biases from the two-step regression procedure.

The problem arises when the residuals from the first-step regression serve as the dependent variable in the second-step regression, and the second-step regression does not include regressors from the first step as the independent variables. One of the solutions Chen et al. (2018) suggest to eliminate the biases resulting from the commonly used two-step regression procedure is to regress the residuals from a first-step regression on the combination of all second-step regressors, as well as all the first-step regressors.

Following this suggestion, I augment my empirical model (7) by including regressors from model (1) as additional independent variables. Thus, I regress abnormal R&D expense on the proxy for unconditional conservative accounting, control variables, and the factors influencing the level of R&D spending:

$$\begin{aligned} Abn\_R\&D_t = {} & \delta_0 + \delta_1 C\text{-}Score_{t-1}\ (Q\text{-}Score_{t-1}) + \delta_2 |Abn\_Accruals_t| + \delta_3 SIZE_{t-1} \\ & + \delta_4 MB_{t-1} + \delta_5 ADJ\_ROA_{t-1} + \delta_6 LEV_{t-1} + \delta_7 RD\_INT_t + \delta_8 1 / A_{t-1} \\ & + \delta_9 MV_t + \delta_{10} Q_t + \delta_{11} INT_t / A_{t-1} + \delta_{12} RD_{t-1} / A_{t-1} + \varepsilon_t \qquad (10) \end{aligned}$$

As Chen et al. (2018) claim, model (10) is to generate unbiased estimates and reliable t-statistics. Table 9 reports the results. Test statistics and significance levels are based on the standard errors corrected for heteroskedasticity by clustering at the firm level. The coefficients on the independent variables of my interest, C-Score and Q-score, keep being positive and significant: 0.001 and 0.003, respectively. Though, t-statistics is slightly lower than in the main test: 1.92 vs. 2.47 for C-Score, 3.14 vs. 4.00 for Q-Score.

As for control variables, compared to the results in my main test, some of them become significant, insignificant, or even change sign. Under conventional two-step regression specification, the coefficient on absolute value of abnormal accruals |*Abn_accruals*| was insignificant, but under specification suggested by Chen et al. (2018), it becomes strongly significantly negative, which indicates that firms substitute between real and accrual-based earnings management and is consistent with the results in prior studies (Graham et al., 2005; Zang, 2012). The coefficient on *SIZE* was positive and significant in my main test but becomes insignificant now. Conversely, the coefficient on the market-to-book ratio becomes significantly negative, whereas the coefficient on the *ADJ_ROA* becomes significantly positive.

(TABLE 9 here)

All in all, the effect of R&D reserves created by unconditionally conservative treatment of R&D expense on real earnings management through the reduction of R&D spending is robust to the recently proposed two-step regression procedure which is argued to eliminate biases in estimated coefficients.

6. CONCLUSION

This paper examines the relation between unconditional accounting conservatism and real earnings management. Accounting conservatism is claimed to facilitate earnings management (Levitt, 1998), however empirical evidence supporting this notion is very limited. Focusing on accounting conservatism with respect to an individual account – R&D expenditure, – I document that unrecorded R&D reserves created by conservative treatment of R&D expenditure are positively associated with real earning management through the reduction of R&D expense. I also find that this association is driven by firm-year observations in the pre-SOX period. The empirical results indicate that after the passage of SOX firms with more R&D reserves tend to engage in *income-decreasing* real earnings management by spending on R&D more. Answering the question why the relation between unrecorded R&D reserves and abnormal R&D expense is opposite in the pre- and post-SOX periods is beyond the scope of this paper and could become a prospective avenue for future research. Further, I show that firms with more R&D reserves and less accounting flexibility (market-leader status) reduce R&D expense more (less). The results of my main test, that is, a positive relation between unrecorded R&D reserves and real earnings management through cutting R&D expense, are robust to the recently proposed two-step regression procedure which is argued to generate unbiased estimates and reliable t-statistics (Chen et al., 2018).

REFERENCES

Basu, S., 1997. The conservatism principle and the asymmetric timeliness of earnings. *Journal of Accounting and Economics* 24: 3–37.

Cefis, E., and Marsili, O. 2006. Survivor: the role of innovation in firms' survival. *Research Policy* 35: 626-641.

Chen, L., Folsom, D., Paek, W., Sami, H. 2014. Accounting conservatism, earnings persistence, and pricing multiples on earnings. *Accounting Horisons* 28 (2): 233-260.

Chen, W., Hribar, P., Melessa, S. 2018. Incorrect inferences when using residuals as dependent variables. *Journal of Accounting Research* 50 (3): 751-796.

Cohen, D., Dey, A., and Lys, T. 2008. Real and accrual-based earnings management in the pre- and post-Sarbanes-Oxley periods. *The Accounting Review* 83 (3): 757–787.

Dichev, I., Graham, J. R., Harvey, C. R., and Rajgopal, S. 2013. Earnings quality: Evidence from the field. *Journal of Accounting and Economics* 56: 1-33.

Donovan, J., Frankel, R., Martin, X. 2015. Accounting conservatism and creditor recovery rate. *The Accounting review* 90 (6): 2267-2303.

Eberhart, A.C., Maxwell, W.F., Siddique, A. 2004. An examination of long-term abnormal stock returns and operating performance following R&D Increases. *Journal of Finance* 59 (2): 623–650.

FASB (Financial Accounting Standards Board), 1974, Accounting for research and development costs, Statement of Financial Accounting Standards No. 2.

Fischer, P., and Verrecchia, R. 2000. Reporting bias. *The Accounting Review* 75 (2): 229–45.

Francis, B., Hasan, I., Wu, Q. 2013. The benefits of conservative accounting to shareholders: evidence from financial crisis. *Accounting Horizons* 27 (2): 319-346.

Givoly, D., Hayn, C., 2000. The changing time series properties of earnings, cashflows, and accruals: has financial reporting become more conservative? *Journal of Accounting and Economics* 29 (3): 287–320.

Goh, B. Lim, C. Lobo, G., Tong, Y. 2017. Conditional conservatism and debt versus equity financing. *Contemporary Accounting Research* 34 (1): 216-251.

Graham, J. R., C. R. Harvey, and S. Rajgopal. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* 40: 3–73.

Gunny, K. 2010. The relation between earnings management using real activities manipulation and future performance: Evidence from meeting earnings benchmarks. *Contemporary Accounting Research* 27 (3): 855-888.

Hombert, J., and Matray, A. 2018. Can innovation help US manufacturing firms escape import competition from China? *Journal of Finance* 73 (5): 2003-2039.

Hsu, C., Novoselov, K., Wang, R. 2017. Does accounting conservatism mitigate the shortcomings of CEO overconfidence? *The Accounting Review* 92 (6): 77-101.

Jackson, S., and Liu, X. 2010. The allowance for uncollectible accounts, conservatism, and earnings management. *Journal of Accounting Research* 48 (3): 565-601.

Khan, M., and Watts, R. L. 2009. Estimation and empirical properties of a firm-year measure of accounting conservatism. *Journal of Accounting and Economics* 48 (2): 132–150.

Kim, Y., Li, S., Pan, C. and Zuo, L. 2013. The role of accounting conservatism in the equity market: evidence from seasoned equity offerings. *The Accounting Review* 88 (4): 1327-1356.

Kim, Y., Park, M. S., and Wier, B. 2012. Is earnings quality associated with corporate social responsibility? *The Accounting Review* 87 (3): 761–796.

Kim, B., Zhang, L. 2016. Accounting conservatism and stock price crash risk: firm-level evidence. *Contemporary Accounting Research* 33 (1): 412-441.

Kothari, S. P., Leone, A., and Wasley, C. 2005. Performance matched discretionary accrual measures. *Journal of Accounting and Economics* 39 (1): 163–197.

Kravet, T. 2014. Accounting conservatism and managerial risk-taking: corporate acquisitions. *Journal of Accounting and Economics* 57: 218-240.

Lara, J., Osma, B., Penalva, F. 2016. Accounting conservatism and firm investment efficiency. *Journal of Accounting and Economics* 61: 221-238.

Lev, B., and T. Sougiannis. 1996. The capitalization, amortization, and value-relevance of R&D. *Journal of Accounting and Economics* 21: 107-138.

Levitt, A. 1998. 'The Numbers Game'. *The CPA Journal* 68, 14–19.

Louis, H., Sun, A., Urcan, O. 2012. Value of cash holdings and accounting conservatism. *Contemporary Accounting Research* 29 (4): 1249-1271.

Penman, S. H., and X. Zhang. 2002. Accounting conservatism, the quality of earnings, and stock returns. *The Accounting Review* 77 (2): 237-264.

Roychowdhury, S. 2006. Earnings management through real activities manipulation. *Journal of Accounting and Economics* 42 (3): 335–70.

Ryan, S., Zarowin, P., 2003. Why has the contemporaneous linear returns–earnings relation declined? *The Accounting Review* 78: (523–553).

Scott, W.R. 2015. Financial Accounting Theory (7th Edition). Pearson.

Sougiannis, T. 1994. The accounting based valuation of corporate R&D. *The Accounting Review* 69 (1): 44–68.

Watts, R.L., 2003a. Conservatism in accounting, Part I: explanations and implications. *Accounting Horizons* 17 (3, September): 207–221.

Watts, R.L., 2003b. Conservatism in accounting, Part II: evidence and research opportunities. *Accounting Horizons* 17 (4, December): 287–301.

Zang, A. 2012. Evidence on the trade-off between real activities manipulation and accrual-based earnings management. *The Accounting Review* 87 (2): 675–703.

APPENDIX
Variable definitions

Variable	Definition	Compustat data
Real earnings management		
RD	R&D expense;	46[Research and Development Expense]
A	Total assets;	6[Assets - Total]
MV	Natural logarithm of the market value of equity;	ln(199[Price Close - Annual - Fiscal Year] * 25[Common Shares Outstanding])
Q	Tobin's Q;	(199[Price Close - Annual - Fiscal Year] * 25[Common Shares Outstanding] + 130[Preferred/Preference Stock (Capital) - Total] + 9[Long-Term Debt - Total] + 34[Debt in Current Liabilities - Total]) / 6[Assets - Total]
INT	Internal funds.	18[Income Before Extraordinary Items] + 46[Research and Development Expense] + 14[Depreciation and Amortization]
Unconditional accounting conservatism		
C-Score	Proxy for unconditional conservative accounting which measures its effect on the balance sheet;	
Q-score	Proxy for unconditional conservative accounting which measures its effect on earnings in the income statement;	

Variable	Definition	Compustat data
RD^{res}	R&D reserve. It is the estimated amortized R&D assets that would have been on the balance sheet if R&D had not been expensed. It can be calculated by capitalizing R&D expenditures and then amortizing them using (1) amortization rates estimated by Lev and Sougiannis (1996), or (2) the sum-of-the-years' digits method over five years;	46[Research and Development Expense]
NOA	Net operating assets (Common Equity + Financial Obligations - Financial Assets + Minority Interest).	(60[Common/Ordinary Equity - Total] + 227[Treasury Stock - Preferrred] - 242[Preferred Dividends in Arrears]) + (34[Debt in Current Liabilities - Total] + 9[Long-Term Debt - Total] + 130[Preferred/Preference Stock (Capital) - Total] - 227[Treasury Stock - Preferrred] + 242[Preferred Dividends in Arrears] - (1[Cash and Short-Term Investments] + 32[Investment and Advances – Other]) + 38[Minority Interest (Balance Sheet)]
Control variables		
|Abn_accruals|	Absolute value of abnormal accruals, where abnormal accruals are computed using the modified Jones model including lagged ROA as a regressor;	
SIZE	Natural logarithm of the market value of equity;	ln(199[Price Close - Annual - Fiscal Year] * 25[Common Shares Outstanding])
MB	Market-to-book ratio;	(199[Price Close - Annual - Fiscal Year] * 25[Common Shares Outstanding]) / 60[Common/Ordinary Equity - Total]

Variable	Definition	Compustat data
ADJ_ROA	Industry mean-adusted return on assets;	18[Income Before Extraordinary Items] / lagged 6[Assets - Total]
LEV	Leverage;	9[Long-Term Debt - Total] / 6[Assets - Total]
RD_INT	R&D intensity for the year.	46[Research and Development Expense] / 12[Sales/Turnover (Net)]
Accrual-based earnings management		
TA	Total accruals;	(Δ4[Current Assets - Total] - Δ1[Cash and Short-Term Investments] - Δ5[Current Liabilities - Total] + Δ34[Debt in Current Liabilities - Total] - 14[Depreciation and Amortization]) / lagged 6[Assets - Total]
A	Total assets;	6[Assets - Total]
Δ*REV*	Change in revenues;	Δ12[Sales/Turnover (Net)]
Δ*REC*	Change in accounts receivable;	Δ2[Receivables – Total]
PPE	Gross property, plant and eqipment;	7[Property Plant and Equipment - Total (Gross)]
ROA	Return on assets.	18[Income Before Extraordinary Items] / lagged 6[Assets - Total]
Firm characteristics used for the test of cross-sectional variation		
Market_share_ Dummy	Indicator variable that equals to 1 if the ratio of a company's sales to the total sales of its industry (based on three-digit SIC codes) is above the median of the corresponding industry-year, and 0 otherwise;	12[Sales/Turnover (Net)]
NOA_Dummy	Indicator variable that equals to 1 if the net operating assets (i.e., shareholders' equity less cash and marketable securities plus total debt) divided by lagged sales are above the median of the corresponding industry-year, and 0 otherwise.	(216[Stockholders Equity - Total] - 1[Cash and Short-Term Investments] + 9[Long-Term Debt - Total] + 34 [Debt in Current Liabilities - Total]) / lagged 12[Sales/Turnover (Net)]

TABLE 1
Example of recognition of R&D expense under conservative and non-conservative accounting treatment

	t	*t + 1*	*t + 2*	*t + 3*	*t + 4*	*t + 5*
Equipment used for R&D	(500.000)					
		(500.000)				
Equipment used for operations	(100.000)	(100.000)	(100.000)	(100.000)	(100.000)	
		(100.000)	(100.000)	(100.000)	(100.000)	(100.000)

TABLE 2
Sample distribution

Panel A. Sample distribution by year

Year	N of obs.	% of sample	Cumulative %
1975	1426	1.80%	1.80%
1976	1404	1.77%	3.58%
1977	1397	1.76%	5.34%
1978	1380	1.74%	7.08%
1979	1393	1.76%	8.84%
1980	1524	1.93%	10.77%
1981	1565	1.98%	12.75%
1982	1641	2.07%	14.82%
1983	1636	2.07%	16.89%
1984	1572	1.99%	18.87%
1985	1475	1.86%	20.74%
1986	1452	1.83%	22.57%
1987	1434	1.81%	24.38%
1988	1427	1.80%	26.19%
1989	1390	1.76%	27.94%
1990	1440	1.82%	29.76%
1991	1575	1.99%	31.75%
1992	1660	2.10%	33.85%
1993	1701	2.15%	36%
1994	1758	2.22%	38.22%
1995	1803	2.28%	40.50%
1996	1982	2.50%	43%
1997	2053	2.59%	45.59%
1998	2084	2.63%	48.23%
1999	2113	2.67%	50.90%
2000	2233	2.82%	53.72%
2001	2291	2.89%	56.61%
2002	2305	2.91%	59.52%
2003	2255	2.85%	62.37%
2004	2348	2.97%	65.34%
2005	2345	2.96%	68.30%
2006	2265	2.86%	71.16%
2007	2125	2.68%	73.85%
2008	1963	2.48%	76.33%
2009	1953	2.47%	78.80%
2010	1909	2.41%	81.21%
2011	1986	2.51%	83.72%
2012	1999	2.53%	86.24%
2013	1994	2.52%	88.76%
2014	1992	2.52%	91.28%
2015	1820	2.30%	93.58%
2016	1805	2.28%	95.86%
2017	1783	2.25%	98.11%
2018	1496	1.89%	100%
Total	79152	100%	

Panel B. Sample distribution by industry

Industry	Two-digit SIC	N of obs.	% of sample	Cumulative %
Metal, Mining	10	245	0.31%	0.31%
Oil & Gas Extraction	13	6761	8.54%	8.85%
Food & Kindred Products	20	3954	5%	13.85%
Textile Mill Products	22	512	0.65%	14.49%
Furniture & Fixtures	25	870	1.10%	15.59%
Paper & Allied Products	26	1776	2.24%	17.84%
Chemical & Allied Products	28	6945	8.77%	26.61%
Petroleum & Coal Products	29	1186	1.50%	28.11%
Rubber & Miscellaneous Plastics Products	30	1806	2.28%	30.39%
Stone, Clay, & Glass Products	32	1048	1.32%	31.71%
Primary Metal Industries	33	2348	2.97%	34.68%
Fabricated Metal Products	34	2895	3.66%	38.34%
Industrial Machinery & Equipment	35	7859	9.93%	48.27%
Electronic & Other Electric Equipment	36	9704	12.26%	60.53%
Transportation Equipment	37	3142	3.97%	64.50%
Instruments & Related Products	38	8965	11.33%	75.82%
Miscellaneous Manufacturing Industries	39	1413	1.79%	77.61%
Wholesale Trade – Durable Goods	50	3035	3.83%	81.44%
Miscellaneous Retail	59	136	0.17%	81.62%
Business Services	73	10135	12.80%	94.42%
Health Services	80	1405	1.78%	96.19%
Engineering & Management Services	87	1998	2.52%	98.72%
Non-Classifiable Establishments	99	1014	1.28%	100%
Total		79152	100%	

TABLE 3
Estimation of the normal level of R&D expense

Variable	Coeff.
Intercept	-0.0041
$1/A_{t-1}$	0.0193
MV_t	0.0016
Q_t	0.0034
$INT_t/A_t\text{-}1$	0.0104
RD_{t-1}/A_{t-1}	0.9355
N of industry-year	931
Adj. R-squared	0.8634

This table reports the estimation results of Equation (1). The regression is estimated cross-sectionally for each industry-year with at least 15 observations. The two-digit SIC grouping is used. The reported coefficients are the mean values of the coefficients across industry-years. The adjusted R-squared is the adjusted R-squared across industry years.

TABLE 4
Estimation of the normal level of accruals

Variable	Coeff.
Intercept	-0.0135
$1/A_{t-1}$	0.0282
$(\Delta REV_t - \Delta REC_t)/A_{t-1}$	0.0445
PPE_t/A_{t-1}	-0.0455
ROA_{t-1}	0.1441
N of industry-year	2548
Adj. R-squared	0.3824

This table reports the estimation results of Equation (8). The following regression is estimated cross-sectionally for each industry-year with at least 15 observations. The two-digit SIC grouping is used. The reported coefficients are the mean values of the coefficients across industry-years. The adjusted R-squared is the adjusted R-squared across industry years.

TABLE 5
Descriptive statistics

Panel A. Full sample

Variable	N	Mean	Std. Dev.	Q1	Median	Q3
Abn_R&D	79152	0.0108	0.0707	-0.0037	0.0041	0.0247
C-Score	79152	0.4330	1.3163	0.0000	0.0478	0.2742
Q-Score	79152	0.1477	0.7183	-0.0342	0.0000	0.0430
Abn_accruals	79152	-0.0015	0.1066	-0.0519	-0.0011	0.0487
|*Abn_accruals*|	79152	0.0763	0.0818	0.0224	0.0504	0.0995
SIZE	79152	4.7116	2.4695	2.8656	4.5073	6.4131
MB	79152	2.4354	3.4472	0.8976	1.5808	2.8297
ADJ_ROA	79152	0.3317	0.4437	0.0385	0.1754	0.5494
LEV	79152	0.1612	0.1706	0.0065	0.1210	0.2536
RD_INT	79152	0.0771	0.2409	0.0000	0.0092	0.0619

Panel B. Pre-SOX sample (1975-2001)

Variable	N	Mean	Std. Dev.	Q1	Median	Q3
Abn_R&D	44809	0.0078	0.0744	-0.0046	0.0024	0.0163
C-Score	44809	0.2304	0.6070	0.0000	0.0338	0.1885
Q-Score	44809	0.0687	0.3178	-0.0130	0.0000	0.0328
Abn_accruals	44809	-0.0053	0.1067	-0.0569	-0.0046	0.0452
|*Abn_accruals*|	44809	0.0770	0.0811	0.0229	0.0514	0.1010
SIZE	44809	3.9611	2.1770	2.3927	3.7726	5.3542
MB	44809	2.1945	3.0887	0.7914	1.3714	2.4556
ADJ_ROA	44809	0.0953	0.2072	0.0027	0.0684	0.1613
LEV	44809	0.1675	0.1592	0.0248	0.1370	0.2586
RD_INT	44809	0.0454	0.1239	0.0000	0.0061	0.0405

Panel C. Post-SOX sample (2002-2018)

Variable	N	Mean	Std. Dev.	Q1	Median	Q3
Abn_R&D	34343	0.0147	0.0653	-0.0022	0.0091	0.0361
C-Score	34343	0.7467	2.2947	0.0000	0.0781	0.4773
Q-Score	34343	0.2807	1.3399	-0.0755	0.0000	0.0756
Abn_accruals	34343	0.0034	0.1063	-0.0451	0.0032	0.0530
|*Abn_accruals*|	34343	0.0755	0.0827	0.0219	0.0490	0.0976
SIZE	34343	5.6906	2.4883	3.8466	5.6760	7.4167
MB	34343	2.7599	3.9630	1.0974	1.8808	3.3015
ADJ_ROA	34343	0.6448	0.4994	0.3280	0.5796	0.8726
LEV	34343	0.1531	0.1853	0.0000	0.0932	0.2452
RD_INT	34343	0.1433	0.5506	0.0000	0.0168	0.1030

Variables are defined in Appendix.
The residuals from the estimation model of R&D expense are multiplied by -1, such that higher values of *Abn_R&D* indicate more real earnings management by cutting expense.

TABLE 6
The effect of R&D reserves on abnormal R&D expenditure

Panel A. Main independent variable is C-Score

Variable	Coeff.	t-stat	p-value
Intercept	0.0306	5.90	<.0001
C-Score $_{t-1}$	0.0015	2.47	0.0136
$\lvert Abn\_accruals_t \rvert$	-0.0013	-0.16	0.8739
$SIZE_{t-1}$	0.0009	5.38	<.0001
MB_{t-1}	-0.0001	-0.88	0.3798
ADJ_ROA_{t-1}	-0.0010	-0.52	0.6029
LEV_{t-1}	0.0103	4.11	<.0001
RD_INT_t	-0.0465	-10.97	<.0001
Industry FE	Yes		
Year FE	Yes		
N of obs.	79152		
R-squared	0.0540		

Panel B. Main independent variable is Q-Score

Variable	Coeff.	t-stat	p-value
Intercept	0.0301	5.80	<.0001
Q-Score $_{t-1}$	0.0038	4.00	<.0001
$\lvert Abn\_accruals_t \rvert$	-0.0016	-0.19	0.8495
$SIZE_{t-1}$	0.0009	5.41	<.0001
MB_{t-1}	-0.0001	-0.85	0.3941
ADJ_ROA_{t-1}	-0.0007	-0.34	0.7373
LEV_{t-1}	0.0104	4.16	<.0001
RD_INT_t	-0.0477	-11.92	<.0001
Industry FE	Yes		
Year FE	Yes		
N of obs.	79152		
R-squared	0.0546		

This table reports the estimation results of Equation (7). The residuals from the estimation model of R&D expense are multiplied by -1, such that higher values of *Abn_R&D* indicate more real earnings management by cutting expense.

TABLE 7
Subsample test: the effect of R&D reserves on abnormal R&D expenditure in pre- and post-SOX period

Panel A. Main independent variable is C-Score

	Pre-SOX period 1975-2001			Post-SOX period 2002-2018		
Variable	**Coeff.**	**t-stat**	**p-value**	**Coeff.**	**t-stat**	**p-value**
Intercept	0.0300	3.93	<.0001	0.0582	4.34	<.0001
$C\text{-}Score_{t-1}$	0.0183	8.39	<.0001	-0.0019	-4.28	<.0001
$\lvert Abn\_accruals_t \rvert$	-0.0074	-0.55	0.5807	-0.0105	-1.21	0.225
$SIZE_{t-1}$	0.0019	7.09	<.0001	0.0006	2.70	0.007
MB_{t-1}	0.0006	2.14	0.0326	-0.0009	-4.23	<.0001
ADJ_ROA_{t-1}	-0.0331	-4.45	<.0001	-0.0019	-0.97	0.3303
LEV_{t-1}	-0.0068	-1.79	0.0732	0.0230	5.86	<.0001
RD_INT_t	-0.1349	-9.69	<.0001	-0.0182	-7.64	<.0001
Industry FE	Yes			Yes		
Year FE	Yes			Yes		
N of obs.	44809			34343		
R-squared	0.0446			0.1185		

Panel B. Main independent variable is Q-Score

	Pre-SOX period 1975-2001			Post-SOX period 2002-2018		
Variable	**Coeff.**	**t-stat**	**p-value**	**Coeff.**	**t-stat**	**p-value**
Intercept	0.0304	3.98	<.0001	0.0560	4.18	<.0001
$Q\text{-}Score_{t-1}$	0.0319	9.14	<.0001	-0.0017	-2.57	0.0102
$\lvert Abn\_accruals_t \rvert$	-0.0064	-0.48	0.6301	-0.0114	-1.30	0.1924
$SIZE_{t-1}$	0.0019	6.89	<.0001	0.0006	2.89	0.0038
MB_{t-1}	0.0007	2.42	0.0156	-0.0009	-4.45	<.0001
ADJ_ROA_{t-1}	-0.0309	-4.13	<.0001	-0.0010	-0.54	0.589
LEV_{t-1}	-0.0073	-1.92	0.0555	0.0233	5.93	<.0001
RD_INT_t	-0.1264	-10.12	<.0001	-0.0197	-8.34	<.0001
Industry FE	Yes			Yes		
Year FE	Yes			Yes		
N of obs.	44809			34343		
R-squared	0.0451			0.1162		

This table reports the estimation results of Equation (7) for pre- and post-SOX samples separately. The residuals from the estimation model of R&D expense are multiplied by -1, such that higher values of *Abn_R&D* indicate more real earnings management by cutting expense.

TABLE 8
Cross-sectional variation in the effect of R&D reserves on abnormal R&D expenditure

Panel A. Main independent variable is C-Score

Variable	Coeff.	t-stat	p-value
Intercept	0.0256	7.11	<.0001
$C\text{-}Score_{t-1}$	0.0012	1.79	0.0729
$\lvert Abn\_accruals_t \rvert$	0.0012	0.14	0.8852
$SIZE_{t-1}$	0.0006	3.00	0.0027
MB_{t-1}	0.0000	-0.18	0.8592
ADJ_ROA_{t-1}	-0.0014	-0.68	0.4964
LEV_{t-1}	0.0058	2.88	0.004
RD_INT_t	-0.0698	-12.26	<.0001
$Market\_share_{t-1}\_Dummy$	0.0027	4.14	<.0001
NOA_{t-1}_Dummy	0.0024	4.40	<.0001
$C\text{-}Score_{t-1} \times Market\_share_{t-1}\_Dummy$	-0.0038	-4.45	<.0001
$C\text{-}Score_{t-1} \times NOA_{t-1}\_Dummy$	0.0098	7.98	<.0001
Industry FE	Yes		
Year FE	Yes		
N of obs.	78222		
R-squared	0.0637		

Panel B. Main independent variable is Q-Score

Variable	Coeff.	t-stat	p-value
Intercept	0.0248	6.87	<.0001
$Q\text{-}Score_{t-1}$	0.0030	2.73	0.0064
$\lvert Abn\_accruals_t \rvert$	0.0009	0.11	0.9152
$SIZE_{t-1}$	0.0006	2.93	0.0034
MB_{t-1}	0.0000	-0.03	0.9795
ADJ_ROA_{t-1}	-0.0010	-0.49	0.6215
LEV_{t-1}	0.0054	2.66	0.0079
RD_INT_t	-0.0668	-13.05	<.0001
$Market\_share_{t-1}\_Dummy$	0.0022	3.54	0.0004
NOA_{t-1}_Dummy	0.0041	7.82	<.0001
$Q\text{-}Score_{t-1} \times Market\_share_{t-1}\_Dummy$	-0.0085	-5.44	<.0001
$Q\text{-}Score_{t-1} \times NOA_{t-1}\_Dummy$	0.0164	7.42	<.0001
Industry FE	Yes		
Year FE	Yes		
N of obs.	78222		
R-squared	0.0639		

This table reports the estimation results of Equation (9). The residuals from the estimation model of R&D expense are multiplied by -1, such that higher values of *Abn_R&D* indicate more real earnings management by cutting expense.

TABLE 9
Alternative specification of regression equation: addressing concerns of biased coefficients

Panel A. Main independent variable is C-Score

Variable	Coeff.	t-stat	p-value
Intercept	-0.0056	-3.09	0.002
$C\text{-}Score_{t-1}$	0.0011	1.92	0.0555
$\lvert Abn\_accruals_t \rvert$	-0.0249	-3.46	0.0005
$SIZE_{t-1}$	0.0007	0.78	0.4354
MB_{t-1}	-0.0006	-2.96	0.0031
ADJ_ROA_{t-1}	0.0194	18.73	<.0001
LEV_{t-1}	0.0075	2.86	0.0043
RD_INT_t	-0.0573	-11.53	<.0001
$1/A_{t-1}$	0.0566	4.55	<.0001
MV_t	0.0017	2.10	0.036
Q_t	0.0034	5.30	<.0001
INT_t/A_{t-1}	-0.0569	-13.24	<.0001
RD_{t-1}/A_{t-1}	0.0605	5.07	<.0001
N of obs.	79137		
R-squared	0.05127		

Panel B. Main independent variable is Q-Score

Variable	Coeff.	t-stat	p-value
Intercept	-0.0055	-3.02	0.0026
$Q\text{-}Score_{t-1}$	0.0028	3.14	0.0017
$\lvert Abn\_accruals_t \rvert$	-0.0250	-3.48	0.0005
$SIZE_{t-1}$	0.0007	0.82	0.4094
MB_{t-1}	-0.0006	-2.93	0.0034
ADJ_ROA_{t-1}	0.0196	19.05	<.0001
LEV_{t-1}	0.0074	2.82	0.0048
RD_INT_t	-0.0575	-11.78	<.0001
$1/A_{t-1}$	0.0566	4.55	<.0001
MV_t	0.0017	2.04	0.0412
Q_t	0.0034	5.33	<.0001
INT_t/A_{t-1}	-0.0568	-13.23	<.0001
RD_{t-1}/A_{t-1}	0.0578	4.86	<.0001
N of obs.	79137		
R-squared	0.05156		

This table reports the estimation results of Equation (10). The residuals from the estimation model of R&D expense are multiplied by -1, such that higher values of *Abn_R&D* indicate more real earnings management by cutting expense.

국문초록

1975 년부터 시행된 SFAS № 2 Accounting for Research and Development Costs 기준에 따라 기업이 연구개발비 발생시 전액을 인식해야 한다. 이러한 보수적인 처리는 기록되지 않은 R&D reserve 를 창출한다. 본 연구의 결과는 R&D reserve 가 클수록 연구개발비 절감을 통한 실질이익조정의 정도가 증가하는 것이다. 또한 본 논문은 SOX 의 입법 전 (이후) R&D reserve 가 많은 회사는 소득 증가 (감소)하도록 실질이익조정에 더 많이 관여할 가능성이 높았다는 실증적인 증거를 제공한다. 또한 R&D reserve 가 많고 회계 유연성이 낮은 회사는 연구개발비를 더 많이 절감하는 반면, R&D reserve 가 많고 마켓 리더의 지위를 가진 회사는연구개발비를 덜 절감하는 것으로 나타났다.

주요어: 무조건회계보수주의, R&D reserve, 실질이익조정

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