R&D Accounting, Earnings Management, and Investment Efficiency *

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Abstract

We examine how capitalization vs expensing of R&D costs affects how the firm manages earnings with R&D, and the economic consequences of the earnings management method. We focus on the period around the UK's switch from UK GAAP, which allowed expensing, to IFRS, which mandated capitalization for firms that met certain conditions. We find that switching firms changed from cutting R&D expenditures to meet earnings benchmarks, to cutting expenses without cutting expenditures. Firms that continued to expense continued to cut expenditures. This is the first empirical evidence that capitalization reduces real expenditure cuts. Most important, we find that switching firms increased their R&D investment efficiency relative to firms that continued to expense, and this efficiency gain is concentrated in Switchers that reduced their cutting of R&D expenditures to meet earnings benchmarks, consistent with the negative economic consequences of real earnings management.

Keywords: Research &Development, Capitalization, Earnings Management

JEL-classifications: M40, M41

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I. Introduction

We examine how capitalizing vs expensing of R&D affects whether firms cut R&D expenditures to meet earnings benchmarks, and the economic consequences of R&D expenditure cuts. We focus on UK firms in the years immediately before and after the UK switched from UK GAAP to IFRS in 2005. Under UK GAAP, firms had the option to capitalize or expense development expenditures; under IFRS, development expenditures must be capitalized if certain conditions (discussed below) are met.[1] Thus, firms that had expensed development expenditures were required to switch to capitalization. Firms that only had research expenditures, or did not meet the capitalization conditions, continued to expense. We refer to these two groups as "Switchers" and "Expensers", respectively, and we compare their earnings management behavior in the years immediately before vs after the switch.[2] We predict and find that in both periods, Expensers cut R&D *expenditures* to meet/beat benchmarks such as avoiding losses or analysts' expectations. Switchers, however, changed from cutting R&D *expenditures* under UK GAAP to cutting *expenses* but not *expenditures* under IFRS, by increasing the percentage of R&D costs that are capitalized. While there is much evidence that firms use earnings management to meet benchmarks, ours is the first paper to link the accounting method, capitalization vs expensing, to how firms manage earnings, and in particular to show that R&D capitalizers avoid real expenditure cuts to manage earnings.

[1] EU Regulation No. 1606/2002 required that the consolidated financial statements of European companies whose securities are traded on a regulated market be prepared under IFRS for fiscal years beginning on or after January 1, 2005.

[2] There were also firms that capitalized development expenditures under UK GAAP and continued to do so under IFRS. As we discuss below in Section 3, there are too few of these "Capitalizers" for our tests.

Most important, we examine the economic consequences of reducing real expenditure cuts. Fields, Lys, and Vincent (2001) suggest that manipulating accruals may result in lower wealth loss to principals than manipulating real transactions. Bushee (1998) points out that R&D expenditure cuts have real implications for long-term value and are of greater concern to equity holders than manipulation of discretionary accruals. Graham, Harvey, and Rajgopal (2005) find that managers are willing to sacrifice economic value to manage earnings. Thus, expensing R&D may induce more costly earnings management than capitalization.

Theoretically, Demski (2004) and Ewert and Wagenhofer (2005) demonstrate that making accrual earnings management more costly (such as by regulations like SOX, which mandated greater penalties for earnings manipulation) may reduce accrual earnings management, but by increasing real earnings management. Moreover, as Ewert and Wagenhofer point out, since real earnings management is often indistinguishable from other economic transactions, it is generally more difficult to detect than accrual earnings management, thus making enforcement more difficult. Empirically, Cohen, Dey, and Lys (2008) find that after SOX made accrual earnings management more costly, firms shifted to real earnings management. More recently, Terry (2015) and Terry, Whited, and Zakolyukina (2022) show that substituting real for accrual earnings management can result in significant losses in firm value.

Consistent with these arguments and evidence, we find that Switchers experienced an increase in investment efficiency relative to Expensers, and this efficiency gain is concentrated in Switchers that reduced their cutting of R&D expenditures to meet earnings benchmarks. This combination is strong evidence that these Switchers were previously underinvesting, and that the switch to capitalization, and the resulting increase in R&D expenditures (due to the reduced cutting), is the cause of the increased investment efficiency.

An important question is why didn't all R&D firms capitalize under UK GAAP, when they had the option to do so and could have reaped the benefits before the switch to IFRS? Oswald, Simpson, and Zarowin (2022) show that firms chose not to capitalize primarily due to the negative signal capitalization conveyed about financial strength, since mostly poorer performing firms, who needed the expense deferral, chose to capitalize. Once capitalization became mandatory, the signal was eliminated.

Following Leuz's (2022) design-based approach, we apply a wholistic methodology, contributing to the accounting literature by being the first paper to link three components: 1. the R&D accounting method (expensing vs capitalization); 2. the method of earnings management (real expenditure cuts vs expense reductions without real cuts); 3. and most important, by documenting the economic consequences of different earnings management methods (improvements in investment efficiency). By showing the positive consequences of mandating capitalization and thereby reducing real expenditure cuts, our paper is a "mirror image" of the papers cited above, which deal with the negative consequences of making accrual earnings management more costly, forcing firms to manage earnings with real expenditure cuts.

R&D accounting is "one of the most pronounced differences between US GAAP and IFRS" (Chen, Gavious and Lev, 2017), and it is important for U.S. regulators to see the effects of R&D capitalization in a major capital market. We focus on U.K. firms, since it is widely agreed that the U.K. is the most comparable country to the U.S.[3] Since the two countries have similar institutions, accounting and legal frameworks, among others, the U.K. results act as a benchmark for what U.S. results with R&D capitalization might be. By providing empirical evidence on this important issue,

[3] Michaely and Roberts (2012) note that U.K. has an economic environment that shares many similarities to that found in the U.S. Acharya, Sundaram, and John (2011) note that the financial systems in the U.K. and U.S. are similar. Allen, Carletti, and Marquez (2009) also note that systems of corporate governance in the U.S. and U.K. are very similar.

we answer the call for research by Roychowdhury, Shroff and Verdi (2019). Our results suggest that regulations such as SOX, which caused firms to shift from accrual to real earnings management, may have the unintended consequence of reducing economic efficiency.

The rest of the paper is organized as follows. Section 2 reviews the previous literature on R&D and earnings management. Section 3 discusses our data and sample. Section 4 discusses our hypotheses and test results. Section 5 provides evidence on how firms that capitalize R&D manage earnings. Section 6 provides results on the effect of capitalization vs expensing R&D on investment efficiency. Section 7 concludes.

II. Related Literature

Our paper is related to research on R&D and earnings management, real vs accrual earnings management, and the real effects of earnings management.

A number of papers have shown that firms use R&D expenditure cuts to manage earnings. All of the studies exclusively use data from the U.S., where R&D costs must be expensed. Baber, Fairfield and Haggard (1991) find that R&D spending is relatively lower for firms that can manage to hit their earnings goal by reducing their R&D expenditures. The authors conclude that managerial decisions to invest in R&D are influenced by a concern about reported earnings.

Bushee (1998) examines whether institutional investors create or reduce incentives for managers to cut their R&D spending in order to meet short-term earnings targets. He finds that managers of firms with high institutional ownership are less likely to cut their R&D expenditures to increase earnings; however, if the institutional ownership is by 'transient' owners, then managers are more likely to cut their R&D spending to increase earnings.

Dechow and Sloan (1991) find that the growth in R&D expenditures is reduced in the final years of a CEO's tenure, but the reduction in expenditures is mitigated through CEO stock ownership. Roychowdhury (2006) finds that firms that report small profits have unusually low discretionary expenses (advertising, R&D and selling, general and administrative) expenses, suggesting that they manage earnings via R&D expenditures. Edmans, Fang, and Lewellen (2017) show that firms cut investments in tangibles such as R&D to meet short term earnings targets. Finally, Darrough and Rangan (2005) document that the change in R&D expenditures is negatively associated with the level of managerial selling in an initial public offering, indicating that firms manage R&D expenditures even at the time of the IPO. In summary, there is considerable evidence that U.S. firms engage in "real" earnings management by cutting R&D expenditures to meet earnings targets. Importantly, all of these papers deal with samples where expensing of R&D and intangible investments is mandated, and capitalization is prohibited.

A number of papers contrast real vs accrual earnings management. Demski (2004) and Ewert and Wagenhofer (2005) demonstrate theoretically that making accrual earnings management more costly may reduce accrual earnings management, but at the cost of increasingreal earnings management. Moreover, as Ewert and Wagenhofer point out, since real earnings management is often indistinguishable from other economic transactions, it is generally more difficult to detect than accrual earnings management, thus making enforcement more difficult. Consistent with their predictions, Cohen, Dey, and Lys (2008) show empirically that after SOX made accrual earnings management more costly, firms shifted to real earnings management. Baik, Gunny, Jung, and Park (2022) find that smoothing by R&D management results in less informative earnings than smoothing by accruals management.

Regarding the real effects of earnings management, Graham, Harvey, and Rajgopal (2005) find that managers are willing to sacrifice economic value to manage earnings, such as cutting R&D expenditures to meet earnings benchmarks, consistent with Stein's (1989) model of managerial myopia. Gunny (2010) finds that R&D expenditure cuts, and other forms of real earnings management, are associated with lower future operating performance. More recently, Terry (2015) and Terry, Whited, and Zakolyukina's (2022) structural analyses show that substituting real for accrual earnings management can result in significant losses in economic growth and firm value. Bereskin, Hsu, and Rotenberg (2018) find that R&D expenditure cuts to manage earnings lead to fewer and less cited patents and lower innovative efficiency.

Perhaps the closest papers to ours are Dinh, Sidhu, and Yu (2019) and Bhattacharya, Saito, Venkataraman, and Yu (2021). Dinh et al (2019) employ the U.S. GAAP setting that requires software firms to capitalize software development expenditures that meet certain recognition criteria, but mandates other hi-tech firms to expense all R&D costs. They show that U.S. software firms are less likely to under-invest in R&D projects than other U.S. hi-tech firms in the presence of myopic incentives. However, software firms are different from other hi-tech firms, so omitted firm characteristics may be driving their result. Indeed, the specific characteristics of software firms are what caused the FASB to mandate capitalization only in this industry. Also, they do not provide evidence that the difference in R&D expenditure cutting behavior causes the difference in the investment efficiency between U.S. software firms and other high-tech firms.[4]

Bhattacharya et al (2021) show that when Germany mandated that firms switch from R&D expensing to capitalization, firms reporting R&D expenditures experienced improvement in

[4] They find that the change of capitalized software development expenditures from the previous year is negatively correlated with the R&D expenditure cutting for only U.S. software firms. They also document that this negative correlation is concentrated in the subsamples that experience an earnings decline. However, they are silent about how this negative correlation affects investment efficiency.

economic efficiency. This is similar to our result that Switchers show an improvement in efficiency. However, they do not link the efficiency gains to changes in the earnings management method, so the paper is silent on the mechanism behind the improvement. Indeed, we find that the improvement is concentrated in Switchers that reduced their real cutting to meet earnings benchmarks, thereby pinpointing the mechanism. Most important, ours is the only paper to connect the method of R&D accounting, the method of earnings management, and investment efficiency, thereby linking all there components together. Moreover, since we show that both the accounting and efficiency changes are for the same set of firms (Switchers), it is unlikely that any uncontrolled firm differences are driving our result.

In summary, we contribute beyond these papers by linking the accounting method to the type of earnings management, by showing how firms that capitalize R&D manage earnings, and most important, by being the first paper to document the economic consequences of different earnings management tools on investment with archival data.

III. Data and Sample

Our sample consists of UK firms, because prior to the adoption of IFRS, UK GAAP permitted, but did not require, the capitalization and subsequent amortization of development expenditures [SSAP 13, para. 25, (1989)]. However, with the adoption of IFRS in 2005, capitalization of development expenditures became mandatory. Specifically, IAS 38 (para. 57) states that an intangible development asset shall be recognized if the firm could demonstrate the following conditions: (a) The technical feasibility of completing the intangible asset so that it will be available for the use or sale; (b) its intention to complete the intangible asset and use or sell it; (c) its ability to use or sell the intangible asset; (d) how the intangible asset will generate probable

future economic benefits; (e) the availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset; and (f) its ability to measure reliably the expenditure attributable to the intangible asset during its development [International Accounting Standard (IAS) 38, 1998]. Since the capitalization criteria are essentially the same under both reporting regimes, a firm that could have capitalized under UK GAAP but chose not to, would be mandated to capitalize under IFRS. Thus, by examining UK firms, we are able to compare the impact of mandatory capitalization on firms that expensed their R&D under UK GAAP and switched to capitalization under IFRS, with those firms that expensed under both regimes.[5]

Table 1 shows the formation of our sample. To construct our sample, we first obtain from Thomson Reuters Datastream those firms that disclosed either an R&D asset or R&D expense in any year t = 1998 - 2014. We begin in 1998 since 2004 was the first year of IFRS adoption in our sample, and we use six years of data under UK GAAP.[6] We finish in 2014 since 2009 was the last year of IFRS adoption, and we require six years of data under IFRS.[7] From this initial download of firm-year observations we examine the notes to the financial statements for all observations with a positive value of R&D asset to ensure that the data relates to R&D, and to record the amount of R&D capitalized and amortized in the period (firms with R&D expense but without an R&D

[5] In both SSAP 13 and IAS 38 research expenditures must be expensed; only development expenditures meeting the conditions detailed in this paragraph may be capitalized, resulting in a development asset. We use the term R&D to maintain consistency with the literature. Furthermore, both R and D expenditures are aggregated into one line item, so we cannot separately analyze them anyway.

[6] We begin our data collection in 1998 since there are eleven firms that switched to capitalization in 2004; we call these firms Early Switchers. The listing requirements of the Alternative Investment Market (AIM), which is not considered a regulated market by the EU, required firms to adopt IFRS for fiscal years beginning on or after January 1, 2007. One of the AIM listed sample firms delayed adopting IFRS until their 2009 fiscal year. Throughout the paper, we refer to the adoption year as 2005. As a robustness test, we excluded the Early Switchers, and got qualitatively similar results.

[7] Our results are not sensitive to eliminating observations during the Financial Crisis, 2008.

asset are assumed to be Expensers). This analysis provides us with 9,138 firm-year observations (1,231 firms).

We then remove firms that do not have data in both accounting regimes. Specifically, we remove 1,657 firm-year observations (471 firms) as they never adopted IFRS (i.e., they delisted before adoption of IFRS). We then remove 1,241 firm-year observations (226 firms) as they do not have any observations under UK GAAP (i.e., they did not exist prior to the adoption of IFRS).

The first step in creating our sample was to utilize the full sample of data over the maximum time-period to ensure we could obtain twelve years of data per firm regardless of their IFRS adoption year. At this stage we identified the IFRS adoption year for the remaining firms and then deleted 1,213 firm-year observations outside of the twelve-year window.[8] For the remaining firms, we require that they have lagged R&D expenditures; we remove 123 firm-year observations that have missing lagged R&D expenditures. We then remove 953 firm-year observations (96 firms) that had a mixed R&D policy in either (or both) of the regimes; that is, these firms had firm-year observations where they would capitalize in some years, and expense in other years within the same regime. Next, we remove 1 firm (12 firm-year observations) that changed from capitalizing to expensing under IFRS. Finally, we remove 1,192 firm-year observations due to missing accounting and financial data needed to construct our control variables for our multivariate analysis (see below); this resulted in the removal of 124 firms that no longer have data in both regimes.

The next step in our sample construction is to identify our two primary sub-groups of firms: (1) those firms that always expensed under UK GAAP and then began to always capitalize under IFRS ('Switchers'), and (2) those firms that always expensed under UK GAAP and continued to

[8] For example, for a firm that adopted IFRS in 2005, we deleted the 2011-2014 firm-year observations. Similarly, for a firm that adopted IFRS in 2008, we deleted the 1998-2001 and 2014 firm-year observations.

always expense under IFRS ('Expensers'). In total, there are 134 Switchers (1,220 firm-year observations). This group includes 9 firms (746 firm-year observations) that switched to capitalizing in the year before officially adopting IFRS. There are 141 Expenser firms (1,241 firm-year observations).

In addition to these two sub-groups, we also have a sub-group of firms that always capitalized under UK GAAP and IFRS ('Capitalizers'). In total there are 38 Capitalizer firms (286 firm-year observations). As we point out in Section 4, we exclude these firms, since there are too few observations for our benchmark beating analysis.

We also construct an analyst sample, where the earnings target is the consensus analyst earnings forecast (measured as the median forecast of all forecasts made three months prior to fiscal year end, obtained from I/B/E/S). Applying the requirement of at least one available analyst forecast to our initial sample results in 1,918 firm-year observations (243 firms). In the analyst sample, there are 110 Switchers (889 firm-year observations), which also include 6 firms (37 firm-year observations) that switched to capitalizing in the year before officially adopting IFRS. There are 109 Expensers (865 firm-year observations) and 24 Capitalizers (164 firm-year observations).

An important assumption underlying our tests is that capitalization of eligible development expenditures became mandatory under IFRS. There is much evidence to support this assumption. First, the fact that so many Expensers switched is *prima facie* evidence that enforcement was effective, and non-switchers did not simply choose to avoid capitalization. Second, the timing of their switches was when IFRS went into effect, consistent with the mandate. Third, in the first IRFS year, Switchers' were required to disclose pro-forma (as-if IFRS) capitalized amounts pertaining to the *previous* (last UK GAAP) year. This shows that they could have capitalized under UK GAAP (i.e., they had development expenditures that met the capitalization conditions), but

that they chose to expense, and only capitalized when they were mandated to. Fourth, Oswald et al (2022) analyzed the R&D footnotes for every firm that expensed under both UK GAAP and IFRS. They found that industry membership was an important determinant of whether a firm remained an Expenser. For example, firms in particular industries, such as Healthcare, explicitly mentioned that their development expenditures did not meet the capitalization conditions, due to the uncertainty of future benefits. Thus, firms that continued to expense either had only research expenditures, or their development expenditures never met the conditions for capitalization. In summary, there is strong evidence that the switch was mandatory and enforcement was effective.

Table 2, Panel A presents descriptive statistics for Switchers and Expensers during the UK GAAP and IFRS periods. In both periods, the Switchers (firms that expensed R&D under UK GAAP and capitalized under IFRS) are smaller than Expensers, based on market value, sales, assets, and employment. These differences are important because they mean that we must control for size in our regressions. Also, Switchers are younger and more profitable than Expensers. Notably, the differences in the probability of R&D expenditure cut during the UK GAAP period are insignificant, which means that the two groups had similar R&D expenditure cutting behavior prior to the IFRS adoption. However, Switchers are less likely to cut R&D expenditures in the IFRS period than Expensers, consistent with the premise of this paper.

Table 2, Panel B reports the industry membership of Switchers and Expensers; 43% of the Switchers are from computer related industries (computer hardware, computer services, semiconductors and software), and 30% of the Expensers are from medical related industries (biotechnology, pharmaceuticals, medical equipment and medical supplies). Most notably, there are industry differences between Switchers and Expensers; therefore, in our tests we control for industry membership.

IV. Hypotheses and Tests

4.1 Hypotheses

Our research is motivated by the different ways in which capitalization vs expensing affect earnings. When firms expense R&D costs, a reduction in R&D expenditures increases pre-tax earnings one-for-one, and thus manipulating R&D expenditures is an effective means for managing earnings to avoid losses or negative earnings changes. However, when firms capitalize and amortize R&D costs, current period R&D expense is a combination of amortization of past R&D expenditures plus the percentage of current expenditures that are expensed. Since amortization of past R&D expenditures is a sunk expense of the current period, a reduction in current R&D expenditures has less than a one for one effect on pre-tax earnings (how much less depending on the fraction of costs capitalized), and reducing R&D expenditures is a relatively ineffective tool for managing earnings to achieve benchmarks. Since reducing R&D expenditures may not yield much earnings management benefit and may negatively impact the firm's long term growth and profitability, capitalizers might be reluctant to do it. For capitalizers, therefore, reducing expenses without reducing expenditures, by changing the percentage of current expenditures that are capitalized, may be a more effective, less costly, earnings management tool.

The UK's change to IFRS, requiring the capitalization of eligible development expenditures, was a "quasi-experiment", an exogenous event that affected some firms but not others. We compare the benchmark beating behavior in the years immediately before vs after the change, for affected firms ("Switchers") vs unaffected firms ("Expensers"). By comparing how the behavior of the two groups changed at exactly the same time, we can control for any economy-wide effects or changes in other accounting rules or enforcement common to all firms. Such tests are virtually impossible in the U.S., where almost all internal R&D costs are expensed (except in the case of

the software industry - SFAS #86). Because UK GAAP permitted both capitalization and expensing of development costs, the UK setting is not exactly identical to countries such as the U.S. However, because the switch to IFRS mandated that firms switch methods, our tests provide the first empirical guidance for what the effects of such a mandatory change might be elsewhere. Since the U.K. is a major capital market that is similar to the U.S. (as well as to the stock markets of other developed nations), our results might be generalized to other countries.[9]

Based on prior research, we assume that firms manage earnings to avoid losses and earnings decreases (Burgstahler and Dichev, 1997), and to meet analysts' expectations (Degeorge, Patel, and Zeckhauser, 1999). Thus, our earnings benchmarks are zero earnings level, zero earnings change, and the median consensus analyst forecast (three months before fiscal year end).[10] Also based on previous research, we examine whether firms decreased their R&D expenditures as compared to the previous year. Thus, our R&D benchmark is zero change.

Using these benchmarks, analogous to Baber, Fairfield and Haggard (1991) and Bushee (1998), we consider three groups of firms, based on their level of pre-tax earnings before R&D expenditures in the current year ($EBRD_t$), or change vs the previous year ($\Delta EBRD_t$), or median analysts' forecasts for the current year (AF_t), all compared to their R&D expenditures in the previous year (RD_{t-1}). Our first grouping assumes that firms manage earnings to avoid losses (the earnings benchmark is zero earnings). Therefore, we create the following groupings based on $EBRD_t$ compared to RD_{t-1}:

Group 1	Group 2	Group 3
$EBRD_t < 0$	$0 < EBRD_t < RD_{t-1}$	$RD_{t-1} < EBRD_t$

[9] Ball, Kothari, and Robin (2000) group the U.K., U.S., Australia, and Canada as major common-law countries.
[10] We used the median to minimize the effect of extreme observations. Using the mean, or using the forecast 6 months before year end, produced similar results.

Group 1 firms are performing so poorly that they show losses even before considering current R&D expenditures. By contrast, Group 3 firms are successful enough that they would show current year pre-tax profits even if current year R&D expenditures maintained at last year's level. Group 2 would show losses if they maintained R&D expenditures at last year's level, but can show profits by cutting R&D expenditures.

Group 2 is the primary group of interest. Since firms in Groups 1 and 3 will show losses and profits, respectively, by maintaining R&D expenditures at last year's level, they have less incentive to cut R&D expenditures than firms in Group 2, who can show profits only by cutting R&D expenditures.

Analogous to the first grouping, our second grouping assumes that firms manage earnings to avoid earnings decreases (the earnings benchmark is zero earnings change). Therefore, we create the following groupings based on $\Delta EBRD_t$ compared to RD_{t-1}.

Group 1	Group 2	Group 3
$\Delta EBRD_t < -RD_{t-1}$	$-RD_{t-1} < \Delta EBRD_t < 0$	$0 < \Delta EBRD_t$

Our third grouping assumes that firms manage earnings to meet analysts' expectations (the earnings benchmark is the consensus analyst median forecast). Therefore, we create the following groupings based on the difference between $EBRD_t$ and AF_t ($AFBRD_t$), compared to RD_{t-1}:

Group 1	Group 2	Group 3
$AFBRD_t < 0$	$0 < AFBRD_t < RD_{t-1}$	$RD_{t-1} < AFBRD_t$

Similar to our first grouping, Group 1 firms' earnings even before considering current R&D expenditures are less than the consensus analyst median forecast. By contrast, Group 3 firms would beat the consensus analyst median forecast even if current year R&D expenditures maintained at last year's level. Group 2 firms would not meet the consensus analyst forecast if they maintained

R&D expenditures at last year's level, but can beat the consensus analyst forecast by cutting R&D expenditures. Note that unlike the other two benchmarks, the groups for the analyst benchmark are not ordered by profitability, but by whether an R&D cut is necessary to meet the consensus analyst forecast. Thus, a firm can be performing very well (strong sales and earnings) and still fall short of the consensus forecast. Likewise, a firm can be performing poorly and exceed the forecast.

Table 3 shows the number of firm-years (firms) that fall into each group, for each benchmark, under each regime. Since there are too few Group 2 observations for Capitalizers, we focus on Expensers and Switchers.[11]

Table 4, Columns (1) – (3) show descriptive statistics for the firm-year observations of the Switchers in each of the three earnings groups, for the entire sample period (UK GAAP and IFRS) combined, using the earnings level benchmark.[12] Additionally, in Column (4) we also provide descriptive statistics of Expensers in Group 2. We also show the statistical significance of pairwise tests of differences between the groups. By construction, profitability of Group 1 is lower than profitability of Group 2, which is lower than Group 3. For the most part, Group 3 firms are larger than Group 2 firms, which are larger than Group 1 firms, whether size is measured by market value, sales, assets, and employment. This is not surprising, since the groups are ordered by success, and more successful firms become larger than less successful firms. However, the differences between Group 2 and Group 3 are small. Notably, Group 2 Expensers have similar

[11] As Table 1 shows, there are only 38 Capitalizers to begin with, and when we require at least 2 firm-year observations in each regime, for the earnings level and change benchmarks there are zero Group 2 capitalizers under IFRS and UK GAAP, respectively.

[12] We only show one benchmark in the interest of brevity. Most of the statistics for the other benchmarks are similar; however, there are some differences. Most important, for the analyst benchmark, Group 1 firms are better performers than for the other two benchmarks. For example, sales growth for Group 1 firms is comparable to that for Group 2 firms, and Group 1 Expensers have positive earnings (higher than Group 2 Expensers at the mean). This is because as pointed out above, for the analyst benchmark, the groups are not ordered by profitability, but by whether an R&D cut is necessary to meet the consensus analyst forecast.

size, firm age, capital expenditure growth rate, and ownership structure with Group 2 Switchers although they exhibit lower profitability, higher Tobins' Q and sales growth rate.

Although we are primarily interested in the change in benchmark beating behavior from the UK GAAP period to IFRS, to maintain consistency with Baber et al (1991) and Bushee (1998), we first compare both Switchers and Expensers in the three groups under UK GAAP (note by construction Switchers expense under UK GAAP). Thus, our first hypothesis is (in null form):

H1: Firms in Group 2 are no more likely to cut R&D expenditures than firms in Group 1 or 3 under UK GAAP.

Our alternative hypothesis is that Expensers in Group 2 are more likely to cut R&D expenditures than Expensers in Groups 1 or 3. We use H1 to replicate prior research on U.S. data cited above.

The results of the pairwise group comparisons of R&D expenditure and expense cutting probability are shown in Table 5 and Table 6, respectively. Panels A, B, and C are for the earnings level, earnings change, and analyst forecast benchmarks, respectively. We focus on the top row in each Panel, UK GAAP. Switchers in Group 2 are significantly more likely to cut R&D expenditures than Switchers in Group 1 or 3, for both the earnings level and analyst forecast benchmarks, but not for the earnings change benchmark. For example, for the earnings level benchmark, Switchers in Groups 1, 2, and 3 have cut probabilities of 0.484, 0.610, and 0.319, respectively, with Group 2's probability higher than Group 1 and Group 3 at significance levels of 0.093 and (less than) 0.001. For Expensers, Group 2 firms are more likely to cut R&D expenditures than Group 3 for both the earnings level and analyst forecast benchmarks, but not significantly more likely than Group 1. This is not surprising, because Group 1 are poorly performing firms,

and might have less profitable R&D investments. Overall, for both earnings benchmarks, our results are strongly consistent with previous research on U.S. firms.[13]

Since Switchers change from expensing to capitalization, cutting R&D expenditures does not have a 1:1 effect on pre-tax earnings, since part of each expenditure is capitalized. But, since cutting R&D expenditures may have a detrimental effect on firm value and performance, they may be reluctant to do it. For Expensers, of course, there is no change in accounting method, and so we expect no change in R&D expenditure cutting behavior. Thus, our second and more important hypothesis involves the change in their R&D expenditure cut probabilities from UK GAAP to IFRS:

> H2: Switchers in Group 2 reduce their R&D expenditure cut probability from UK GAAP to IFRS.
>
> H2A: Expensers in Group 2 do not reduce their R&D expenditure cut probability from UK GAAP to IFRS.

While H2 may seem obvious, it is not without tension: because we cannot separate R&D into "R" vs "D", Switchers might still cut research expenditures, which are expensed, so we would not find any change in their earnings management behavior. In addition, there are other factors than earnings management that influence firms' R&D expenditures (which we control for in our multivariate tests below), so even if firms changed their benchmark beating behavior, this change might not be detectable in the data. Most important, documenting the change in R&D cutting is a

[13] The effectiveness of the earnings change benchmark can be weak because of the UK R&D tax relief schemes introduced in 2000 for small and medium-sized companies and in 2002 for large companies. These tax relief provisions allowed small and medium-sized (large) companies to deduct up to 150% (125%) of qualifying R&D expenditures. Due to these R&D tax credits, firms can have larger after-tax income by not cutting their R&D expenditures but receiving more tax credits so that they can beat or meet the past year's after-tax income. Therefore, firms have weaker incentives to engage in R&D cutting to meet the earnings-change benchmark. However, these do not apply to the earnings-level benchmark because R&D tax credits cannot be used if pre-tax income is negative. Also, as analysts make adjustments to arrive at their 'street earnings' definition (Philbrick and Ricks, 1991; Gu and Chen, 2004), firms cannot predict whether their R&D tax credits will be excluded or not in their street earnings. Thus, analysts median forecast benchmark can remain effective.

necessary first step to linking the change in accounting method (expensing to capitalization) to the change in investment efficiency, through the mechanism of a change in earnings management behavior (Section 6, below).

Each panel in Table 5 shows the group R&D expenditure cut probabilities under UK GAAP and IFRS, and compares the probabilities for all three groups. For Switchers, using the earnings level benchmark, the probability of Group 2 firms cutting R&D expenditures decreased from 0.610 to 0.327, with a p-value of 0.002. For the analyst benchmark, Group 2's expenditure cut probability decreased from 0.628 to 0.397, significant at less than the 0.001 level. By contrast for Expensers, with the earnings level benchmark, the Group 2 cut probability hardly changed from 0.533 under UK GAAP to 0.459 under IFRS, with a p-value of 0.469 and with the analyst benchmark, the Group 2 cut probability actually increased from 0.500 to 0.620, with a p-value of 0.092. These results are strongly consistent with H2 and H2A, and show that how a firm accounts for R&D costs affects its earnings management.

Although Switchers reduce their probability of cutting R&D expenditures, we assume that they still want to meet earnings benchmarks. Thus, they may reduce R&D expenses, so we have our third hypothesis (in null form):

> H3: Switchers in Group 2 do not reduce their R&D expense cut probability from UK GAAP to IFRS.

Table 6 examines the probability of R&D *expense* cuts. Since expense equals expenditure for Expensers, we do not repeat the Expensers' results from the previous table. By construction, the results under UK GAAP for Switchers are the same as the previous table. We repeat them, to make the comparison more visually transparent. Switchers' probability of an expense cut in Group 2 barely changed, from 0.610 to 0.558 for the earnings level benchmark, and from 0.628 to 0.568 for the analyst benchmark and both changes are insignificant. Since Table 5 showed that Switchers

reduced their tendency to cut R&D expenditures, they must be cutting expenses in another way, by managing the percentage of R&D costs that are capitalized. Below, we investigate the mechanism by which Switchers cut R&D expenses without cutting R&D expenditures, under IFRS.

Overall, the results in Tables 5 and 6 are strongly consistent with our hypotheses, showing that while Expensers continued to make R&D expenditure cuts to meet earnings benchmarks, Switchers changed their behavior, cutting expenses without cutting expenditures. This is novel evidence relating accounting methods (capitalization vs expensing) to how firms manage earnings.

4.2. Multivariate Tests

4.2.1 Model

Our tests in Tables 5 and 6 assume that a firm's decision to cut R&D expenditures is based only on the firm's decision to meet an earnings benchmark to avoid losses or earnings declines or to meet analysts' expectations. However, there are other factors that determine a firm's R&D expenditures, such as the firm's growth opportunities (positive NPV investments), pattern of past R&D expenditures, and profitability. Following Bushee (1998), we estimate the following linear probability regression model to control for these other effects.[14]

$$\begin{aligned} CutRD_t = {} & \alpha + \beta_0 Switcher + \beta_1 IFRS + \beta_2 Switcher*IFRS + \beta_3 PCRD_t + \beta_4 CIRD_t \\ & + \beta_5 CCAPEX_t + \beta_6 CSALES_t + \beta_7 TOBQ_t + \beta_8 SIZE_t + \beta_9 LEV_t + \beta_{10} FCF_t \\ & + \beta_{11} DIST_t + \text{Industry Fixed Effects} + \text{Year Fixed Effects} + \varepsilon_t \end{aligned} \quad (1)$$

where $CutRD_t$ equals one if a firm cut its R&D expenditures in t, compared to t-1, and zero otherwise, and Switcher and IFRS are dummy variables that equal 1 for Switcher firms and the IFRS period respectively, and zero otherwise. Although we are primarily interested in Group 2,

[14] Our model is similar to Berger's (1993), who explains current R&D expenditures by lagged R&D, internal funds, Tobin's Q, capital expenditures, and size.

we estimate (1) for all three groups, for completeness. Our main coefficient of interest is β_2, the change in Switchers' R&D expenditure cut probability from UK GAAP to IFRS, compared to Expensers. We expect β_2 to be negative.

We include the prior change in R&D expenditures ($PCRD_t$), measured as the logarithm of one-year lagged R&D expenditures divided by lagged sales minus the logarithm of two-year lagged R&D expenditures divided by two-year lagged sales, , as a proxy for changes in the firm's R&D opportunity set over time. To control for changes in the industry's R&D opportunity set, we include the change in industry R&D intensity ($CIRD_t$), measured as the logarithm of current industry R&D expenditures divided by current sales less the logarithm of lagged industry R&D expenditures divided by lagged industry sales (excluding the firm; industry membership is based on Datastream Level 6 Classification). Firms with an increasing (decreasing) R&D opportunity set are expected to be less (more) likely to cut their R&D expenditures; therefore, we expect β_3 and β_4 to be negative.

To control for funds available to invest in R&D projects, we include both the change in capital expenditures ($CCAPX_t$) and the change in sales ($CSALES_t$); we expect a negative relation between the funds available for investment and the decision to cut R&D expenditures (β_5 and β_6 should be negative). We measure the change in capital expenditures (sales) as the log of current capital expenditures (sales) in year t minus the log of capital expenditures (sales) in year t-1.

To proxy for the amount of available cash we include free cash flow (FCF_t); we hypothesize that lower (greater) available cash will be positively (negatively) associated with the decision to cut R&D expenditures (β_{10} should be negative). We measure free cash flow as cash flow from operations less the average capital expenditures in the prior two years divided by total assets.

Tobin's q ($TOBQ_t$) is included to capture the marginal benefit-to-cost ratio of undertaking new investment. Firms with higher (lower) values should face a greater (lower) cost associated with reducing investment; therefore, we expect a negative association with the decision to cut R&D expenditures (β_7 should be negative). We measure Tobin's q as the sum of book value of assets and the difference between market value of equity (measured at fiscal year end of year t) and book value of equity divided by total assets.

Firm size ($SIZE_t$) is included to first proxy for the firm's information environment (larger firms should have fewer opportunities for earnings management) and secondly to proxy for the likelihood that the firm faces cash constraints. Therefore, we hypothesize that larger (smaller) firms will be less (more) likely to cut their R&D expenditures (β_8 should be negative). We measure size as the log of market value of equity at the fiscal year end of year t. Leverage (LEV_t) is included to proxy for the firm's proximity to debt covenants. Firms with higher (lower) leverage may be more (less) likely to engage in earnings management, suggesting a positive relation between leverage and a cut in R&D expenditures (β_9 should be positive). Leverage is measured as total debt divided by total assets.

Finally, we include a variable to measure the percentage of R&D that would need to be cut in order to hit the earnings goal ($DIST_t$). We hypothesize that the more (less) R&D that needs to be cut in order to achieve the earnings goal the firm is more (less) likely to cut their R&D expenditures (β_{11} should be positive).[15] When the earnings goal is zero earnings, $DIST_t$ equals pre-tax pre-R&D earnings divided by lagged R&D expenditure all minus one. When the earnings goal is zero earnings change, $DIST_t$ equals the change in pre-tax pre-R&D earnings R&D divided by

[15] Similar to Bushee (1998), our hypothesized relation is for Group 2 firms. For Group 3 firms, DIST is always positive. If Group 3 firms with a larger value have an incentive to increase R&D in order to dampen their reported earnings level or earnings growth, we would expect a negative coefficient on DIST. If for Group 1 firms the incentive is to take a 'big bath', we would also expect a negative coefficient.

lagged R&D expenditure. When the earnings goal is analyst forecast, $DIST_t$ equals the difference between median analyst forecast and pre-R&D actual earnings divided by lagged R&D expense all minus one.

As Table 1 shows, requiring these additional variables for equation (2) results in our final sample of 2,754 firm-year observations, (1,230 Switcher firm-year observations and 1,239 Expenser firm-year observations) for the earnings level and earnings change benchmark. For the analyst sample there are 1,936 firm-year observations, (888 Switcher firm-year observations and 882 Expenser firm-year observations).

4.2.2 Test Results

The results of equation (1) are shown in Table 7.[16] As pointed out above, we can only estimate (1) on the final sample, due to the data requirements. Panel A shows the results for earnings-level benchmark, Panel B for the earnings-change benchmark, and Panel C for the analyst median forecast benchmark. Consistent with our prediction, we find negative coefficients on Switcher*IFRS (β_2) for the Group 2 firm-year observations using earnings-level benchmark and analyst median forecast benchmark. These results show that the probability of R&D expenditure cut for the Group 2 Switchers decreases more than that of Group 2 Expensers after IFRS adoption even when controlling for other economic determinants. However, we find insignificant results for Groups 1 and 3, indicating that the decrease of R&D expenditure cut found for Group 2 cannot be attributed to a common trend of Switchers. Regarding the control variables, the results are generally consistent with our expectations for all benchmarks. Overall, these results confirm that

[16] Our results are qualitatively the same when using level-4 industry classification or without fixed effects.

firms' real economic circumstances, such as sales and the profitability of new investment, are important determinants of their R&D decisions.[17]

4.3 Tests for Endogeneity

A possible confounding issue in our tests is endogeneity (self-selection), because under UK GAAP, firms could choose to capitalize or expense development costs, and some unidentified firm characteristic might relate both to this choice and to how the firm managed earnings. Relatedly, the switch to IFRS revealed that there were two different subgroups of firms that expensed development costs under UK GAAP: firms that met the capitalization conditions and switched vs those that did not meet the conditions (or had only research expenditures) and did not switch. Differences between the firms in these two groups might relate to their R&D cutting behaviour.

We doubt that self-selection is driving our results for three reasons. First, it is difficult to imagine what firm attributes would have changed only for Switchers, and at exactly the same time as the switch to IFRS, causing them to change their earnings management behavior. Second, Table 2, Panel A shows that Switchers and Expensers have similar R&D cutting behaviour under UK GAAP. Third, our main tests compare Switchers before vs after IFRS; since each firm acts as its own control, any differences between Switchers and Expensers are irrelevant. Nevertheless, we conduct additional tests to bolster our causal interpretation of our results, and to ensure that endogeneity is not driving our results.

[17] We also estimated equation (1) on Switchers only; results (untabulated) confirm that Group 2 Switchers reduce their R&D cutting probability more than Group 1 or Group 3 Switchers, consistent with Hypothesis 1 and the univariate results in Table 5.

First, as mentioned above, both Expensers and Switchers reduced R&D expenditures to meet earnings targets under UK GAAP. To be confident that Switchers' change in earnings management behavior is caused by their switch to R&D capitalization, we conduct a placebo test by changing the IFRS adoption year to be either two years before or two years after the actual adoption year. If before, then the PRE and POST periods are both under UK GAAP: Pre includes observations up until 2 years before the IFRS adoption year, and Post includes observations from 2 years before IFRS adoption until the last UK GAAP year. If after, then the PRE and POST periods are both under IFRS: Pre includes observations from the IFRS adoption year up until 2 years after the IFRS adoption year, and Post includes observations beginning 2 years after IFRS adoption year. The results are shown in Table 8. As Table 8 shows, there is no change in how Switchers managed earnings at either time, supporting the causal interpretation of our results.

To test the parallel trend assumption, we add interaction terms between Switcher and indicator variables of each year relative to the event year ("IFRS adoption year") to model (1). The results are shown in Table 9. If our causal interpretation is correct, there should be no significant results for the pre-IFRS period interaction terms. In the interest of brevity, we report the regression results only for interaction terms. The base period is the year before IFRS adoption. All coefficients on the pre-IFRS period interaction terms are insignificant, which means that Switchers do not reduce the probability of R&D expenditure cut more than Expensers before the IFRS adoption.

As an additional placebo test, we focus on SG&A expenditures to rule out the possibility that Switchers reduced their overall real earnings management after IFRS adoption, and this trend may drive our results. SG&A expenditures have been considered an important real earnings management channel (Graham et al. 2005; Gunny 2010) because managers have discretion in determining the amount and timing of SG&A expenditures. Since SG&A expenditures continue

to be expensed as incurred after the IFRS adoption, Switchers should not reduce the probability of SG&A expenditures cuts after IFRS adoption if our main results are induced by the change in R&D accounting. We conduct a similar univariate test by assigning each firm-year observation into three earnings management groups for the three earnings management benchmarks.[18]

Table 10 shows the univariate test results for SG&A. We cannot find any significant decrease in the probability of SG&A expenditures cut for switchers after the IFRS adoption, bolstering the causal interpretation of our main results for R&D. Therefore, Switchers reduce the probability of R&D expenditure cut after the IFRS adoption not because of decrease in overall real earnings management, but because their R&D accounting policy has changed. It is important to note that earnings-change benchmark works well for SG&A management. This result supports our argument that UK R&D tax credit weakens firms' incentives to engage in real earnings management through R&D expenditure cut to meet or beat their previous earnings (see footnote 13).

Overall, our tests in Tables 8 – 10 show that endogeneity is not a problem, and strongly support the causal interpretation of our results.

V. How Do Firms that Capitalize R&D Manage Earnings?

Previously we showed that Switchers reduced cutting R&D expenditures to meet earnings benchmarks under IFRS, but still cut R&D expense. We now investigate the mechanism they use to do this. Capitalizers' R&D expenditure in a given period is a combination of the capitalized plus the expensed (uncapitalized) portions of current expenditures. Thus, firms that capitalize

[18] For example, for the earnings-level benchmark, if pre-tax earnings plus SG&A expenditure is below zero, a firm-year observation is classified as Group 1. If pre-tax earnings plus SG&A expenditure is greater or equal to zero but below the lagged SG&A expenditure, a firm-year observation is classified as Group 2. If pre-tax earnings plus SG&A expenditure is greater or equal to the lagged SG&A expenditure, then a firm-year observation is classified as Group3.

R&D can manage their R&D expense by varying the percentage of current expenditures that they capitalize. If cutting R&D expenditures is more costly than adjusting the percentage of costs capitalized, capitalizers may manage earnings by adjusting this percentage. To examine this, we compare the change in capitalization percentage of Switchers entering into Group 2 vs those exiting from Group 2. We expect that entering Switchers increase their percentage of costs capitalized relative to exiting switchers. This gives us our fourth hypothesis (in null form).[19]

> H4: Switchers entering Group 2 increase the percentage of R&D expenditures that they capitalize relative to Switchers exiting from Group 2.

For each earnings benchmark, Table11, Panel A shows the mean ΔCAP% (change in percentage of current R&D expenditures that are capitalized, from year t-1 to t), for Switchers exiting and entering Group 2, and the significance level for the difference. For both the earnings level and analysts' forecast benchmarks, the mean change in CAP% is significantly greater when they enter Group 2 vs when they exit Group 2. For example, for the earnings level benchmark, the mean change in CA% is 11.2% for firms entering Group 2 but only 1.2% for firms leaving Group 2. This shows that firms increase CAP% when they need to cut R&D expense to beat earnings benchmarks.

Analogously, Panel B shows that a greater percentage of firms increase CAP% when they enter Group 2 than when they exit Group 2. For example, again with the earnings level benchmark, 56.8% of firms entering Group 2 increase their CAP%, but only 39% of firms leaving Group 2. Although the difference is significant only for the analyst benchmark, the results are directionally correct for all three benchmarks. Overall, the results in Table 11 show that a mechanism R&D capitalizers use to manage earnings is to change the percentage of R&D expenditures that are

[19] Capitalizers can also increase the amortization period to reduce R&D expense. Unfortunately, from firms' disclosures, we are unable to accurately determine the amortization period.

capitalized. Since we can't observe the breakdown of the expenditures between research and development, we can't know if the increased capitalization percentage is due to a real shift from R to D, or just a reclassification. But, the underlying reason doesn't matter: as long as a greater percentage of R&D costs are being capitalized, firms can reduce R&D expense without reducing R&D expenditures, to meet earnings benchmarks.

VI. R&D Investment Efficiency

Finally, and most important, we examine the economic consequences of Switchers' change in earnings management behavior. Bushee (1998), Fields, Lys,and Vincent (2001), and Graham, Harvey, and Rajgopal (2005), among others, posit that real earnings management is more costly to the firm than accrual earnings management. Terry (2015) and Terry, Whited, and Zakolyukina's (2022) simulation studies estimate that substituting real for accrual earnings management results in a significant reduction in economic growth and firm value. But, there is no archival evidence documenting the real effects of managing earnings by real R&D cuts. We fill this important gap in the literature.[20]

If real expenditure cuts are more detrimental to the firm than other earnings management tools, then relative to Expensers, Switchers' investment efficiency should improve with their change to capitalization after IFRS adoption, since they would no longer be sacrificing positive investment opportunities to meet earnings benchmarks. Since managers do not make the optimal R&D investment decision when opportunistically managing their real R&D activities, we predict

[20] Gunny (2010) finds an association between R&D cuts to meet benchmarks and subsequent operating performance, but as she acknowledges, this association may reflect declining returns to R&D, rather than causality from real earnings management to future performance.

that R&D investment efficiency of Switchers improves after the IFRS adoption, relative to Expensers.[21]

To measure the R&D investment efficiency, we examine R&D investment sensitivity to the investment opportunities following prior literature (Zhong 2018). As a firm's R&D investment is more sensitive to the firm's investment opportunities, the manager makes more efficient R&D investment decisions. As a proxy for the firm's investment opportunity, we use *Tobin's Q* (Skinner 1993; Zhong 2018). To be specific, we estimate the following diff-in-diff regression model**:**

$$\begin{aligned} R\&Dinvestment_t = {} & \alpha + \beta_0 TOBQ_{t-1}*IFRS*Switcher + \beta_1 TOBQ_{t-1}*IFRS + \beta_2 TOBQ_{t-1}*Switcher \\ & + \beta_3 IFRS*Switcher + \beta_4 TOBQ_{t-} + \beta_5 IFRS + \beta_6 Switcher + Controls \\ & + Controls*Switcher + Industry\ Fixed\ Effects + Year\ Fixed\ Effects + \varepsilon_t \end{aligned} \quad (2)$$

In (2), we control for the level and change in sales, total number of employees, the number of years the firm is listed on Worldscope, the ratio of property, plant and equipment to total employees, the percentage of closely held shares, market-to-book ratio, return on assets, firm leverage, total cash balance, and net equity issues, as these have been shown to be related to investment (Zhong 2018).

$R\&Dinvestment_t$ is measured as R&D expenditure scaled by lagged assets. $TOBQ_{t-1}$ is the Tobin's Q measured at the end year t-1. Tobin's Q captures the investment opportunities of a firm at the beginning of year t, so the coefficient on $TOBQ_{t-1}$ shows how a firm adjusts its R&D expenditure based on the investment opportunities it faces. Our main interest of coefficient is β_0, the coefficient on $TOBQ_{t-1}$*IFRS*Switcher, which captures the change in Switchers' R&D expenditure sensitivity to Tobin's Q from UK GAAP to IFRS, relative to Expensers.

Our fifth hypothesis is (in null form):

[21]Reducing real investment cuts made to manage earnings should also increase a firm's market value, but we cannot do an event study, because we do not know when the information hit the market that the firm would switch to capitalization.

H5: Switchers do not improve their investment efficiency relative to Expensers.

Our (one-sided) alternative hypothesis is that Switchers increase their investment efficiency relative to Expensers.

As a first step, we compare β_0 for our entire sample of Switchers and Expensers. Results are shown in Table 12. Although both Switchers and Expensers expensed all R&D expenditure under the U.K. GAAP, they might have different characteristics that are related to R&D investment efficiency. To mitigate this concern, we implement Propensity Score Matching (PSM) on observable covariates and use the matched samples to conduct all regressions in Table 12. Following prior literature (e.g., Beaver and Ryan, 2000; Dinh, Kang, and Schultze, 2016; Oswald et al., 2022; Tutti, Krishnan, and Percy, 2007), we match on a firm's performance, life cycle, corporate governance, and information environment. Specifically, we match each Switcher to an Expenser with replacement on earnings sign, ROA, R&D intensity, age, leverage, percentage of closely held shares, analyst coverage, and size one year prior to IFRS adoption. Table 12, Panel A shows that the PSM matched samples have virtually identical means of the matched variables, attesting to the efficacy of the matching process.

Results in Table 12 Panel B for the entire sample do not show an improvement in investment sensitivity under IFRS for Switchers relative to Expensers, as β_0 is -.001 with a t-statistic of -0.108. However, for both the Switchers and the Expensers the coefficient on $TOBQ_{t-1}$*IFRS is insignificant, indicating that there is no change in investment sensitivity in the last year of UK GAAP to the first year of IFRS.

Notwithstanding the results in Table 12, Panel B, we expect that the increase in investment sensitivity should only exist for the Group 2 Switchers. Therefore, we dig deeper by focusing on Switchers in Group 2. If the reduction in real R&D cuts improves investment sensitivity, then any

increase should be concentrated in Group 2, where Table 5 showed, the earnings management behavior has changed. Thus, based on Hypothesis 4, we expect β_0 to be positive only for Switchers in Group 2 and insignificant for the other groups of Switchers.

Results, shown in Table 12, Panels C - E, confirm our prediction. For both the earnings level and analyst forecast benchmarks (Panels C and E), only Group 2 has a significant positive β_0 coefficient on $TOBQ_{t-1}$*IFRS*Switcher. For example, for the earnings level benchmark, Group 2's β_0 coefficient (.026, t=1.92), whereas both Group 1 and 3 report insignificant coefficients. This shows that R&D investment of Switchers in Group 2 becomes more sensitive to their investment opportunities relative to Expensers after IFRS adoption, which is consistent with their improvement in R&D investment efficiency being due to the decrease in real earnings management.

Moreover, the coefficients on TOBQ*IFRS*Switcher are reasonable and indicate that the effect is economically important. For example, for a typical Group 2 Switcher in our sample with a Tobin's Q of about 2 (Table 4), the coefficients of .026 and .029 on $TOBQ_{t-1}$*IFRS*Switcher in Table 12, Panels C and E, imply an increased investment of .05 to .06, which seems quite reasonable given the mean of .155 (Table 4).[22]

Overall, the results in Table 12 strongly support an increase in investment efficiency for Switchers in Group 2, This is the first archival evidence on the real costs of real earnings management on investment.[23]

What is the underlying mechanism behind Switchers' efficiency improvement that we document? Badertscher, Shroff, and White (2013), Shroff (2020), and Roychowdhury et al (2019)

[22] The coefficient on IFRS in the first earnings level column is not identified because all Switchers have the same IFRS adoption year, so it is subsumed by the year fixed effect.
[23] Although not about R&D per se, Bens, Nagar, and Wong (2002) find that ESO exercises also impose a real cost of foregone investment due to firms avoiding EPS dilution.

discuss different mechanisms that could lead to such improvement, such as lower cost of capital from increased disclosure and greater transparency, and firms' learning from the new information they generate. While some of these mechanisms might be at play in our case, our story does not rely on them. As Graham et al (2005) discuss, firms are willing to sacrifice value by cutting back on positive NPV investments, such as reducing R&D expenditures, to meet earnings benchmarks. As we show, capitalization mitigates such wasteful behavior. Indeed, all Switchers increased their R&D disclosures, by definition, since capitalization requires the breakdown between capitalized vs expensed costs. But, the fact that the efficiency gains are found only in Group 2, is strong evidence that these Switchers were previously underinvesting, and that it isn't the new information per se that is causing the increased efficiency; rather, it is the change in investment behavior.

To be confident that increase in investment sensitivity for the Switchers in Group 2 shown in Table 12, Panels B – D is caused by their switch to R&D capitalization, we conduct a placebo test by changing the IFRS adoption year to be either two years before or two years after the actual adoption year. The results shown in Table 13 document that all six coefficients on $TOBQ_{t-1}$*IFRS±2*Switcher are insignificant, supporting the causal interpretation of our results.[24]

VII. Conclusion

This paper investigates how capitalization vs expensing of R&D costs affects how firms manages earnings with R&D, how firms that capitalize R&D manage earnings, and the economic consequences of different earnings management methods. We find that when the U.K.'s switch to IFRS made R&D capitalization mandatory (for firms that met the conditions), firms that had

[24] As a final placebo test, we examine the SG&A expenditure sensitivity to Tobin's Q. We do not find any significant improvement for SG&A expenditure efficiency for Switchers in Group 2 after IFRS adoption (untabulated).

previously expensed R&D changed from cutting R&D expenditures to meet benchmarks, to cutting R&D expenses without cutting R&D expenditures. We find evidence that they do this by increasing the percentage of R&D costs that they capitalize. Firms that continued to expense (because they did not meet the capitalization conditions or had only research expenditures) continued to cut R&D expenditures to meet earnings benchmarks. This is the first evidence we are aware of relating accounting methods, capitalization vs expensing, to firms' tendency to use real expenditure cuts to manage earnings.

Most important, we find that the Switchers' investment efficiency increased relative to Expensers, and that this increase is concentrated in Switchers who decreased their tendency to cut R&D expenditures to meet the earnings benchmarks, consistent with the greater real costs of real earnings management. This is the first archival evidence documenting the economic benefits of reducing real investment cuts to manage earnings. Our results suggest that regulations such as SOX, which caused firms to shift from accrual to real earnings management, may have the unintended consequence of reducing economic efficiency.

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Appendix A. Variable descriptions

Variable	Definition
CutRD	1 if firm cuts R&D expenditure in year t relative to year t-1, and 0 otherwise
IFRS	1 if firm follows IFRS standard in year t, and 0 otherwise
PCRD	The log of one-year lagged R&D expenditures divided by lagged sales minus the logarithm of two-year lagged R&D expenditures divided by two-year lagged sales
CIRD	The log of current industry R&D expenditures divided by current sales less the logarithm of lagged industry R&D expenditures divided by lagged industry sales (excluding the firm; industry membership is based on Datastream Level 6 Classification)
CCAPX	The log of capital expenditures in year t minus log of capital expenditures in year t-1
CSALES	The log of sales in year t minus log of sales in year t-1
R&Dinvestment	R&D expenditure scaled by lagged assets
TOBQ	The sum of book value of assets and the difference between market value of equity (measured at fiscal year end of year t) and book value of equity divided by total assets.
Employment	Total number of employees in thousands.
SIZE	The log of market value of equity at the fiscal year end
LEV	Total debt / total assets
FCF	Cash flow from operations minus average capital expenditure over the prior two years all divided by total assets
DIST	Pre-tax pre-R&D earnings divided by lagged R&D expense all minus one for the earnings-level benchmark; The change in pre-tax pre-R&D earnings R&D divided by lagged R&D expense for the earnings-change benchmark; The difference between median analyst forecast and pre-R&D actual earnings divided by lagged R&D expense all minus one for the analyst forecast benchmark.
FINANCE	The sum of a firm's net equity issues (scaled by total assets) over a rolling five-year window ending in the current fiscal year
SALES	Sales in thousands
ASSETS	Assets in thousands
Firm Age	The log of one plus the number of years listed on Worldscope
K/L	Ratio computed as net property, plant and equipment scaled by total number of employees
Close%	Total number of closely held shares as a percentage of the total number of shares outstanding
MTB	Market value of equity divided by book value of equity
ROA	Net income divided by beginning total assets
CASH	Cash and cash equivalents, scaled by average total assets over prior two years

Table 1
Sample Selection

	Firm-Year Obs	Firms
Initial Sample (1998~2014)	9,138	1,231
Remove:		
UK GAAP Only	(1,657)	(471)
IFRS Only	(1,241)	(226)
Outside Twelve-Year Window	(1,213)	0
Missing Lagged R&D expenditure	(123)	0
Mixed R&D Policy	(953)	(96)
Reverse Switcher	(12)	(1)
Missing control variables	(1,192)	(124)
Final Sample	2,747	315
• Type		
Switcher	1,220	134
Normal Switcher	1,146	125
Early Switcher	74	9
Expenser	1,241	141
Capitalizer	286	38
Final Sample for Analyst Forecast Benchmark	1,918	243
• Type		
Switcher	889	110
Normal Switcher	852	104
Early Switcher	37	6
Expenser	865	109
Capitalizer	164	24

The sample consists of up to twelve firm-year observations per firm of UK firms who disclosed either an R&D asset or R&D expense during the period 1998-2014. To obtain our final sample, we remove inappropriate observations and require lagged R&D and other accounting and financial data. Switchers are firms that switched from expensing R&D under UK GAAP to capitalizing R&D under IFRS. Expensers are firms that always expensed R&D under UK GAAP and IFRS. Capitalizers are firms that always capitalized R&D under UK GAAP and IFRS.

Table 2
Sample Description

Panel A: Descriptive Statistics: Switchers vs Expensers

	Full Sample			Under UK GAAP			Under IFRS		
	Switchers	Expensers	Diff.	Switchers	Expensers	Diff.	Switchers	Expensers	Diff.
	Mean	Mean	P-value	Mean	Mean	P-value	Mean	Mean	P-value
Market Value	467	1,738	**<0.001**	408	1,593	**<0.001**	524	1,876	**<0.001**
SALES	439	1,122	**<0.001**	357	1,094	**<0.001**	518	1,149	**<0.001**
ASSETS	536	1,619	**<0.001**	446	1,561	**<0.001**	623	1,675	**<0.001**
Employment	2842	6016	**<0.001**	2,801	6,292	**<0.001**	2,881	5,754	**<0.001**
Firm Age	17.702	19.114	**0.009**	15.164	17.886	**<0.001**	20.135	20.281	0.849
Close %	27.976	25.963	**0.021**	27.767	22.939	**<0.001**	28.176	28.839	0.607
ROA	-0.03	-0.149	**<0.001**	-0.070	-0.144	**0.001**	0.009	-0.154	**<0.001**
TOBQ	2.371	2.788	**<0.001**	2.705	2.773	0.693	2.050	2.803	**<0.001**
FCF	-0.016	-0.151	**<0.001**	-0.064	-0.136	**<0.001**	0.030	-0.166	**<0.001**
K/L	25.65	64.5	**<0.001**	22.519	67.405	**<0.001**	28.650	61.737	**<0.001**
FINANCE	0.519	0.806	**<0.001**	0.639	0.761	**0.051**	0.404	0.849	**<0.001**
CSALES	0.094	0.093	0.935	0.100	0.115	0.635	0.089	0.071	0.543
CCAPX	-0.003	-0.042	0.279	-0.042	-0.010	0.539	0.034	-0.073	**0.036**
CutRD	0.353	0.394	**0.037**	0.399	0.413	0.608	0.310	0.376	**0.014**
RDInvestment	0.110	0.141	**<0.001**	0.111	0.126	0.111	0.109	0.156	**<0.001**

Table 2
Sample Description - Continued

Panel B: Industry Membership

Industry	Switcher	Expenser	Industry	Switcher	Expenser
Aerospace	2	1	Food Products	2	3
Alternative Fuels	0	4	Industrial Machinery	11	9
Auto Parts	1	2	Industrial Suppliers	1	1
Biotechnology	4	14	Internet	2	1
Broadcast & Entertain	0	3	Medical Equipment	8	6
Building Mat.& Fix.	2	3	Medical Supplies	3	3
Bus, Train & Employment	0	1	Mobile Telecom.	0	2
Business Support Service.	5	4	Multi-utilities	0	2
Comm. Vehicles, Trucks	2	0	Oil Equip. & Services	1	3
Computer Hardware	3	1	Personal Products	0	4
Computer Services	13	2	Pharmaceuticals	3	19
Consumer Electronics	1	0	Semiconductors	8	3
Containers & Package	2	2	Software	33	14
Defense	2	0	Specialty Chemicals	2	10
Divers. Industrials	1	2	Specialty Retailers	0	1
Electrical Equipment	6	7	Telecom. Equipment	5	5
Electronic Equipment	8	3	Toys	2	1
Fixed Line Telecom.	0	1	Water	1	4
			Total	**134**	**141**

Table 2 presents the sample description for our final sample. Panel A shows the descriptive statistics of Switchers and Expensers in each accounting regime. Columns (3), (6), and (9) of Panel A report the p-value of t-tests comparing the sample means of these two groups. Panel B shows the Datastream level-6 industry distribution of Switchers and Expensers. See Appendix A for variable definitions.

Table 3
Earnings Management Group by Type

Panel A: Earnings Level Benchmark

	Switcher						**Expenser**					
	Group 1		Group 2		Group 3		Group 1		Group 2		Group 3	
UK GAAP	153	(69)	77	(43)	367	(100)	228	(92)	60	(37)	317	(82)
IFRS	111	(52)	52	(34)	460	(112)	213	(71)	61	(35)	362	(96)

Panel B: Earnings Change Benchmark

	Switcher						Expenser					
	Group 1		Group 2		Group 3		Group 1		Group 2		Group 3	
UK GAAP	113	(77)	111	(72)	373	(124)	159	(85)	105	(59)	341	(128)
IFRS	139	(80)	103	(68)	381	(127)	123	(74)	128	(71)	385	(130)

Panel C: Analyst Forecast Benchmark

	Switcher						Expenser					
	Group 1		Group 2		Group 3		Group 1		Group 2		Group 3	
UK GAAP	76	(51)	113	(62)	209	(87)	109	(62)	104	(56)	215	(86)
IFRS	97	(48)	132	(73)	262	(91)	84	(46)	100	(58)	253	(90)

Table 3 presents the number of firm-year observations and firms (in parentheses) in each group of each type of firms in each accounting regime. In Panel A, based on the earnings level benchmark, firm-year observations are classified into the three groups as following: Group 1 – if the firm reported negative pre-tax pre-R&D earnings in that year t; Group 2 – if the firm reported positive pre-tax pre-R&D earnings in year t, but less than R&D expense in year t-1; Group 3 – if the firm reported positive pre-tax pre-R&D earnings in year t, and greater than R&D expense in year t-1. In Panel B, based on the earnings change benchmark, the three groups are defined as following: Group 1 – if the firm reported negative pre-tax pre-R&D earnings in year t; Group 2 - if the firm reported positive pre-tax pre-R&D earnings in year t, but less than R&D expense in year t-1; Group 3 - if the firm reported positive pre-tax pre- R&D earnings in year t, and greater than R&D expense in year t-1. In Panel C, based on the analyst median forecast benchmark. , the three groups are defined as following: Group 1 - if the firm reported pre-R&D earnings lower than the analyst forecast in year t; Group 2 - if the firm reported pre-R&D earnings in excess of the analyst forecast in year t, but the excess is less than R&D expense in year t-1; Group 3 - if the firm reported pre- R&D earnings in excess of the analyst forecast in year t, and the excess is greater than R&D expense in year t-1.

Table 4
Descriptive Statistics by Earnings Management Group

	Switchers			Expensers	Mean Difference		
	Group 2	Group 1	Group 3	Group 2	Switchers: G2 vs G1	Switchers: G2 vs G3	Switchers vs Expensers: G2
Market Value	258	90	620	178	**0.026**	**0.012**	0.469
SALES	307	111	565	146	**0.039**	0.109	0.234
ASSET	487	116	678	177	**0.018**	0.382	0.177
Employment	2653	886	3495	1359	**0.018**	0.338	0.231
Firm Age	14.496	12.485	19.868	14.620	**0.072**	**<0.001**	0.929
Close %	33.883	33.077	25.426	31.615	0.744	**<0.001**	0.365
ROA	-0.057	-0.413	0.097	-0.164	**<0.001**	**<0.001**	**<0.001**
TOBQ	2.02	3.678	2.008	3.486	**<0.001**	0.940	**<0.001**
FCF	-0.028	-0.285	0.072	-0.138	**<0.001**	**<0.001**	**<0.001**
K/L	15.832	17.209	29.876	16.341	0.579	**0.044**	0.829
FINANCE	0.612	1.334	0.244	0.985	**<0.001**	**<0.001**	**0.002**
CSALES	0.044	0.074	0.109	0.208	0.634	**0.014**	**0.023**
CCAPX	-0.126	-0.166	0.068	-0.217	0.725	**0.004**	0.444
CutRD	0.496	0.489	0.288	0.496	0.889	**<0.001**	0.997
RDInvestment	0.155	0.162	0.086	0.303	.0717	**<0.001**	**<0.001**

Table 4 presents the descriptive statistics for each group of Switchers and Group 2 of Expensers for the whole sample period combined (UK GAAP and IFRS). Columns (1) – (4) report the mean value of the variable and columns (5), (6) and (7) in each panel show the p-value of t-tests that compare sample mean of two groups. All continuous variables are winsorized at the top/bottom 1%. See Appendix A for variable definitions.

Table 5
R&D Expenditure Cut by Earnings Management Group

Panel A: Earnings Level Benchmark

Switcher	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.484	0.610	0.319	**0.093**	**<0.001**
IFRS	0.495	0.327	0.263	**0.062**	0.326
UK GAAP vs IFRS	0.901	**0.002**	**0.089**		

Expenser	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.469	0.533	0.350	0.388	**0.009**
IFRS	0.484	0.459	0.298	0.773	**0.017**
UK GAAP vs IFRS	0.775	0.469	0.162		

Panel B: Earnings Change Benchmark

Switcher	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.442	0.423	0.378	0.789	0.438
IFRS	0.439	0.311	0.262	**0.046**	0.383
UK GAAP vs IFRS	1.000	**0.092**	**0.001**		

Expenser	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.484	0.390	0.387	0.164	1.000
IFRS	0.439	0.406	0.345	0.612	0.243
UK GAAP vs IFRS	0.471	0.893	0.248		

Table 5 - Continued
R&D Expenditure Cut by Earnings Management Group

Panel C: Analyst Forecast Benchmark

Switcher	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.447	0.628	0.196	**0.017**	**<0.001**
IFRS	0.402	0.397	0.176	1.000	**<0.001**
UK GAAP vs IFRS	0.642	**<0.001**	0.633		

Expenser	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.468	0.500	0.307	0.682	**0.001**
IFRS	0.440	0.620	0.237	**0.018**	**<0.001**
UK GAAP vs IFRS	0.770	**0.092**	**0.095**		

This table reports the percentage of firm-year observations in each group which have cut their R&D expenditure in year t relative to year t-1 for Switchers and Expensers. Panel A uses earnings-level benchmark, panel B the earnings-change benchmark, and panel C the analyst median forecast benchmark. Columns labeled G1 vs G2 and G2 vs G3 report the p-value of exact tests that compare the average percentage of two groups, and the row 'UK GAAP vs IFRS' shows the p-value of exact tests that compare the average percentage of a group across the accounting regime.

Table 6
R&D Expense Cut by Earnings Management Group

Panel A: Earnings Level Benchmark

Switcher	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.484	0.610	0.318	**0.093**	**<0.001**
IFRS	0.450	0.558	0.274	0.240	**<0.001**
UK GAAP vs IFRS	0.619	0.587	0.191		

Panel B: Earnings Change Benchmark

Switcher	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.442	0.423	0.378	0.789	0.438
IFRS	0.338	0.456	0.291	**0.083**	**0.002**
UK GAAP vs IFRS	**0.093**	0.680	**0.011**		

Panel C: Analyst Forecast Benchmark

Switcher	Group 1	Group 2	Group 3	G1 vs G2	G2 vs G3
UK GAAP	0.447	0.628	0.196	**0.017**	**<0.001**
IFRS	0.340	0.568	0.153	**0.001**	**<0.001**
UK GAAP vs IFRS	0.161	0.363	0.221		

This table reports the percentage of firm-year observations in each group which have cut their R&D expense in year t relative to year t-1 for Switchers only. Panel A uses earnings-level benchmark, panel B the earnings-change benchmark, and panel C the analyst median forecast benchmark. Columns labeled G1 vs G2 and G2 vs G3 report the p-value of exact tests that compare the average percentage of two groups, and the row 'UK GAAP vs IFRS' shows the p-value of exact tests that compare the average percentage of a group across the accounting regime.

Table 7
Probability of Cutting R&D Expenditures

Panel A: Earnings Level Benchmark

	Group 2	**Group 1**	**Group 3**
SWITCHER	-0.058	-0.070	-0.017
	(-0.498)	(-1.142)	(-0.469)
IFRS	-0.045	**0.147***	-0.044
	(-0.313)	**(1.909)**	(-0.731)
SWITCHER*IFRS	**-0.270****	-0.011	-0.016
	(-2.031)	(-0.127)	(-0.334)
PCRD	0.093	**0.079*****	0.240
	(1.259)	**(2.807)**	(1.168)
CIRD	**-0.994***	0.232	**0.962****
	(-1.713)	(0.617)	**(2.204)**
CCAPEX	-0.038	**-0.058*****	**-0.040****
	(-1.110)	**(-3.377)**	**(-2.146)**
CSALES	**-0.190*****	**-0.061*****	**-0.249*****
	(-2.850)	**(-2.642)**	**(-3.382)**
TOBQ	-0.011	-0.003	-0.007
	(-0.837)	(-0.439)	(-1.041)
SIZE	-0.009	**-0.047*****	**-0.021*****
	(-0.308)	**(-3.275)**	**(-2.724)**
LEV	-0.087	**0.229*****	**0.199****
	(-0.398)	**(2.877)**	**(1.988)**
FCF	**0.456*****	0.025	0.096
	(2.626)	(0.480)	(0.625)
DIST	-0.109	**-0.000*****	-0.000
	(-0.828)	**(-2.920)**	(-1.079)
Constant	0.654***	0.568***	0.464***
	(3.594)	(8.817)	(8.944)
Observations	245	704	1,505
Adjusted R2	0.159	0.106	0.049
Fixed Effects	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.
Clustered SE	Firm	Firm	Firm

Table 7 - Continued
Probability of Cutting R&D Expenditures

Panel B: Earnings Change Benchmark

	Group 2	**Group 1**	**Group 3**
SWITCHER	-0.011	-0.043	0.000
	(-0.143)	(-0.652)	(0.005)
IFRS	0.099	-0.045	0.026
	(1.018)	(-0.369)	(0.472)
SWITCHER*IFRS	-0.090	0.093	-0.070
	(-0.952)	(0.999)	(-1.378)
PCRD	**0.105****	0.056	0.029
	(2.207)	(1.013)	(0.784)
CIRD	0.628	-0.111	-0.296
	(1.476)	(-0.182)	(-0.894)
CCAPEX	**-0.058****	**-0.055****	**-0.061*****
	(-2.029)	**(-2.139)**	**(-3.461)**
CSALES	-0.054	**-0.129*****	**-0.119*****
	(-1.204)	**(-2.608)**	**(-3.832)**
TOBQ	0.008	-0.017	0.004
	(1.146)	(-1.522)	(0.653)
SIZE	**-0.034****	-0.022	**-0.043*****
	(-1.987)	(-1.441)	**(-5.655)**
LEV	0.166	0.195	0.113
	(0.811)	(1.552)	(1.284)
FCF	-0.032	-0.050	**-0.093***
	(-0.320)	(-0.525)	**(-1.799)**
DIST	-0.033	0.000	0.000
	(-0.409)	(0.449)	(0.249)
Constant	0.439***	0.565***	0.534***
	(4.069)	(5.936)	(11.340)
Observations	444	494	1,427
Adjusted R2	0.049	0.023	0.085
Fixed Effects	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.
Clustered SE	Firm	Firm	Firm

Table 7 - Continued
Probability of Cutting R&D Expenditures

Panel C: Analyst Forecast Benchmark

	Group 2	Group 1	Group 3
SWITCHER	**0.169***	-0.033	**-0.109****
	(1.921)	(-0.362)	**(-2.369)**
IFRS	-0.050	-0.064	-0.056
	(-0.409)	(-0.540)	(-0.903)
SWITCHER*IFRS	**-0.398*****	0.091	0.008
	(-3.878)	(0.679)	(0.142)
PCRD	0.016	0.067	0.026
	(0.294)	(1.217)	(0.483)
CIRD	-0.484	-0.482	-0.017
	(-0.792)	(-1.080)	(-0.053)
CCAPEX	**-0.102*****	-0.029	**-0.059*****
	(-3.580)	(-0.905)	**(-2.797)**
CSALES	**-0.121****	**-0.126****	**-0.095****
	(-2.585)	**(-2.155)**	**(-2.145)**
TOBQ	-0.005	**-0.020****	-0.003
	(-0.409)	**(-2.060)**	(-0.338)
SIZE	0.011	**-0.040***	**-0.040*****
	(0.644)	**(-1.963)**	**(-4.211)**
LEV	-0.124	0.169	**0.432*****
	(-0.944)	(1.152)	**(3.558)**
FCF	0.006	-0.026	0.083
	(0.051)	(-0.212)	(0.863)
DIST	**-0.019****	**-0.000***	-0.000
	(-2.308)	**(-1.819)**	(-0.150)
Constant	0.545***	0.674***	0.475***
	(5.073)	(6.453)	(8.231)
Observations	448	333	922
Adjusted R2	0.081	0.054	0.097
Fixed Effects	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.
Clustered SE	Firm	Firm	Firm

Table 7 - Continued
Probability of Cutting R&D Expenditures

This table reports the coefficients and (t-statistics) from estimating the following model: $CutRD_t = \alpha + \beta_0 SWITCHER + \beta_1 IFRS + \beta_2 SWITCHER*IFRS + \beta_3 PCRD_t + \beta_4 CIRD_t + \beta_5 CCAPEX_t + \beta_6 CSALES + \beta_7 TOBQ_t + \beta_8 SIZE_t + \beta_9 LEV_t + \beta_{10} FCF_t + \beta_{11} DIST_t$ + Industry Fixed Effects + Year Fixed Effects + ε_t

Group membership is based on either the earnings-level benchmark (Panel A), the earnings-change benchmark (Panel B) or the analyst forecast benchmark (Panel C).

All continuous variables are winsorized at the top/bottom 1%.

See Appendix A for variable definitions.

*, ** and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 8
Placebo Test for R&D Expenditure Cut by Earnings Management Group

Panel A: Earnings Level Benchmark

	Group 1	Group 2	Group 3
Pre IFRS -2	0.516	0.487	0.302
Post IFRS -2	0.431	0.737	0.342
Pre vs Post	0.524	1.000	0.600
Pre IFRS +2	0.407	0.308	0.240
Post IFRS +2	0.579	0.346	0.277
Pre vs Post	0.136	0.124	0.686

Panel B: Earnings Change Benchmark

	Group 1	Group 2	Group 3
Pre IFRS -2	0.420	0.424	0.354
Post IFRS -2	0.500	0.423	0.409
Pre vs Post	0.685	0.343	0.222
Pre IFRS +2	0.422	0.375	0.224
Post IFRS +2	0.447	0.270	0.294
Pre vs Post	0.896	**0.062**	0.385

Panel C: Analyst Forecast Benchmark

	Group 1	Group 2	Group 3
Pre IFRS -2	0.449	0.562	0.140
Post IFRS -2	0.444	0.750	0.248
Pre vs Post	0.733	0.264	0.245
Pre IFRS +2	0.381	0.319	0.121
Post IFRS +2	0.418	0.476	0.205
Pre vs Post	1.000	0.663	0.459

Table 8 - Continued
Placebo Test for R&D Expenditure Cut by Earnings Management Group

This table reports the results of a placebo test which changes the IFRS adoption year to be either two years before, or after the actual IFRS adoption year. The Pre (Post) IFRS -2 shows the results using observations all within UK GAAP, where the Pre includes observations up until 2 years before the IFRS adoption year, and the Post includes observations from 2 years before IFRS adoption until the last UK GAAP year. The Pre (Post) IFRS +2 shows the results using observations all within IFRS, where the Pre includes observations from the IFRS adoption year up until 2 years after the IFRS adoption year, and the Post includes observations beginning 2 years after IFRS adoption year.

Each panel reports the percentage of firm-year observations in each group which have cut their R&D expense in year t relative to year t-1 for Switchers only. Panel A uses earnings-level benchmark, panel B the earnings-change benchmark, and panel C the analyst median forecast benchmark. Rows labeled 'Pre vs Post' show the p-value of exact tests that compare the average percentage of a group across the two placebo years.

Table 9
Testing for Parallel Trends

	Earnings Level	Earnings Change	Analyst Forecast
SWITCHER * IFRS Year - 6	-0.095	0.057	0.164
	(-0.260)	(0.183)	(0.609)
SWITCHER * IFRS Year - 5	-0.027	0.120	**0.404****
	(-0.107)	(0.622)	**(2.141)**
SWITCHER * IFRS Year - 4	-0.098	-0.153	-0.114
	(-0.482)	(-0.990)	(-0.614)
SWITCHER* IFRS Year - 3	0.058	0.090	0.010
	(0.249)	(0.573)	(0.056)
SWITCHER * IFRS Year - 2	0.035	0.093	0.187
	(0.244)	(0.676)	(1.205)
SWITCHER * IFRS Year	**-0.356****	-0.073	**-0.479*****
	(-2.255)	(-0.495)	**(-3.222)**
SWITCHER * IFRS Year +1	-0.133	0.208	**-0.379****
	(-0.618)	(1.154)	**(-2.351)**
SWITCHER* IFRS Year +2	-0.254	0.124	-0.114
	(-1.385)	(0.738)	(-0.577)
SWITCHER * IFRS Year +3	-0.170	-0.065	-0.203
	(-0.745)	(-0.382)	(-1.054)
SWITCHER * IFRS Year +4	-0.432	-0.141	-0.024
	(-1.338)	(-0.771)	(-0.113)
SWITCHER * IFRS Year +5	**-0.522***	**-0.277***	-0.285
	(-1.783)	**(-1.678)**	(-1.182)
SWITCHER	-0.052	-0.048	0.057
	(-0.366)	(-0.400)	(0.371)
Observations	245	444	448
Adjusted R-squared	0.132	0.052	0.108
Control Variables	Yes	Yes	Yes
Fixed Effects	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.
Clustered SE	Firm	Firm	Firm

Table 9 - Continued
Testing for Parallel Trends

This table reports the coefficients and (t-statistics) from estimating the following model: $CutRD_t = \alpha + \beta_0 SWITCHER + \beta_1 SWITCHER*IFRS\ Year\ -6 + \beta_2 SWITCHER*IFRS\ Year\ -5 + \beta_3 SWITCHER*IFRS\ Year\ -5 + \beta_4 SWITCHER*IFRS\ Year\ -3 + \beta_5 SWITCHER*IFRS\ Year\ -2 + \beta_6 SWITCHER*IFRS\ Year + \beta_7 SWITCHER*IFRS\ Year\ +1 + \beta_8 SWITCHER*IFRS\ Year\ +2 + \beta_9 SWITCHER*IFRS\ Year\ +3 + \beta_{10} SWITCHER*IFRS\ Year\ +4 + \beta_{11} SWITCHER*IFRS\ Year\ +5 + Industry\ Fixed\ Effects + Year\ Fixed\ Effects + \varepsilon_t$

The model is estimated only for Group 2 Switchers. Group 2 membership is determined using either the earnings level benchmark (column 2), earnings change benchmark (column 3) or the analyst forecast benchmark (column 4).

All continuous variables are winsorized at the top/bottom 1%.

See Appendix A for variable definitions.

*, ** and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 10
SG&A Expenditure Cut by Earnings Management Group

Panel A: Earnings Level Benchmark

Switcher	Group 1	Group2	Group3
UK GAAP	0.440	0.584	0.199
IFRS	0.533	0.571	0.245
UK GAAP vs IFRS	0.745	0.900	0.206

Expenser	Group 1	Group2	Group3
UK GAAP	0.444	0.510	0.215
IFRS	0.708	0.503	0.211
UK GAAP vs IFRS	**0.009**	0.919	0.916

Panel B: Earnings Change Benchmark

Switcher	Group 1	Group2	Group3
UK GAAP	0.444	0.531	0.259
IFRS	0.333	0.607	0.199
UK GAAP vs IFRS	0.692	0.225	**0.084**

Expenser	Group 1	Group2	Group3
UK GAAP	0.412	0.546	0.246
IFRS	0.500	0.568	0.245
UK GAAP vs IFRS	0.725	0.747	1.000

Table 10 - Continued
SG&A Expenditure Cut by Earnings Management Group

Panel C: Analyst Forecast Benchmark

Switcher	**Group 1**	**Group2**	**Group3**
UK GAAP	0.222	0.655	0.114
IFRS	0.619	0.685	0.070
UK GAAP vs IFRS	0.109	0.682	0.122
Expenser	**Group 1**	**Group2**	**Group3**
UK GAAP	0.333	0.643	0.116
IFRS	0.606	0.759	0.089
UK GAAP vs IFRS	**0.048**	**0.067**	0.417

This table reports the percentage of firm-year observations in each group which have cut their SG&A expenditure in year t relative to year t-1 for Switchers and Expensers. Panel A uses earnings-level benchmark, panel B the earnings-change benchmark, and panel C the analyst median forecast benchmark. Rows labeled 'UK GAAP vs IFRS' show the p-value of exact tests that compare the average percentage of a group across the accounting regime.

Table 11
R&D Capitalization Percentage For Firms Entering / Leaving Group 2

Panel A: Change in Capitalization Percentage

	From Group 2	To Group 2	From vs To
Earnings Level	0.012	0.112	**0.022**
Earnings Change	0.040	0.075	0.229
Analyst Forecast	0.019	0.075	**0.055**

Panel B: Increase in Capitalization Percentage

	From Group 2	To Group 2	From vs To
Earnings Level	0.390	0.568	0.173
Earnings Change	0.468	0.592	0.146
Analyst Forecast	0.435	0.734	**<0.001**

Panel A (Panel B) reports the mean change (increase) in the capitalization percentage of current R&D expenditures that are capitalized from year t-1 to t for Switchers that left from Group 2 or entered to Group 2. The Column labeled From vs To reports the p-value of exact tests that compare the average percentage of two groups.

Table 12
R&D Sensitivity to Tobin's Q

Panel A: Descriptive Statistics of the Matching Covariates

	Switcher	**Expenser**	**Mean Difference**
SIZE	4.025	4.161	0.551
LEV	0.149	0.147	0.957
ROA	-0.096	-0.104	0.894
Firm Age	2.428	2.620	**0.078**
R&D Intensity	0.124	0.135	0.670
Analyst Coverage	0.771	0.707	0.477
Close%	29.831	30.243	0.889
EARN_SIGN	0.675	0.648	0.653

Panel B: Full Sample

$TOBQ_{t-1}$*IFRS*Switcher	-0.001
	(-0.108)
$TOBQ_{t-1}$*IFRS	-0.002
	(-0.343)
$TOBQ_{t-1}$*Switcher	-0.008
	(-1.368)
IFRS * Switcher	**0.024*** **
	(5.716)
$TOBQ_{t-1}$	-0.001
	(-0.108)
Observations	1,792
Adjusted R-squared	0.657
Control Variables	Yes
Fixed Effects	Ind. & Yr.
Clustered SE	Firm

Table 12 - Continued
R&D Sensitivity to Tobin's Q

Panel C: Earnings Level Benchmark

	Group 2	Group 1	Group 3
$TOBQ_{t-1}$*IFRS*Switcher	**0.026***	0.000	-0.007
	(1.923)	(0.013)	(-0.685)
$TOBQ_{t-1}$*IFRS	**-0.018****	-0.006	0.006
	(-2.041)	(-0.999)	(0.720)
$TOBQ_{t-1}$*Switcher	0.015	0.001	**-0.018*****
	(1.072)	(0.058)	**(-3.369)**
IFRS*Switcher	-0.014	0.032	-0.000
	(-0.261)	(0.731)	(-0.005)
$TOBQ_{t-1}$	**0.018****	**0.017****	**0.031*****
	(2.285)	**(2.069)**	**(9.997)**
Observations	194	353	1,239
Adjusted R-squared	0.709	0.683	0.680
Control Variables	Yes	Yes	Yes
Fixed Effects	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.
Clustered SE	Firm	Firm	Firm

Panel D: Earnings Change Benchmark

	Group 2	Group 1	Group 3
$TOBQ_{t-1}$*IFRS*Switcher	0.015	-0.007	0.005
	(1.038)	(-0.758)	(0.684)
$TOBQ_{t-1}$*IFRS	-0.016	0.009	-0.005
	(-0.980)	(1.372)	(-1.024)
$TOBQ_{t-1}$*Switcher	**-0.037*****	-0.001	-0.006
	(-4.039)	(-0.089)	(-0.932)
IFRS*Switcher	-0.018	**0.053***	-0.008
	(-0.500)	**(1.726)**	(-0.464)
$TOBQ_{t-1}$	**0.026*****	0.010	**0.026*****
	(4.003)	(1.261)	**(6.203)**
Observations	307	343	1,133
Adjusted R-squared	0.714	0.658	0.663
Control Variables	Yes	Yes	Yes
Fixed Effects	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.
Clustered SE	Firm	Firm	Firm

Panel E: Analyst Forecast Benchmark

	Group 2	Group 1	Group 3
$TOBQ_{t-1}$*IFRS*Switcher	**0.029****	**-0.109*****	-0.013
	(2.310)	**(-2.864)**	(-1.165)
$TOBQ_{t-1}$*IFRS	**-0.018***	**0.096****	**0.016****
	(-1.963)	**(2.553)**	**(2.008)**
$TOBQ_{t-1}$*Switcher	**0.021*****	0.043	0.003
	(3.403)	(1.011)	(0.379)
IFRS * Switcher	-0.035	**0.218****	0.035
	(-0.948)	**(2.314)**	(1.433)
$TOBQ_{t-1}$	-0.000	-0.030	0.011
	(-0.053)	(-0.733)	(1.287)
Observations	227	148	528
Adjusted R-squared	0.794	0.744	0.731
Control Variables	Yes	Yes	Yes
Fixed Effects	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.
Clustered SE	Firm	Firm	Firm

Panel A presents descriptive statistics on means of the matching covariates of Switchers vs Expensers after the propensity score matching.

Panels B - E report the coefficients and (t-statistics) from estimating the following model:

$R\&Dinvestment_t = \alpha + \beta_0 TOBQ_{t-1}*IFRS*Switcher + \beta_1 TOBQ_{t-1}*IFRS + \beta_2 TOBQ_{t-1}*Switcher + \beta_3 IFRS*Switcher + \beta_4 TOBQ_{t-} + \beta_5 IFRS + \beta_6 Switcher + Controls + Controls*Switcher + Industry\ Fixed\ Effects + Year\ Fixed\ Effects + \varepsilon_t$

Panel B reports the results for the full matched sample of Switchers and Expensers. Panels C – E estimate the model for Switchers based on their profitability group membership and corresponding matched Expensers: earnings-level benchmark (Panel C), earnings-change benchmark (Panel D) or analyst forecast benchmark Panel E).

All continuous variables are winsorized at the top/bottom 1%.

See Appendix A for variable definitions.

*, ** and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 13
Placebo Test for R&D Sensitivity to Tobin's Q

	Earnings Level		**Earnings Change**		**Analyst Forecast**	
$TOBQ_{t-1}$	0.014	**0.018****	**0.031***	**0.020*****	-0.009	-0.013
	(1.387)	**(2.282)**	**(1.865)**	**(2.768)**	(-0.877)	(-1.472)
$TOBQ_{t-1}$*IFRS – 2*Switcher	0.002		0.016		0.019	
	(0.147)		(0.925)		(1.358)	
$TOBQ_{t-1}$*IFRS + 2*Switcher		-0.018		0.007		0.005
		(-0.338)		(0.260)		(0.351)
Observations	194	194	307	307	240	240
Adjusted R-squared	0.704	0.709	0.707	0.706	0.710	0.705
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.	Ind. & Yr.
Clustered SE	Firm	Firm	Firm	Firm	Firm	Firm

This table reports the placebo test for Group 2 Switchers and Expensers where the IFRS adoption year is moved either two years before, or two years after the actual IFRS adoption date. The table reports the coefficients and (t-statistics) from estimating the following model:

$R\&Dinvestment_t = \alpha + \beta_0 TOBQ_{t-1}*IFRS*Switcher + \beta_1 TOBQ_{t-1}*IFRS + \beta_2 TOBQ_{t-1}*Switcher + \beta_3 IFRS*Switcher + \beta_4 TOBQ_{t-} + \beta_5 IFRS + \beta_6 Switcher + Controls + Controls*Switcher + Industry\ Fixed\ Effects + Year\ Fixed\ Effects + \varepsilon_t$

All continuous variables are winsorized at the top/bottom 1%.

See Appendix A for variable definitions.

*, ** and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.