Capitalization vs Expensing and the Behavior of R&D Expenditures

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Abstract

We examine the effect of capitalization vs expensing on UK firms' R&D expenditures. Our investigation is motivated by the UK's mandatory switch from UK GAAP to IFRS in 2005. Under UK GAAP, firms could elect to expense or capitalize development expenditures, but IFRS mandates capitalization. Thus, "capitalizers" maintained their accounting method, while "switchers" were required to change from expensing to capitalization. Using a difference-in-difference design, we examine the effect of the rule change on the amount of the two groups' R&D expenditures. Consistent with arguments that expensing's deleterious effect on income causes firms to reduce their R&D outlays, we find that switching firms increased their R&D expenditures more than firms that continued to capitalize. We subject our results to numerous robustness tests, using propensity score matched samples, comparing early vs late switchers, switchers with high vs low R&D expenditure growth, examining R&D behavior in the last year before IFRS adoption, and a placebo test in which we alter the switch date. Across all of these tests, our results support the conclusion that the accounting method affects the amount that firms invest in R&D. Our results attest to the real effects of accounting policy on firms' R&D investments.

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1. Introduction

In this paper, we examine the effect of capitalization vs expensing on the amount of UK firms' R&D expenditures. We focus on the years immediately before and after the UK switched from UK GAAP to IFRS in 2005.[1] Under UK GAAP, firms had the option to capitalize or expense development expenditures; under IFRS, development expenditures must be capitalized. Thus, firms that had capitalized development expenditures under UK GAAP continued to do so, while firms that had expensed them were required to switch to capitalization. We refer to these two groups as "capitalizers" and "switchers", respectively. The accounting change, therefore, was a "natural experiment", an exogenous event that affected some firms but not others. Based on this event, we conduct a difference-in-difference (diff-in-diff) analysis comparing the amount of capitalizers' vs switchers' R&D expenditures in the years immediately before vs after the UK switched to IFRS, 2005. By comparing how the R&D expenditures of the two groups changed at exactly the same time, we can control for any economy-wide effects common to all firms. Thus, regardless of why firms initially choose to capitalize vs expense R&D, if the accounting method affects expenditures, the exogenous change should reveal this.

Our research is important, because understanding the real effects of accounting policies is a fundamental issue for both academics and policymakers. While researchers have examined the economic consequences of various accounting policies[2], there is no reliable evidence for R&D. The accounting policy issue is especially important for R&D, because of concerns that the accounting method may affect the amount of firms' R&D investments, and thereby affect

[1] IFRS required large (small) firms to adopt in 2005/2006 (2007/2008); the specific year of adoption for each group was dependent on when their fiscal year began. For brevity, we refer to the adoption year as 2005. We provide the detailed discussion of our data and sample (Section 4) and empirical tests (Section 6).

[2] See, for example, Amir et al (2010, Bens and Monahan (2008), Chuk (2013), and Collins et al (1981)

innovation and economic growth. Because of its importance, there has been a large debate about accounting for R&D in the U.S. Moreover, R&D accounting is one of the main differences between US GAAP and IFRS, and it is important for U.S. regulators to see the effects of R&D capitalization in a major capital market. Thus, we provide empirical evidence on this important issue.

Researchers have been interested in the effects of capitalization vs expensing of R&D since at least the 1970's, when the FASB issued SFAS No. 2, requiring U.S. companies to expense R&D expenditures.[3] Indeed, seven articles in the 1980 *Journal of Accounting Research Supplement* concerned the effect of SFAS No. 2 on firms' R&D expenditures and equity values. These researchers' goal was the same as ours: to examine the impact of the accounting rule change on firms' R&D behavior. However, their work was plagued by inconsistent and inadequate disclosures, often requiring hand collection, leading to small samples and resultant inconclusive results. For example, prior to SFAS 2 Dukes, Dyckman, and Elliott (1980) point out that there was no uniform definition of R&D expenditures that firms used, and Elliott et al. (1984) point out that capitalizers often reported R&D amortization expense without reporting R&D expenditures, both of which make comparisons across firms difficult. Horowitz and Kolodny's (1980) sample contained only 43 firms, while Dukes, Dyckman, and Elliott (1980) used a matched sample of only 24 expensers and 23 capitalizers. Exacerbating the bad data and small sample problems were confounding economic events such as the energy crisis and recession around the time of SFAS 2. Because of these problems, this research produced inconsistent and unreliable results. The UK's switch to IFRS provides an opportunity to reexamine these important questions on a large sample in an important, major capital market,

[3] *Statement of Financial Accounting Standard No. 2: Accounting for Research and Development Costs*, 1974. The one exception is SFAS No. 86, which allows capitalization of software development costs.

that has been the subject of significant recent research (for example, Ball and Shivakumar, 2005, 2008, Gerakos, Lang and Maffett, 2013). Thus, our results may be generalizable to other countries.

Why might capitalization vs expensing affect firms' R&D expenditures? As long as a firm's R&D expenditures are growing, expensing results in greater R&D expense than capitalization, so growing firms that expense their R&D might reduce their R&D expenditures to raise their net income, which may adversely affect innovation in the economy. For example, Dukes, Dyckman and Elliot (1980) point out that managers of R&D capitalizing firms told the FASB that they would reduce R&D expenditures if FAS2 required expensing. Horowitz and Kolodny (1980) also found that firms believe that SFAS 2 might affect R&D expenditures. Consistent with these views, Stein's (1989) model of managerial myopia assumes that managers pass up profitable investments to raise current earnings, and managers responding to Graham et al's (2005) survey acknowledged that they would forego positive NPV projects to boost net income. Thus, according to these arguments, expensing should result in lower R&D expenditures than capitalization. We provide evidence on the mechanism through which capitalization affects R&D expenditures by sorting companies on their R&D growth and the magnitude of the income effect. We find that companies with greater R&D growth or a greater income effect have a greater expenditure increase around the time of the switch.

Contrary to this point of view, Zimmerman (2013) argues that accounting policies have negligible real effects. Thus, whether capitalization or expensing affects the amount of firms' R&D expenditures is an important, unanswered question that we address.

As a first step, we investigate firms' choices to capitalize vs expense under UK GAAP. Our Logit analysis shows that smaller, growing, less profitable, more highly leveraged firms, and

those firms not in steady-state with respect to their R&D programs – those benefitting most from capitalization's effect on income - were most likely to capitalize. Next, we compare the two groups R&D expenditures before vs after the switch. Again consistent with the income-based arguments discussed above, we find that switching firms increased their R&D expenditures more than firms that continued to capitalize. In supplemental tests, we find that switchers with high R&D growth or high R&D expenditures increased their R&D expenditures more than switchers with low growth or low expenditures, indicating that capitalization's effect works through R&D's effect on income, as its proponents have claimed. In addition, some firms were allowed to defer the switch to capitalization; we find that in the period when only the "early" switchers had switched, they increased their R&D expenditures more than "late" switchers (firms that continued to expense). We also conduct a placebo (falsification) test, by designating the switch date to be either entirely within the UK GAAP period or entirely within the IFRS period, thereby comparing switchers vs capitalizers when no firms had yet switched, or when they had already switched. In both of these tests, we find no difference between the two groups.

The crucial assumption of our identification strategy is that the trends in R&D expenditures of expensers and capitalizers would have been the same in the absence of IFRS (the parallel trends assumption); however, our Logit analysis showed that capitalizers and expensers had different characteristics, potentially invalidating our difference-in-difference analysis. To address this issue, we first validate the parallel trends assumption by calculating the counterfactual treatment effect (Christensen et al, 2016), in the pre-IFRS period, and we find no significant differences in R&D behavior between the two groups. Second, we use propensity score matching, matching the two groups on industry, size and R&D. The results with propensity score matching strongly support our main analysis, indicating that firms switching from expensing to

capitalization increased their R&D expenditures more than firms that continued to capitalize.Thus, both of these tests support the conclusion that the accounting method affects the amount that firms invest in R&D.

We contribute to the accounting literature by addressing an important, unresolved issue that has interested researchers for decades. Our results attest to the real effects of accounting policy on firms' R&D investments, and thus to the importance of accounting methods in this crucial context. Our research fits Kinney's (1986, pg. 339) definition of having practical relevance: "Does how we as a firm or as a society account for things make a difference?" Our answer for R&D accounting is "yes, it does".

The rest of the paper is organized as follows. Section 2 reviews the literature on the effect of capitalization vs expensing on firms' R&D expenditures. Section 3 discusses our hypotheses and tests. Section 4 describes our data and sample. Section 5 analyzes firms' capitalize vs expense decisions under UK GAAP. Section 6 reports our test results. Section 7 concludes.

2. Literature Review

In the 1970's and 1980's, there was much interest among researchers about the effect of capitalization vs expensing on firms' R&D expenditures and firm valuation, due to the passage on SFAS 2 in 1974, which mandated expensing of virtually all R&D expenditures in the U.S. As pointed out above, much of the 1980 *Journal of Accounting Research Supplement* was devoted to studies of the effect of SFAS No. 2. In recent decades, because all U.S. firms must expense, and thus there is no variation to study that affects outcomes, interest in R&D accounting declined

and has switched primarily to comparing the valuation relevance of actual R&D expenses (expenditures) to estimates of what they would be under capitalization.[4]

Dukes, Dyckman, and Elliott (1980) examine the impact of SFAS 2 on firms' R&D expenditures. Their concern is that forcing firms to switch to expensing R&D would lower their net income. Since compensation contracts and covenants are based on reported income, firms may respond to the rule change by decreasing their R&D outlays, which could affect economic innovation and productivity. They compare the change in R&D/sales for 24 firms switching from capitalization to expensing with a matched (by industry and sales) sample of firms that always expensed, from before to after SFAS 2. Thus, they effectively used a difference-in-difference analysis like ours. All the firms in both groups had material R&D expenditures, defined as R&D/sales > 1%. In this test, as well as in additional tests, they find no significant differences between the two groups, leading them to conclude that SFAS 2 did not have a significant effect on firms' R&D expenditures.

Ball (1980) criticizes Dukes, Dyckman, and Elliott's design for presuming that sales is the primary driver of R&D (as embodied by their use of R&D/sales), rather than incorporating a more complex model of firms' R&D expenditures, and thus he is not surprised by their insignificant results. For example, he asks whether the R&D expenditures of the sample and control firms were growing, steady, or declining at the time of SFAS 2, since trend would presumably be an important determinant of their post SFAS 2 expenditures. However, trend could be controlled by matching on recent growth, and the researchers could test the robustness

[4] See for example, Sougiannis (1994), Lev and Sougiannis (1996), Chambers, Jennings, and Thompson (1998), and Healy, Myers, and Howe (2002). Relatedly, Kothari, Laguerre, and Leone (2002) study the uncertainty of future benefits to R&D expenditures. An exception to these U.S. studies is Oswald (2008) who examined the value relevance of R&D data for UK expensers and capitalizers under UK GAAP.

of their results by using different R&D metrics. Most important, whatever drives firms' R&D expenditures, as long as it is similar between the experimental and control firms, the diff-in-diff design should account for any market-wide factors that affect both groups, effectively isolating the effect of the accounting change (if any).

Motivated by the same goal as Dukes, Dyckman, and Elliott (1980), Horowitz and Kolodny (1980) find different results, i.e., SFAS 2 had significant effects on firms' R&D expenditures. The likely reason is the difference in samples. Pointing out that most large firms were already expensing by the time of SFAS 2, Horowitz and Kolodny (1980) focus on a treatment sample of 43 small (OTC) firms that switched to expensing and a matched (by industry, sales, prior growth of R&D, and prior R&D/sales) sample of 43 firms that expensed before SAFS2. They conducted a diff-in-diff analysis on various R&D metrics, such as the percentage change in R&D expenditures and R&D/sales. Overall, they find a significant decline in the R&D expenditures of the treatment firms relative to the control firms. However, when they also compare the variability of both groups' R&D expenditures, they cannot reject the null hypothesis of no relative change.

Similar to Ball, Wolfson (1980) also considers the effect of SFAS 2 to be more complex than what is captured by Horowitz and Kolodny's research design, and so he is surprised by the authors' significant findings. For example, he argues that the R&D expenditures of the non-affected firms (i.e., those that always expensed) would also be changed (as a response to the affected firms in general equilibrium), so comparing the two groups may show no differences. Thus, like Ball, he also advocates a more complex model of R&D expenditures. However, whatever the true model, as long as the firms are well matched to begin with (or the factors affecting R&D, such as sales, are controlled for), the diff-in-diff design allows the researchers to

isolate the effect of the accounting change. More problematic, therefore, are Wolfson's claims that the matching is not proper, since the treatment and control firms had different pre-SFAS 2 changes in R&D/sales from 1972 to 1973, and that over 25% pre-SFAS 2 capitalizers and expensers are misclassified, either of which would compromise the test results.[5]

Elliott et al (1984) attempt to reconcile the conflicting results in Dukes, Dyckman, and Elliott (1980) vs Horowitz and Kolodny (1980), by focusing on size and listing differences between the firms in the two studies. Their results support the size effect found by Horowitz and Kolodny, as smaller firms showed significant reductions around the time of SFAS 2. However, economic differences between the two groups might be responsible for the observed effects. For example, capitalizers had lower profitability in the years preceding SFAS 2, which was issued during a recession, so the accounting change may have exacerbated their problems. In the end, they conclude that while there is an association between SFAS 2 and declines in R&D expenditures for capitalizers, evidence of a decline for some capitalizers prior to SFAS 2, and the fact that some firms voluntarily switched to expensing before the mandatory date, suggest that association might not mean causation.

The above studies focused on R&D expenditures. Wasley and Linsmeier (1992) conduct an event study to examine security price effects surrounding SFAS 2, under the maintained hypothesis that if SFAS 2 affected market expectations about firms' R&D, there should be a cross-sectional association between firms' stock returns around the announcement of the accounting change and their subsequent declines in R&D expenditures. The importance of such a study is that it can pinpoint the stock market's reaction to exactly the time it learned about the

[5] Horowitz and Kolodny (1981) report survey results supporting firms' concerns about SFAS 2. Like Ball (1980) and Wolfson (1980), Marshall (1980) is also concerned that both Dukes, Dyckman, and Elliott (1980) and Horowitz and Kolodny (1980) ignore the underlying processes driving firms' R&D expenditures.

accounting change, thus mitigating the possibility that other factors drive the results. Finding such an association, they conclude that SFAS did have an impact on firms' R&D outlays, but only for OTC firms, not listed firms.

Overall, given the small samples and other methodological problems, previous research on the effect of R&D reporting on R&D behavior reached inconsistent and inconclusive results. The UK's switch to IFRS, requiring the capitalization of development costs, provides the opportunity to revisit these important questions, in a major capital market, such that the results may be generalizable.

3. Hypotheses and Tests

To examine the effect of the UK's switch to IFRS on the amount of firms' R&D expenditures, we estimate the following model:

$$\text{R\&D Growth} = b_0 + b_1\text{*POST} + b_2\text{*SWITCH} + b_3\text{*SWITCH*POST} + \text{Controls} + e \qquad (1)$$

Where: R&D Growth is a measure of R&D expenditure (see below for a discussion as to how we measure the dependent variable). POST is a dummy variable that equals 1 in the IFRS period (2005 and beyond) and 0 in the UK GAAP period (pre 2005); SWITCH is a dummy variable that equals 1 for switchers, firms that switched from expensing to capitalization, and 0 for capitalizers (firms that always capitalized, i.e., did not switch). Controls are the control variables (size and firm and year fixed effects, which we discuss below).

We estimate (1) on firm-year observations for the 3 years before IFRS, 2002-2004 and the 3 years under IFRS, 2005-2007. We include firm and year fixed effects, and the standard errors are clustered by firm and year. We also include the natural log of market capitalization (MVE) to

control for size differences between switchers and capitalizers. To control for industry effects, we industry adjust all dependent variables.[6]

Our primary coefficient of interest is b_3, the difference-in-difference effect. If b_3 is non-zero, then capitalization vs expensing has an effect on firms' R&D expenditures, since the exogenous change from UK GAAP to IFRS affected capitalizers differently than it affected expensers.

If capitalization, by delaying expense recognition, causes firms to increase their R&D expenditures, then switchers should have a greater increase (or a smaller decrease) in R&D expenditures than capitalizers, so b_3 should be positive, when the dependent variable is a measure of R&D expenditures. If as Zimmerman (2013) argues, accounting policies have negligible real effects, then b_3 should be zero. Thus, we state our hypothesis in null form.

H1: The accounting method, capitalization vs expensing, has no effect on the amount of firms' R&D expenditures; i.e., $b_3 = 0$.

We test the null against the alternative $b_3 \neq 0$.

4. 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.[7] However, with the adoption of IFRS in 2005, capitalization of development

[6] In the regressions with firm fixed effects, we did not also include SWITCH, since it is a time invariant firm characteristic absorbed by the firm fixed effects. We have also run all of our tests with raw variables (i.e., not industry adjusted) with standard errors clustered by industry, with very similar results.

[7] Capitalization is permitted if five conditions are met: (1) There is a clearly defined project; (2) The related expenditure is separately identifiable; (3) The outcome of the project is examined for its technical feasibility and its ultimate commercial viability considered in light of factors such as likely market conditions (including competing products), public opinion, and consumer and environmental legislation; (4) The aggregate of deferred development costs, any further development costs, and related production, selling and administrative costs is reasonably expected to be exceeded by related future sales or other revenues; and (5) Adequate resources exist, or are reasonably expected to be available, to enable the project to be completed and to provide any consequential increases in working capital [Statement of Standard Accounting Practice (SSAP) No. 13, 1989]. Any expenditures on research

expenditures became mandatory when the firm could demonstrate the following conditions: (1) The technical feasibility of completing the intangible asset so that it will be available for the use or sale; (2) its intention to complete the intangible asset and use or sell it; (3) its ability to use or sell the intangible asset; (4) how the intangible asset will generate probable future economic benefits; (5) the availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset; and (6) its ability to measure reliably the expenditure attributable to the intangible asset during its development [International Accounting Standard (IAS) 38, 2010]. 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 with those firms who capitalized their R&D under UK GAAP.[8]

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 = 2002 - 2011. We begin in 2002 since 2005 was the first year of IFRS adoption and we use a maximum of three years of data under UK GAAP. We finish in 2011 since 2009 is the last year of IFRS adoption in our R&D firms and we require a maximum of three years of data under IFRS. We focus on the three year window around IFRS adoption, so that we can be confident that any effects that we find are due to the mandatory capitalization and not to other

(pure or applied) must be expensed in the period incurred. In summary, the five conditions are intended to ensure that an asset is indeed created by the R&D expenditures. See section 5 for a discussion of the costs and benefits of capitalization under UK GAAP.

[8] In both SFAS 13 and IAS 38 research expenditures must be expensed; only development expenditures may be capitalized. 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. While managers may have some discretion in classifying their expenditures, we do not believe that this biases our test results for many reasons. First, nothing has changed for UK GAAP Capitalizers, so any bias story can't be about them. If switchers exercise discretion to classify expenditures as R, it is difficult to understand why this would cause them to increase expenditures, since R must be expensed. Using discretion to classify expenditures as D allows switchers to take more advantage of the expense deferral, and they can increase their expenditures without suffering an income penalty, which is exactly what we predict. Thus, although we can't know for sure which component increased, it is hard to imagine that Switchers increased R right at the time of the switch.

changes. 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 asset are assumed to be expensers). This analysis provides us with 5,881 firm-year observations (1,004 firms). Our initial sample consists of both expensers and capitalizers (in both regimes); however, in a later step we remove the firms classified as expensers under IFRS (see footnote 11 below).

We then remove firms that do not have data in both accounting regimes. Specifically, we remove 788 firm-year observations (273 firms) as they never adopted IFRS (i.e., they delisted before adoption of IFRS). We then remove 837 firm-year observations (201 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 six 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 1,428 firm-year observations outside of the six-year window.[9] For the remaining firms, we require that they have lagged R&D expenditures. We remove 205 firm-year observations that have missing or zero R&D expenditures; this results in the removal of 6 firms that no longer have data in both regimes.[10] We then remove 276 firm-year observations due to missing accounting and financial data need to construct our variables (see below); this resulted in the removal of 16 firms that no longer have data in both regimes.

[9] For example, for a firm that adopted IFRS in 2005, we deleted the 2008-2011 firm-year observations. Similarly, for a firm that adopted IFRS in 2008, we deleted the 2002-2004 and 2011 firm-year observations.
[10] Koh and Reeb (2015) discuss solutions to the problem of missing R&D observations, when R&D is the independent variable. However, in our paper, R&D is the dependent variable, so we cannot use their methods.

Our final step in 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 (the 'Switchers'), and (2) those firms that always capitalized under UK GAAP and continued to always capitalize under IFRS (the 'Capitalizers'). A number of firms did not fall into either of these two categories as they either never began to capitalize under IFRS (167 firms) or they had a mixed policy of expensing and capitalizing in a particular regime (151 firms). For our primary analysis, we deleted both of these groups (in supplemental tests, we include the firms that never capitalized). After these data restrictions, our base sample has 190 firms (984 firm-year observations); 137 firms (737 firm-year observations) are classified as Switchers and the remaining 53 firms (247 firm-year observations) are classified as Capitalizers. [11]

In further analysis we have also examined the 'mixed policy' firms to ascertain which group we believe they belong to. A number of these firms were expensing under UK GAAP and began to capitalize in the year prior to IFRS adoption (potentially in anticipation of the new requirements). Other firms were expensing under UK GAAP and continued to expense in the first year of IFRS adoption, but then began to capitalize the following year. In our expanded sample we have included these early or late switchers and re-run our tests.

Table 2 shows the industry breakdown of both groups. In total there are sixteen industries represented ranging from automobiles and parts to utilities. For both switchers and capitalizers, the majority of the firms are concentrated in three industries: healthcare, industrial goods and services, and technology. Specifically, 86% of the switcher firms are in these three industries, whereas 68% of the capitalizer firms are in these three industries. For the capitalizers,

[11] Firms that never capitalized either had only research expenditures, or their development expenditures never met the conditions for capitalization. The data do not allow us to separately identify research vs development expenditures, so we cannot know the reason for non-capitalization.

approximately 6% of the observations are in each of chemicals and financial services (albeit only 3 firms in each industry). Since R&D expenditures differ by industry, and since the industry compositions of switchers and capitalizers are not identical, our firm-year R&D measures are all adjusted by subtracting the annual industry median.

In order to calculate the impact of the accounting method on R&D expenditures, we need a measure of R&D expenditures or R&D intensity. As there is no agreed upon metric in the literature, we use the following measures (see Appendix A for definitions of all of our variables):

$$RD\_Gwth = (RD_t - RD_{t-1})/RD_{t-1}$$

$$RD\_Sales = RD_t / Sales_t$$

$$RD\_TA = (RD_t - RD_{t-1})/TA_{t-1}$$

$$RD\_MV = (RD_t - RD_{t-1})/MV_{t-1}$$

Our choice of these metrics is motivated by the fact that $RD_t/Sales_t$ is a commonly used measure of R&D intensity, while we are also interested in R&D growth. Since a small value of RD_{t-1} results in an extreme growth rate, we also use beginning total asset and beginning market value of equity as deflators. As mentioned above, we then subtract the corresponding annual industry median of the corresponding metric to calculate our dependent variables for equation 1: Adj_RD_Gwth, Adj_RD_Sales, Adj_RD_TA, and Adj_RD_MV.

Table 3 presents descriptive statistics for switchers and capitalizers during the UK GAAP time period (statistics are similar for the IFRS period, and so are not reported for brevity). The switchers (firms that expensed R&D under UK GAAP) are larger than firms that capitalized, based on share price, market value, sales, and assets. These differences are important, because they mean that we must control for size in our regressions. There is no difference in mean earnings; however, the median switcher is significantly more profitable than the median

capitalizer. Similarly, there is no difference in mean R&D intensity, but the median switcher has significantly higher R&D intensity relative to the median capitalizer. Finally there is no difference in sales or R&D growth between switchers and capitalizers during the UK GAAP time period.

5. Firms' Choices to Capitalize vs Expense R&D Under UK GAAP

If capitalization improves net income, it is important to understand why some firms did not capitalize under UK GAAP, when they had the option to do so and could have reaped the benefits before IFRS.[12] To understand firms' decisions before mandatory capitalization, we took three approaches.

First, we spoke with a former senior technical partner from PwC, who pointed out that capitalization was seen as a sign of weakness, deleterious to a firm's reputation: if the balance sheet was strong and earnings were good and stable, there was no need to capitalize. He also pointed out that the decision was influenced by industry membership, either because different types of development expenditures did or did not meet the requirements for capitalization, or because of the negative reputational effects of capitalization if industry peers expensed. He agreed that if a firm chose to expense R&D, it might spend less to meet earnings targets, and then upon switching to capitalization it would increase its spending, since the extra costs did not hit the income statement. In this view, mandatory capitalization does not have the reputational

[12] Some firms' expenditures might not have met the conditions for capitalization (see footnote 7), and so would have to be expensed. However, with the exception of firms like pharmaceuticals, the outcomes of whose investments are highly uncertain (see the review of comment letters below), we believe this is unlikely for two reasons. First, it amounts to making a negative NPV investment. For example, in a comment letter sent to the Accounting Standards Committee in the UK in response to Exposure Draft 17 – Accounting for Research and Development – Revised (1976), an executive from Tricentrol International said, "I do not believe that any organization will involve itself in development expenditure unless all the criteria laid down in Paragraph 21C have been assessed with reasonable certainty by the people directly involved". Second, firms switching to capitalization under IFRS is *prima facie* evidence that they met the capitalization conditions.

costs of voluntary capitalization. So, a firm could switch to capitalization under IFRS, and then increase its spending.

Second, we analyzed 71 firms' comment letters sent to both the Accounting Standards Committee (ASC) in the UK and to the International Accounting Standards Committee (IASC).[13] Most importantly, some firms are clearly concerned about the effect of expensing on profitability, consistent with the arguments cited above, that the mechanism through which R&D accounting affects expenditures is through income. For example, Westland Aircraft Limited commented that "… to do so [expense] may well distort the annual profits, because expenditure of this sort is not incurred evenly." Bonas Webb Limited commented "…a company's annual results could be effected by high annual write offs in respect of research and development expenditure giving an uneven trend of profits over a period of time." Finally, Hawker Siddeley Group Limited commented "The position could well arise that UK companies would be constrained from entering into new major developments because of a write off requirement, which would certainly not be to the country's advantage." However, firms such as Hoffman-La Roche, Johnson and Johnson, Ely Lilly, IBM, and Texaco believe that the uncertainty of future benefits is the dominating factor, thereby favoring expensing. Additionally, other firms such as Renault and VonRoll Group are concerned with the costs associated with capitalizing, again favoring expensing.

As a third approach, we estimate a Logit model over the 1991-2004 period to understand firms' capitalize vs expense decisions. Our Logit analysis follows Oswald (2008), focusing on

[13] Comment letters sent to the ASC related to the following two exposure drafts: (1) ED14 – Accounting for Research and Development (1975), and (2) ED17 – Accounting for Research and Development – Revised (1976). ED 14 proposed immediate expensing, whereas ED 17 proposed mandatory capitlalization. Those sent to the IASC related to following two exposure drafts: (1) ED37 – International Accounting Standards Proposed Statement – Research and Development Activities (1991), and (2) ED60 – Proposed International Accounting Standard – Intangible Assets (1997). ED 37 also proposed mandatory capitalization. ED 60 was soliciting opinions on three possible options including immediate expensing, the option to capitalize and mandatory capitalization.

life cycle (size, M/B, age, steady-state), risk (earnings variability, beta) and profitability (positive vs negative earnings):

$$CAP_{it} = \beta_0 + \beta_1 EARN\_VAR_{it} + \beta_2 EARN\_SIGN_{it} + \beta_3 SIZE_{it} + \beta_4 M/B_{it} + \beta_5 RDINT_{it} + \beta_6 LEV_{it} + \beta_7 BETA_{it} + \beta_8 AGE_{it} + \beta_9 STATE_{it} + \Sigma\gamma_{jit} IND_{jit} + \varepsilon_{it} \quad (2)$$

where:

CAP_{it} = indicator variable equal to 1 if firm i is a Capitalizer in year t, 0 otherwise;

$EARN\_VAR_{it}$ = percentile ranking of firm i's earnings variance within each firm's industry;

$EARN\_SIGN_{it}$ = indicator variable equal to one if earnings for firm i in year t (adjusted to 'as-if-expense' for the Capitalizers) is positive, zero otherwise;

$SIZE_{it}$ = percentile ranking of firm i's log market value (measured at fiscal year-end) within each firm's industry-year

M/B_{it} = percentile ranking of firm i's market-to-book within each firm's industry-year;

$RDINT_{it}$ = percentile ranking of firm i's R&D intensity within each firm's industry-year;

LEV_{it} = percentile ranking of firm i's leverage within each firm's industry-year;

$BETA_{it}$ = percentile ranking of firm's beta within each firm's industry-year;

AGE_{it} = percentile ranking of firm i's age within each firm's industry-year;

$STATE_{it}$ = indicator variable equal to one if firm i is estimated to be in steady-state with respect to its R&D program in year t, and zero otherwise;

IND_{jit} = indicator variable equal to 1 if firm i belongs to industry j in year t, and 0 otherwise;

e_{it} = residual term for firm i in year t.

The results of estimating equation (2) are shown in Table 4. Consistent with our expectations, firms benefitting most from capitalization's effect on income - firms with negative earnings, smaller firms, more highly levered firms, younger firms, and firms not in steady-state with respect to their R&D programs - are more likely to capitalize.

The central message of our analyses in this section is that under UK GAAP the firms that benefit the most from capitalization did so. For other firms, the negative aspects of capitalization, such as reputation effects, clearly outweighed the benefits. That is, for many firms the benefits of being an expenser (e.g., the signal that the firm was financially sound) clearly outweighed the costs of being an expenser (e.g., the reduction in net income). . As firms are required to capitalize

under IFRS there are no negative reputational costs. We conjecture that as firms switched to capitalization under IFRS they increased their R&D expenditures which were previously reduced to mitigate any negative impact on profitability. This is what we now test.

6. Test Results

6.1 Validating the Difference-in-Difference Analysis

Our Logit analysis showed that there are differences between switchers and capitalizers in the UK GAAP period, potentially invalidating our difference-in-difference identification strategy. To address this issue, we first examine the pre-IFRS R&D behavior of the two groups, to verify that they satisfy the parallel trends assumption, by calculating the counterfactual treatment effect (Christensen et al (2016)). To calculate this effect, we estimate a model similar to (1) for each R&D dependent variable, where we replace SWITCH*POST with separate interactions between SWITCH and indicators for each year except year -1 (the year before IFRS), which serves as the benchmark period (i.e., coefficient constrained to equal zero). Thus, we calculate the counterfactual treatment effect relative to the period right before the adoption of IFRS. The results, in Figure 1, show that the counterfactual treatment effects in the pre-IFRS period are small and insignificantly different from zero for all four R&D metrics, consistent with the parallel trends assumption.[14] .

Second, we use propensity score matching. We calculate the propensity scores from a first stage logistic regression, matching the groups at the firm level without replacement, on industry,

[14]We also estimated the following regression over the 1991-2004 and 1998-2004 periods for each dependent variable: R&D Growth = $b_0 + b_1$*TREND + b_2*SWITCH + b_3*SWITCH*TREND + Controls + e; TREND is a linear time trend that equals year-1991. The results, not reported in the interest of brevity, show insignificant coefficients on TREND*SWITCH for all R&D variables, further supporting the parallel trends assumption.

size, and R&D, in the UK GAAP period.[15] We use a caliper distance of 0.25 to achieve a balance between sample size and closeness of match. We calculate the propensity scores separately for each diff-in-diff regression, matching on the specific R&D metric that is the dependent variable in that given regression. Table 5 shows the tests of differences for the propensity matched samples. For both size and all four R&D metrics, we cannot reject the null hypothesis that the two groups are equal, confirming the efficacy of the propensity matching, and increasing our confidence that results of the diff-in-diff analysis can be interpreted as the differential response of the two groups to the exogenous shock.

6.2 Primary Tests

Table 6 shows the primary regression results. Panels A – D are for the pre-matched sample; Panels E – H repeat Panels A – D, respectively, for the propensity score matched samples. All dependent variables, shown across the top row, are industry adjusted by subtracting the annual industry median. Since Table 3 showed that all of the dependent variables have outliers, mainly on the high end of the distribution, we trimmed the top 2.5% in each case. In addition, Table 3 also showed that switchers were larger than capitalizers during the UK GAAP period; therefore, we control for size by including ln(MVE) in all regressions.

Panel A shows that for the R&D dependent variables, none of the coefficients on POST are significant, implying that capitalizers under UK GAAP did not increase their R&D investments under IFRS. However, all of the coefficients on SWITCH*POST are positive, and three are statistically significant, implying that switchers did increase their R&D investments under IFRS

[15] We match on two firm characteristics to avoid losing observations from matching on more firm-level variables. As a robustness test, we added a third variable, leverage (which was the most statistically significant in our Logit Model in Table 4), with very similar results.

(as they began to capitalize their R&D expenditures). Thus, the change to mandatory capitalization affected R&D investments.[16]

In Panel B, we expand the base sample to include 39 of the 151 firms that had a mixed R&D policy in one of (or both of) the accounting regimes. Specifically, we examined these firms to classify whether we believed that the firm's treatment of its R&D in each regime made them appear to be either a switcher of a capitalizer.[17] In this panel all four coefficients on SWITCH*POST are significantly positive, implying that expensers under UK GAAP did increase their R&D investments under IFRS.

Table 3 showed that there were outliers among the R&D variables, even with trimming. Due to the outliers in the R&D variables, we reran the regressions in Panels A and B (on the primary and expanded samples, respectively), using the ranks of the dependent variables. The results are shown in Panels C and D. All eight coefficients on SWITCH*POST are significantly positive, strongly supporting our conclusions that capitalization results in greater R&D expenditures than expensing.

In summary, our results strongly support the hypothesis that capitalization results in higher R&D expenditures and growth in R&D expenditures than expensing. Thus, the accounting method has real effects. The coefficients on SWITCH*POST (in Panels A and B, with the raw dependent variables) imply that switchers increased their R&D relative to capitalizers by about 3% of sales, which is economically significant, given that the median R&D/sales ratios during the UK GAAP period are .072 and .035 for switchers and capitalizers, respectively (Table 3).

[16] We also ran the regressions by trimming the top and bottom 2.5% and windsorizing the top and bottom 5% of each dependent variable, with similar results.

[17] The remaining 112 firms did not intuitively classify as either a switcher or a capitalizer; therefore, we have not included these firms in our sensitivity test.

The propensity matched results in Panels E – H are even stronger. The coefficients are uniformly higher, and in 15 out of the 16 regressions, the coefficients on SWITCH*POST are significantly positive. This indicates that any pre-shock differences in size or R&D intensity or R&D growth are not causing the significant results in Panels A – D. Rather, these results capture the effect of the exogenous switch to capitalization.

6.3 Additional Tests[18]

In our primary tests, we excluded firms that continued to expense R&D even under IFRS, because we could not identify the reason behind their policy (see footnote 12). For our first robustness test, we run the diff-in-diff regression comparing these non-switchers to the switchers. Note that both of these groups started out with the same R&D policy, as expensers under UK GAAP, and then diverged under IFRS. Although we do not know the reason behind the non-switching, if the R&D accounting method has the effects posited in the literature, the reason may not matter; what matters is the method, per se. That is, the coefficient on the diff-in-diff interaction term should be positive, if firms that switched increased their R&D investments in the post period, compared with firms that continued to expense.

The results are shown in Table 7. The coefficient on the interaction term SWITCH*POST is significantly positive in three of the four regressions, strongly supporting our findings on the efficacy of capitalization.

Earlier we pointed out that while large firms were required to adopt IFRS in 2005/2006, small firms were allowed to delay for a couple of years or more. Thus, firms were staggered in their switch years. In particular, by the end of 2006 only the early switchers had switched; the

[18]All tests reported in this section were conducted on the base sample. We also ran all tests: (1) on the expanded sample; (2) with ranked dependent variables; and, (3) on the propensity score matched samples. These results are untabulated due to brevity, and are strongly consistent with the results reported in the paper. They are available from the authors on request.

late switchers were still expensers. If capitalization motivates firms to increase their R&D expenditures, then early switchers should have greater R&D intensity than late switchers in 2005/2006. For our second robustness test, we run the diff-in-diff regression with switchers only, comparing the early vs late switchers:

$$\text{R\&D Growth} = b_0 + b_1*\text{EARLY} + b_2*\text{POST} + b_3*\text{EARLY*POST} + \text{Controls} + e \quad (4)$$

The model is almost the same as (1), except that POST is now equal to 1 for 2005 and 2006 only (0 for years before 2005), and EARLY denotes the early switchers. The results are shown in Table 8. All four coefficients on EARLY*POST are significantly positive, strongly supporting our previous results, again indicating that our tests capture the effect of the exogenous switch to capitalization.

The arguments behind capitalization increasing R&D expenditures are based on its effect on income, especially for growing firms, for whom capitalization and amortization results in lower R&D expense than expensing. Firms with stable or decreasing expenditures do not have lower R&D expense with capitalization. Thus, high growing switchers would be expected to increase their R&D expenditures more than low growing switchers. For our third robustness test, we compare switchers that have high vs low R&D expenditure growth, where we define high (low) as above (below) median, based on a firm's annual R&D expenditure growth rate both in the UK GAAP period and the IFRS period; i.e., high (low) growth firms are high (low) in both periods. The diff-in-diff regression is:

$$\text{R\&D Growth} = b_0 + b_1*\text{HIGH} + b_2*\text{POST} + b_3*\text{HIGH*POST} + \text{Controls} + e \quad (5)$$

Where HIGH is a dummy variable that equals 1 for high growth switchers and 0 for low growth switchers. If capitalization works through R&D expenditure growth, we expect HIGH*POST to be significantly positive, indicating that high growth switchers increased their R&D expenditures

more than low growth switchers. The results are shown in Table 9, Panel A. Three of the four coefficients on HIGH*POST are significantly positive.

As a second way to capture the magnitude of R&D's effect on income, we rank firms by R&D/Sales. The regression is the same as (5), but HIGH is a dummy variable that equals 1 for high R&D/Sales switchers and 0 for low R&D/Sales switchers. Again, we expect HIGH*POST to be significantly positive, indicating that switchers for whom R&D has a bigger effect on income increased their R&D expenditures more than low growth switchers. The results are shown in Table 9, Panel B. Three of the four coefficients on HIGH*POST are significantly positive.

The results in Table 9 are important, because they indicate that the mechanism through which capitalization works is through R&D's effect on income. This adds to our understanding of accounting's real effects.

If the switch to IFRS was anticipated, switchers may have delayed their R&D investments until IFRS, when they could capitalize and thus lower expenses. If switchers anticipated IFRS and postponed their expenditures, then R&D investments near the end of the UK GAAP period would be decreased, and investments at the beginning of the IFRS period would be increased, which would give us the high growth rate for switchers that we observe in our main tests. But, it would just be a delay, not a real increase in investments. Thus, it is important to rule out this possible explanation for our results.

To address this issue, for our fourth robustness test, we estimate the Diff-in-Diff regression during the UK GAAP period, comparing the last year before IFRS to the previous two years:

$$\text{R\&D Growth}=b_0+b_1*\text{SWITCH}+b_2*\text{LASTYEAR}+b_3*\text{SWITCH*LASTYEAR}+\text{Controls} + e \quad (6)$$

Where LASTYEAR is the last year before IFRS adoption, t-1. If switchers delayed their R&D expenditures in anticipation of IFRS, the coefficient on SWITCH*LASTYEAR should be negative, indicating that switchers' R&D expenditures were lower in t-1 than t-2 or t-3 (relative to capitalizers). The results are shown in Table 10. None of the four coefficients on SWITCH*LASTYEAR is negative, indicating that switchers' did not postpone their R&D expenditures in anticipation of IFRS.

Finally, we conduct two placebo (falsification) tests (Bertrand, Duflo, and Mullainathan, 2004). In the first, we define both the pre and post periods as entirely within the UK GAAP period, 1997-1999 vs 2000-2002; in the second, we define both the pre and post periods as entirely within the IFRS period, 2007-2009 vs 2010-2012.[19] The placebo test is important because it gives us a validation check on our results. As Angrist and Krueger (1999) explain, this test refers to the testable predictions for groups where the treatment effect (the switch from UK GAAP to IFRS in our case) is expected to be absent, because the treatment is missing. Thus, observing significant effects in such tests casts doubt on the causal interpretation of the results for the main sample. For example, we could find a significantly positive coefficient on SWITCH*POST if something other than the accounting change (such as an unidentified factor that causes switchers to increase their R&D expenditures more than capitalizers), is causing our primary results. However, if our hypothesis is correct, we should not find significant results with the placebos, since there was no mandatory accounting change during either test period.

The diff-in-diff regressions for the placebo tests are the same as model (1), but with the pre and post periods defined as at the beginning of the previous paragraph. The results are shown in Table 11. Panel A is for the UK GAAP period, and Panel B is for the IFRS period. For all

[19] For firms that adopt later than 2005, we adjust the pre and post periods accordingly.

regressions in both subperiods, none of the coefficients on SWITCH*POST is significant. This increases our confidence in our interpretation of our primary results: switching firms increased their R&D expenditures more than capitalizers due to the mandatory accounting change.

In summary, both our primary and supplementary tests show that switchers increased their R&D expenditures more than firms that continued to capitalize. Thus, the accounting method affects firms' R&D investments. Moreover, our results show that the mechanism though which capitalization affects R&D expenditures is via the effect on income, thereby adding to our understanding of this issue. Our results attest to the importance of capitalization vs expensing in determining firms' R&D expenditures, and thus to the real effects of accounting policies.

7. Conclusion

We examine the effect of capitalization vs expensing on U. K. firms' R&D expenditures. Our investigation is motivated by the UK's mandatory switch from UK GAAP to IFRS in 2005. Under UK GAAP, firms could elect to expense or capitalize development expenditures, but IFRS mandates capitalization. Thus, "capitalizers" maintained their accounting method, while "switchers" were required to change from expensing to capitalization. Using a difference-in-difference design, we examine the effect of the rule change on the amount of the two groups' R&D expenditures. Consistent with arguments that expensing's deleterious effect on income causes firms to reduce their R&D outlays, we find that switching firms increased their R&D expenditures more than firms that continued to capitalize. We subject our results to numerous robustness tests, comparing early vs late switchers, switchers with high vs low R&D expenditure growth, examining R&D behavior in the last year before IFRS adoption, a placebo test in which we alter the switch date, and propensity score matching to guarantee similar groups. Across all of

these tests, our results support the conclusion that the accounting method affects the amount that firms invest in R&D. Moreover, our results show that the mechanism though which capitalization affects R&D expenditures is via the effect on income, thereby adding to our understanding of how accounting affects real outcomes

We contribute to the accounting literature by addressing an important, unresolved issue that has interested researchers for decades. Because of its importance, there has been a large debate about accounting for R&D in the U.S., and it is important for U.S. regulators to see the effects of R&D capitalization in a major capital market. We provide empirical evidence on this key issue. Our results attest to the real effects of accounting policy on firms' R&D investments, and thus to the importance of accounting methods.

Our research fits Kinney's (1986, pg. 339) definition of having practical relevance: "Does how we as a firm or as a society account for things make a difference?" Our answer for R&D accounting is "yes, it does".

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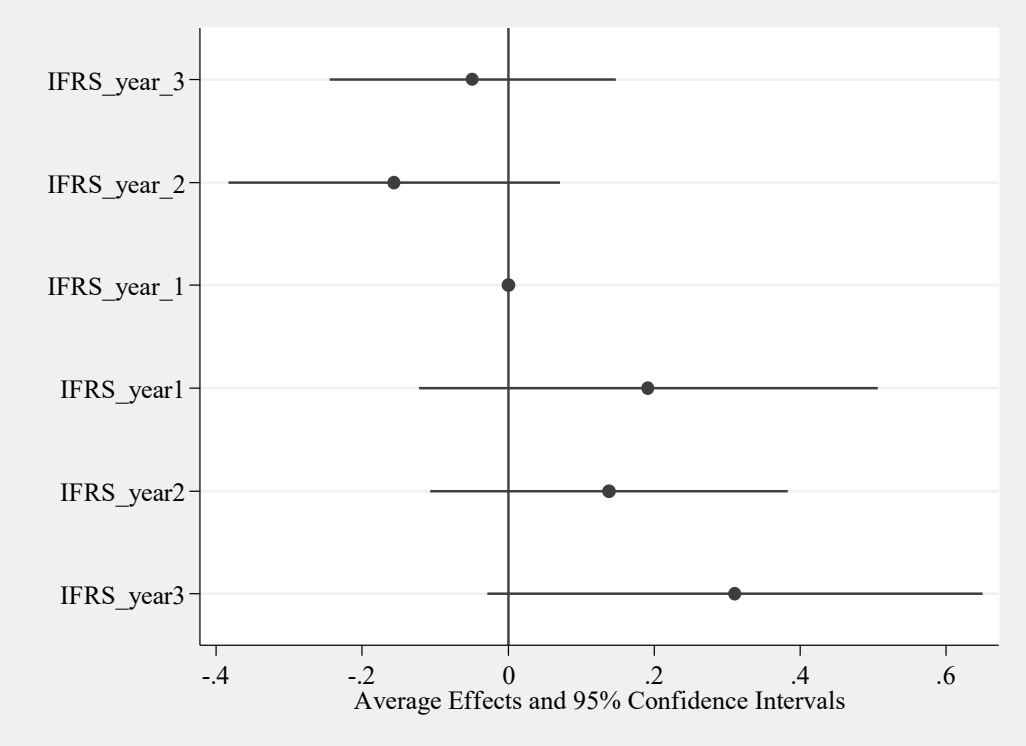
Appendix A
Variable Definitions

Variable	Definition
Share Price	The natural logarithm of firm's share price at fiscal-year-end.
MVE	The natural logarithm of firm's market value at fiscal-year-end.
Sales	The natural logarithm of firm's sales.
Assets	The natural logarithm of firm's total assets.
Earnings	Net income (loss) in millions of pounds sterling.
RD Intensity	R&D expenditure divided by sales.
Sales Growth	The change in sales divided by lagged sales.
RD Growth	The change in R&D expenditures divided by lagged R&D expenditures.
Adj_RD_Gwth	Firm R&D growth minus the industry-year median value of R&D growth.
Adj_RD_Sales	Firm R&D expenditure scaled by sales minus the industry-year median value of R&D scaled by sales.
Adj_RD_TA	Change in firm R&D expenditure, scaled by lagged total assets, minus the industry-year median value of the change in R&D scaled by total assets.
Adj_RD_MV	Change in firm R&D expenditure, scaled by lagged market value, minus the industry-year median value of the change in R&D scaled by market value.
Adj_Ret_Vol	Weekly return volatility, measured as the standard deviation of returns from fiscal-year-end t-1 to fiscal-year-end t, minus the industry-year median value of weekly return volatility.
Adj_Ret_Skew	Return skewness, measured based on weekly returns from fiscal-year-end t-1 to fiscal-year-end t, minus the industry-year median value of weekly return skewness.
Adj_Bmshock	The percentage of monthly returns below -0.20, measured from fiscal year-end t-1 to fiscal year-end t, minus the industry-year-median value of this variable.
SWITCH	An indicator variable equal to 1 if a firm switched from expensing under UK GAAP to capitalizing under IFRS; 0 otherwise.
POST	An indicator variable equal 1 for IFRS years; 0 otherwise.
EARLY	An indicator variable equal 1 for firms that adopt IFRS in 2005/2006; 0 for late adopters.
HIGH	An indicator variable equal to 1 for firms that have higher than median R&D growth in each year of both the UK GAAP and the IFRS period; 0 otherwise.
CAP	Indicator variable equal to 1 if firm i is a capitalizer in year t, 0 otherwise.
EARN_VAR	Percentile ranking of firm i's earnings variance within each firm's industry.
EARN_SIGN	Indicator variable equal to one if earnings for firm i in year t (adjusted to 'as if-expense' for the capitalizers) is positive, zero otherwise.
SIZE	Percentile ranking of firm i's log market value (measured at fiscal year-end) within each firm's industry-year.
M/B	Percentile ranking of firm i's market-to-book within each firm's industry-year; Market-to-Book is market value divided by book value (converted to 'as-if-expense' for the capitalizers) measured at fiscal year-end.

RDINT	Percentile ranking of firm i's R&D intensity within each firm's industry-year; R&D intensity is R&D expenditures divided by total assets (converted to 'as-if-expense' for the capitalizers) measured at fiscal year-end.
LEV	Percentile ranking of firm i's leverage within each firm's industry-year; leverage is measured as debt divided by book value of equity (converted to 'as-if-expense' for the capitalizers) measured at fiscal year-end.
BETA	Percentile ranking of firm's beta within each firm's industry-year. AGE_{it} = percentile ranking of firm i's age within each firm's industry-year; age is measured as the number of years between the date of incorporation and fiscal year-end.
AGE	Percentile ranking of firm i's age within each firm's industry-year; age is measured as the number of years between the date of incorporation and fiscal year-end.
STATE	Indicator variable equal to one if firm i is estimated to be in steady-state with respect to its R&D program in year t, and zero otherwise. Steady-state status is determined based on the absolute value of the difference between the amounts capitalized and amortized in a particular year scaled by the intangible development assets (reported for the capitalizers and estimated for the expensers). Firms in the lower half of the distribution by industry of this variable are classified as steady-state (STATE=1) and firms in the upper half of the distribution by industry are classified as non-steady-state (STATE=0). To estimate the amounts capitalized and amortized for the expensers, we estimate a development asset based on a capitalization percentage of 77% applied to yearly R&D expenditures and amortization rate of 20%. The capitalization and amortization rates are from Oswald (2008).

Figure 1
Counterfactual Treatment Effects[a]

Panel A: Adj_RD_Gwth



Panel B: Adj_RD_Sales

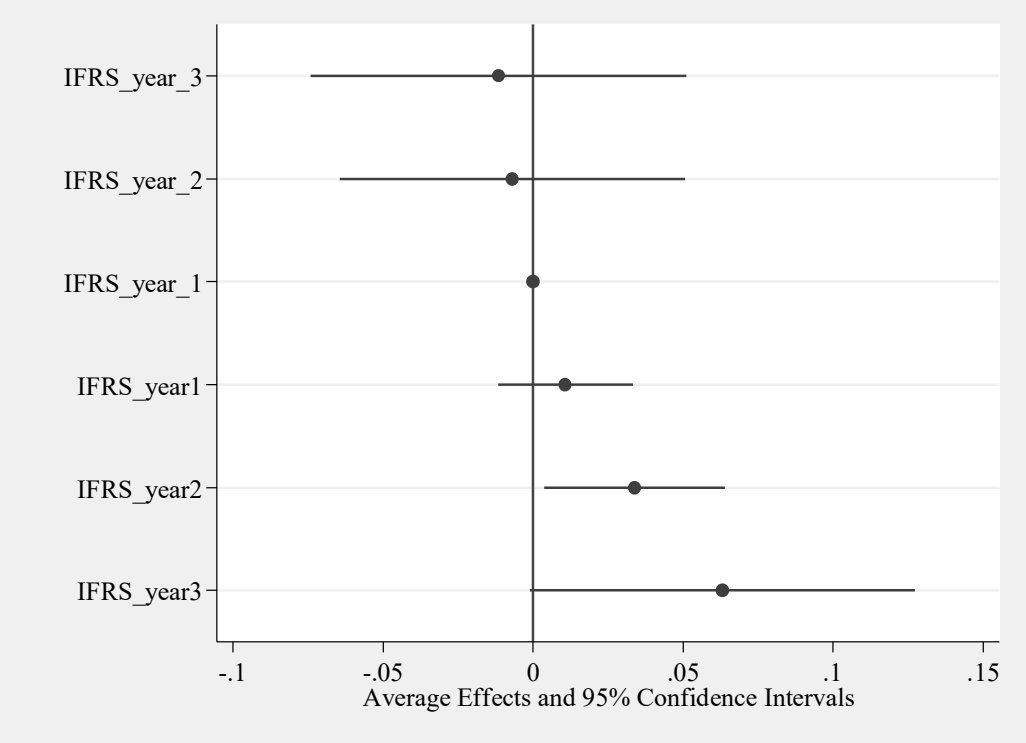
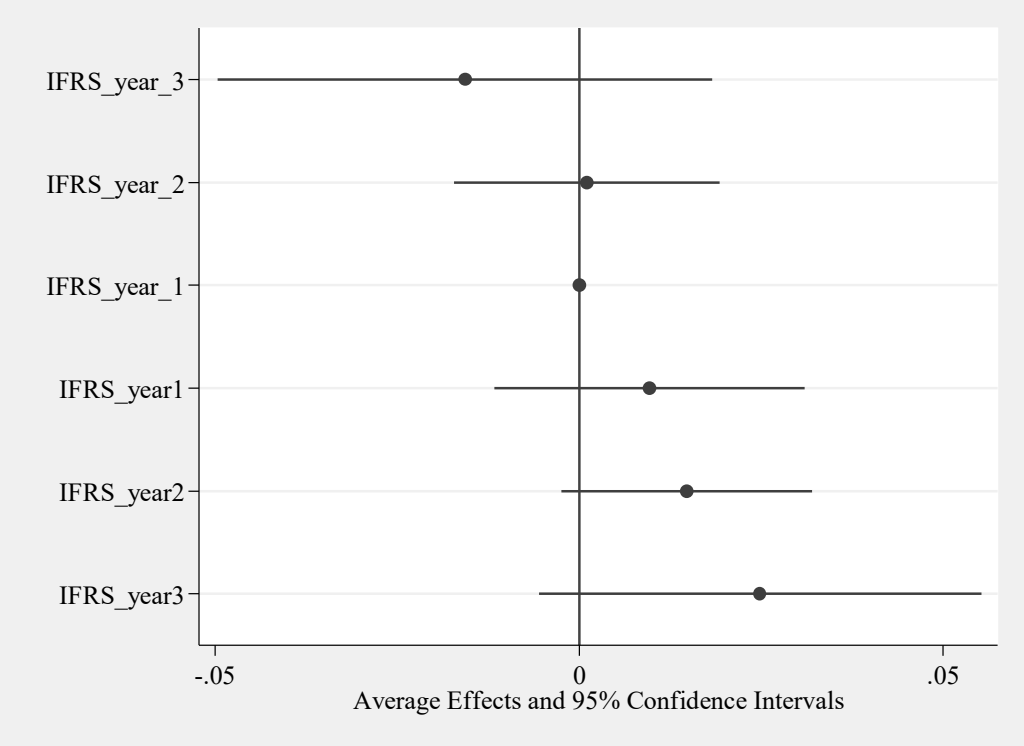


Figure 1 - Continued
Counterfactual Treatment Effects[a]

Panel C: Adj_RD_TA



Panel D: Adj_RD_MV

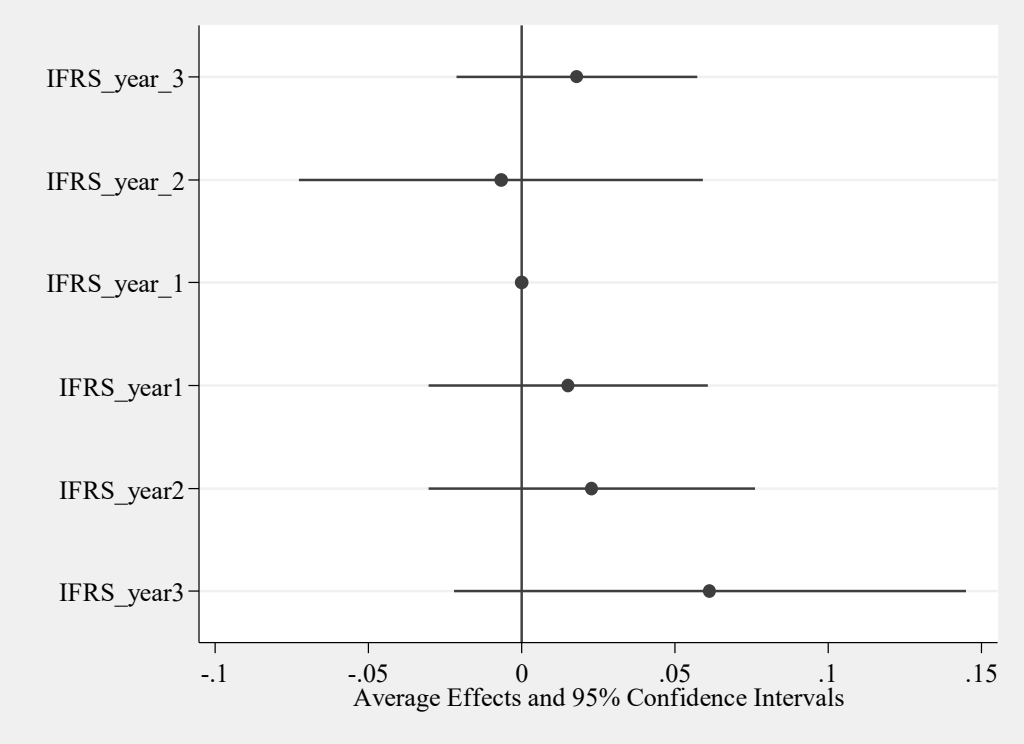


Figure 1 – Continued
Counterfactual Treatment Effects[a]

[a] This figure displays OLS regression coefficient estimates and one-tailed 95% confidence intervals from the following regressions:R&D Growth = b_0 + b_1*SWITCH + b_2*SWITCH*IFRS_year_3 + b_3*SWITCH*IFRS_year_2 + b_4* SWITCH*IFRS_year1 + b_5*SWITCH*IFRS_year2 + b_6*IFRS_year3 + MVE + fixed firm effects + fixed year effects +e Where: SWITCH = 1 if a firm switched from expensing under UK GAAP to capitalizing under IFRS; 0 for firms that capitalized pre- and post; IFRS_year_3 (IFRS_year1)= 1 for three years before IFRS adoption (the first year of IFRS adoption); 0 otherwise; SWITCH*IFRS_year_n is an interaction term between SWITCH and IFRS_year_n. We report results for Adj_RD_Gwth (Panel A), Adj_RD_Sales (Panel B), Adj_RD_TA (Panel C) and Adj_RD_MV (Panel D). The year immediately before IFRS adoption is a benchmark period and it is omitted from the regression, constraining the interaction coefficient SWITCH*IFRS_year_1 to equal zero. See Appendix for the definition of the dependent variables. Standard errors are clustered by firm and year.

Table 1
Sample Observations[a]

	# Observations	#Firms
Initial Sample (2002 - 2011)	5,881	1,004
Remove:		
UK GAAP Firms Only	(788)	(273)
IFRS Firms Only	(837)	(201)
Outside Six Year Window	(1,428)	(0)
Missing / Zero Lagged R&D Expenditures	(205)	(6)
Missing Accounting / Financial Data	(276)	(16)
Remaining Sample	2,347	508
Remove:		
Expensers under IFRS	(872)	(167)
Mixed R&D Policy	(491)	(151)
Base Sample	984	190
Switchers[b]	737	137
Capitalizers[b]	247	53

[a]The sample consists of up to six firm-year observations per firm of UK firms who disclosed either a R&D asset or R&D expense during the period 2002-2011. To obtain our base sample, we remove inappropriate observations and require lagged R&D and other accounting data.

[b]Switchers are those firms that exclusively expensed their R&D under UK GAAP and exclusively capitalized their R&D under IFRS. Capitalizers are those firms that exclusively capitalized their R&D under both UK GAAP and IFRS.

Table 2
Industry Membership[a]

Industry	Switchers	Capitalizers
Automobiles & Parts	0	2
Banks	1	0
Basic Resources	1	0
Chemicals	2	3
Construction & Materials	2	1
Financial Services	0	3
Food & Beverage	3	0
Healthcare	15	8
Industrial Goods & Services	39	14
Media	2	2
Oil & Gas	1	1
Personal & Household Goods	4	2
Technology	64	14
Telecommunications	0	2
Travel & Leisure	1	1
Utilities	2	0
Total Number of Firms	137	53

[a]This table presents the number of firms in each industry for switchers and capitalisers. Industry definitions are based on Thomson Reuters Datastream's level three sector names (INDM3). See Table 1 for sample construction and the definition of swithcers and capitalizers.

Table 3
Descriptive Statistics[a]

UK GAAP years

Switchers

Variable	N	Mean	Median	Minimum	Maximum	Std Dev
Share Price	372	4.239	4.610	-0.342	7.120	1.629
MVE	372	4.050	3.791	-0.462	8.932	1.882
Sales	372	10.693	10.376	4.263	16.049	2.180
Assets	372	10.789	10.600	5.118	16.556	2.071
Earnings	372	-0.981	0.736	-1,442.000	543.200	123.406
RD Intensity	372	0.147	0.072	0.000	3.732	0.322
Sales Growth	372	0.213	0.061	-0.904	9.498	0.908
RD Growth	372	0.389	0.030	-0.907	84.833	4.744

Capitalizers

Variable	N	Mean	Median	Minimum	Maximum	Std Dev
Share Price	119	3.520	3.937	-0.163	6.521	1.690
MVE	119	0.445	3.406	0.191	8.345	1.533
Sales	119	9.953	9.703	6.045	15.597	2.009
Assets	119	10.220	10.078	6.778	15.854	1.737
Earnings	119	2.055	0.061	-118.354	204.000	25.863
RD Intensity	119	0.104	0.035	0.000	2.365	0.268
Sales Growth	119	0.193	0.079	-0.591	1.989	0.423
RD Growth	119	3.527	0.068	-1.000	359.837	33.079

Difference in Mean / Median Between Capitalizers and Switchers

Variable	Mean	p-value	Median	p-value
Share Price	-0.719	0.0005	-0.673	<0.0001
MVE	-0.605	0.0011	-0.385	0.0082
Sales	-0.740	0.0007	-0.673	0.0011
Assets	-0.569	0.0034	-0.523	0.0062
Earnings	3.036	0.6566	-0.675	0.0309
RD Intensity	-0.043	0.1535	-0.037	<0.0001
Sales Growth	-0.030	0.6190	0.018	0.4047
RD Growth	3.138	0.3045	0.038	0.5405

Table 3 - Continued
Descriptive Statistics[a]

[a]This table reports descriptive statistics for switchers and capitalizers for the UK GAAP period. The third table compares the mean and median descriptive statistics between capitalizers and switchers by subtracting the reported value for the capitalizers (the first table) from the reported value for the switchers (the second table). The third (fifth) column in the third table reports the significance levels for t-tests (Wilcoxon tests) comparing the pooled sample mean (median) for the difference between groups. Detailed definitions of the variables are provided in Appendix A.

Table 4
Determinants of the Decision to Capitalize Development Expenditures[a]

	CAP
EARN_VAR	0.002
	(0.41)
EARN_SIGN	-0.507*
	(-1.91)
SIZE	-0.009*
	(-1.81)
M/B	-0.007
	(-1.63)
RDINT	-0.006
	(-1.30)
LEV	0.016***
	(4.02)
BETA	-0.004
	(-0.77)
AGE	-0.013**
	(-2.20)
STATE	-0.777***
	(-3.38)
Constant	-0.663
	(-0.59)
Industry FE	Included
Year FE	Included
Prob > chi2	0.0000
Wald chi2(40)	296.73
Pseuo R-sq	0.1321
Observations	3,174

Table 4 - Continued
Determinants of the Decision to Capitalize Development Expenditures[a]

[a]This table presents estimates from the following regression: $CAP_{it} = \beta_0 + \beta_1 EARN\_VAR_{it} + \beta_2 EARN\_SIGN_{it} + \beta_3 SIZE_{it} + \beta_4 M/B_{it} + \beta_5 RDINT_{it} + \beta_6 LEV_{it} + \beta_7 BETA_{it} + \beta_8 AGE_{it} + \beta_9 STATE_{it} + \sum_{jit} IND_{jit} + \varepsilon_{it}$. The sample includes pre-IFRS firms years for the period 1991 – 2004. Standard errors are clustered by firm and year. Detailed definitions of the variables are provided in Appendix A.

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

Table 5
Propensity score matching[a]

	Switchers vs Capitalizers Base sample	Switchers vs Capitalizers Expanded Sample	Switchers vs Non-switchers Base sample	Early vs Late Switchers
SIZE				
Diff in means (p-values)	0.842	0.568	0.884	0.495
Diff in medians (p-values)	0.897	0.330	0.863	0.246
N firms	54	57	145	30
Adj_RD_Gwth				
Diff in means (p-values)	0.526	0.114	0.969	0.402
Diff in medians (p-values)	0.521	0.150	0.254	0.217
N firms	54	57	145	30
Adj_RD_Sales				
Diff in means (p-values)	0.522	0.992	0.981	0.321
Diff in medians (p-values)	0.034	0.112	0.332	0.702
N firms	74	76	142	32
Adj_RD_TA				
Diff in means (p-values)	0.982	0.970	0.557	0.329
Diff in medians (p-values)	0.283	0.118	0.564	0.304
N firms	73	77	147	31
Adj_RD_MV				
Diff in means (p-values)	0.628	0.280	0.515	0.756
Diff in medians (p-values)	0.820	0.614	0.581	0.456
N firms	65	67	135	32

[a]This table presents p-values of differences in means\medians of propensity score matched samples of switchers vs capitalizers (Base and Expanded samples), switchers vs non-switchers and early vs late switchers. Switchers are firms that switched from expensing under UK GAAP to capitalizing under IFRS; capitalizers are firms that capitalized pre- and post IFRS; non-switchers are firms that expensed pre- and post IFRS; early (late) switchers are firms that switched from expensing under UK GAAP to capitalizing under IFRS in 2005 (later). The expanded sample includes 39 firms with mixed R&D policy in one of (or both of) the accounting regimes that have been classified as either a switcher of a capitalizer based on their R&D treatment. Detailed definitions of the variables are provided in Appendix A.

Table 6
Primary Regression Results[a]

Panel A: Base sample

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	0.049	0.002	0.003	-0.017
	(0.46)	(0.15)	(0.45)	(-1.60)
SWITCH*POST	0.139	0.033**	0.012*	0.035***
	(1.53)	(2.02)	(1.94)	(3.24)
MVE	0.149***	-0.013*	0.009***	-0.022**
	(5.26)	(-1.78)	(2.81)	(-2.51)
Constant	-0.415***	-0.077***	-0.298***	0.014
	(-2.88)	(-4.18)	(-6.18)	(0.47)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.245	0.685	0.285	0.282
Adj. R-sq	0.0498	0.605	0.0977	0.0925
Observations	1,004	1,122	1,116	1,038

Panel B: Expanded sample

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	0.005	0.004	-0.001	-0.007
	(0.05)	(0.34)	(-0.11)	(-0.70)
SWITCH*POST	0.204**	0.027**	0.015***	0.029**
	(2.34)	(2.03)	(3.07)	(2.58)
MVE	0.127***	-0.016**	0.008***	-0.021***
	(5.03)	(-2.19)	(3.11)	(-2.88)
Constant	1.033***	0.216***	-0.302***	0.148***
	(2.87)	(6.40)	(-6.06)	(3.78)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.232	0.706	0.275	0.337
Adj. R-sq	0.0353	0.632	0.0873	0.164
Observations	1,215	1,334	1,327	1,242

Table 6 - Continued
Primary Regression Results[a]

Panel C: Base sample – regressions with ranked dependent variables

	RD_Gwth_Rk	RD_ Sales_Rk	RD_TA_Rk	RD_MV_Rk
POST	15.445	-7.166	28.955	-10.408
	(0.25)	(-0.25)	(0.48)	(-0.20)
SWITCH*POST	112.238**	73.608**	111.376***	115.004***
	(2.16)	(2.08)	(2.96)	(2.77)
MVE	82.994***	-15.748	74.621***	-133.555***
	(5.47)	(-1.06)	(3.36)	(-8.14)
Constant	192.662**	110.827***	75.563**	499.881***
	(2.08)	(3.90)	(2.28)	(10.19)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.264	0.787	0.273	0.213
Adj. R-sq	0.0740	0.733	0.0833	0.00444
Observations	1,004	1,122	1,116	1,038

Panel D: Expanded sample – regressions with ranked dependent variables

	RD_Gwth_Rk	RD_ Sales_Rk	RD_TA_Rk	RD_MV_Rk
POST	17.123	-2.066	14.854	-12.284
	(0.21)	(-0.06)	(0.19)	(-0.22)
SWITCH*POST	153.715**	84.961**	158.369***	137.765***
	(2.52)	(2.31)	(3.39)	(3.04)
MVE	82.972***	-30.705*	71.490***	-157.250***
	(4.72)	(-1.93)	(2.91)	(-6.78)
Constant	1,093.224***	1,391.876	194.774	1,800.016***
	(4.45)	(11.12)	(1.62)	(6.54)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.250	0.788	0.258	0.223
Adj. R-sq	0.0569	0.735	0.0660	0.0197
Observations	1,215	1,334	1,327	1,242

Table 6 - Continued
Primary Regression Results[a]

Panel E: Base propensity score matched sample

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	-0.001	-0.012	0.003	-0.005*
	(-0.01)	(-1.02)	(0.32)	(-1.83)
SWITCH*POST	0.263***	0.040**	0.018***	0.034**
	(2.86)	(2.19)	(3.14)	(2.04)
MVE	0.209***	-0.014	0.008**	-0.023*
	(5.40)	(-1.32)	(2.08)	(-1.72)
Constant	-1.500***	-0.508***	-0.018*	0.087
	(-5.35)	(-11.67)	(-1.71)	(1.42)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.277	0.718	0.305	0.281
Adj. R-sq	0.0779	0.641	0.121	0.0751
Observations	525	722	712	622

Panel F: Expanded propensity score matched sample

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	0.076	-0.006	0.002	-0.001
	(0.61)	(-0.39)	(0.17)	(-0.21)
SWITCH*POST	0.251***	0.052***	0.023***	0.012
	(2.77)	(3.06)	(4.26)	(1.11)
MVE	0.164***	-0.010	0.007**	0.002
	(3.48)	(-1.16)	(2.46)	(0.34)
Constant	-0.987***	-0.018	-0.297***	-0.005
	(-6.82)	(-0.50)	(-5.01)	(-0.48)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.260	0.661	0.317	0.350
Adj. R-sq	0.0493	0.569	0.125	0.165
Observations	560	760	743	666

Table 6 - Continued
Primary Regression Results[a]

Panel G: Base propensity score matched sample – regressions with ranked dependent variables

	RD_Gwth_Rk	RD_ Sales_Rk	RD_TA_Rk	RD_MV_Rk
POST	-1.177	-1.562	4.653	-10.297
	(-0.17)	(-0.57)	(0.80)	(-0.33)
SWITCH*POST	10.828***	5.521*	15.578***	78.266**
	(3.42)	(1.78)	(4.25)	(2.22)
MVE	5.725***	-1.409	5.215***	-67.334***
	(3.31)	(-0.90)	(3.12)	(-3.61)
Constant	-15.389	-91.717***	10.402*	609.625***
	(-1.59)	(-9.35)	(1.82)	(5.51)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.444	0.818	0.440	0.248
Adj. R-sq	0.294	0.768	0.293	0.0330
Observations	525	722	712	622

Panel H: Expanded propensity score matched sample – regressions with ranked dependent variables

	RD_Gwth_Rk	RD_ Sales_Rk	RD_TA_Rk	RD_MV_Rk
POST	4.086	0.977	4.540	3.741
	(0.67)	(0.06)	(0.60)	(0.65)
SWITCH*POST	13.550***	45.489**	19.176***	9.320*
	(4.01)	(2.00)	(3.52)	(1.67)
MVE	5.680***	-11.008	4.591**	5.284***
	(2.94)	(-0.91)	(2.56)	(2.92)
Constant	-40.722***	160.021***	-42.918***	-23.095**
	(-4.87)	(3.75)	(-63.10)	(-2.18)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.449	0.799	0.446	0.484
Adj. R-sq	0.295	0.744	0.290	0.335
Observations	560	760	743	658

Table 6 - Continued
Primary Regression Results[a]

[a]This table presents estimates from the following regressions: R&D Growth = $b_0 + b_1$*POST + b_2*SWITCH + b_3*SWITCH*POST + fixed firm effects + fixed year effects + MVE + e. Where: SWITCH = 1 if a firm switched from expensing under UK GAAP to capitalizing under IFRS; 0 for firms that capitalized pre- and post; POST = 1 for IFRS years; 0 otherwise; SWITCH*POST is an interaction term between switch and post. The expanded sample (Panels B and D) includes 39 firms with mixed R&D policy in one of (or both of) the accounting regimes that have been classified as either a switcher of a capitalizer based on their R&D treatment. The dependent variables in Panels A and B are as defined in Appendix A. The dependent variables in Panels C and D are the ranked values of the corresponding variables. Panels A – D are for the pre-matched sample; Panels E – H repeat Panels A – D, respectively, for the propensity score matched samples. Standard errors are clustered by firm and year. Detailed definitions of the variables are provided in Appendix A.

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

Table 7
Switchers vs Non-switchers[a]

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	0.022	0.044	-0.006	0.002
	(0.48)	(0.18)	(-0.53)	(0.28)
SWITCH*POST	0.125**	0.358	0.021***	0.007**
	(2.42)	(1.55)	(2.88)	(2.00)
MVE	0.144***	-0.043	0.019***	0.015***
	(3.87)	(-0.31)	(6.56)	(4.86)
Constant	-1.016***	12.177***	-0.069***	-0.046***
	(-4.84)	(19.80)	(-7.91)	(-4.73)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-squared	0.278	0.673	0.275	0.320
Adj. R-squared	0.0988	0.592	0.0966	0.148
Observations	1,727	1,748	1,767	1,642

[a]This table presents estimates from the following regressions: R&D Growth = $b_0 + b_1$*POST + b_2*SWITCH + b_3*SWITCH*POST + fixed firm effects + fixed year effects + MVE + e where: SWITCH = 1 if a firm switched from expensing under UK GAAP to capitalizing under IFRS; 0 for firms that expensed pre- and post; POST = 1 for IFRS years; 0 otherwise; SWITCH*POST is an interaction term between switch and post. The dependent variables are as defined in Appendix A. Standard errors are clustered by firm and year. Detailed definitions of the variables are provided in Appendix A.

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

Table 8
Early vs Late Switchers[a]

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	-0.166	-0.035*	-0.020*	-0.014**
	(-1.34)	(-1.78)	(-1.70)	(-2.26)
EARLY*POST	0.221**	0.050***	0.017*	0.013**
	(2.18)	(3.33)	(1.70)	(2.35)
MVE	0.046	-0.012	0.005	0.007**
	(1.17)	(-0.61)	(1.45)	(2.06)
Constant	0.202	0.065***	-0.004	0.035***
	(1.58)	(5.07)	(-0.27)	(4.93)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.364	0.815	0.536	0.662
Adj. R-sq	0.0887	0.736	0.337	0.518
Observations	487	500	481	460

[a]This table presents estimates from the following regressions: R&D Growth = b_0 + b_1*EARLY + b_2*POST + b_3*EARLY*POST + MVE + fixed firm effects + fixed year effects + e where: EARLY = 1 if a firm switched from expensing under UK GAAP to capitalizing under IFRS in 2005; 0 otherwise for firms that switched later; POST = 1 for 2005 and 2006; 0 otherwise; EARLY*POST is an interaction term between switch and post. The dependent variables are as defined in Appendix A. Standard errors are clustered by firm and year. Detailed definitions of the variables are provided in Appendix A.

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

Table 9
R&D's Effect on Income [a]

Panel A: High R&D Growth vs Low R&D Growth Switching Firms

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	0.091	-0.022*	-0.016	-0.072
	(1.01)	(-1.86)	(-1.33)	(-0.98)
HIGH*POST	0.181**	0.037**	0.027**	0.069
	(2.01)	(2.18)	(2.49)	(0.93)
MVE	0.042	-0.027*	0.004	-0.025***
	(0.81)	(-1.92)	(0.63)	(-3.75)
Constant	-0.882***	0.120***	-0.037	0.170**
	(-4.33)	(2.97)	(-0.81)	(2.04)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.267	0.831	0.270	0.279
Adj. R-sq	0.0698	0.788	0.0807	0.0884
Observations	530	533	534	523

Panel B: High R&D/Sal vs Low R&D/Sal Switching Firms

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	0.298***	-0.000	0.009	-0.000
	(2.98)	(-0.04)	(1.35)	(-0.04)
HIGH*POST	-0.075	0.020*	0.009**	0.014*
	(-1.22)	(1.96)	(2.31)	(1.81)
MVE	0.058*	-0.012	0.007	-0.022***
	(1.85)	(-1.10)	(1.52)	(-4.23)
Constant	-0.006	-0.102*	-0.079	0.055**
	(-0.11)	(-1.90)	(-1.55)	(2.22)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.326	0.834	0.310	0.311
Adj. R-sq	0.152	0.788	0.130	0.135
Observations	639	626	651	631

Table 9 - Continued
R&D's Effect on Income [a]

[a]This table presents estimates from the following regressions: R&D Growth = $b_0 + b_1$*HIGH + b_2*POST + b_3*HIGH*POST + MVE + fixed firm effects + fixed year effects + e. where: HIGH = 1(0) for switching firms that had above (below) than median R&D growth (RD/Sal) under UK GAAP and under IFRS within the adoption window; POST = 1 for 2005 and 2006; 0 otherwise; HIGH*POST is an interaction term between HIGH and POST. Standard errors are clustered by firm and year. Detailed definitions of the variables are provided in Appendix A.

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

Table 10
R&D behavior in the last year before IFRS[a]

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
LASTYEAR	-0.149	-0.006	-0.035**	0.040
	(-0.78)	(-0.17)	(-2.55)	(1.44)
SWITCH*LASTYEAR	0.166	0.001	0.024*	0.006
	(0.94)	(0.03)	(1.70)	(0.25)
MVE	-0.014	-0.005	-0.006	-0.049**
	(-0.32)	(-0.22)	(-0.77)	(-2.43)
Constant	1.138***	0.033	-0.122***	0.241***
	(4.31)	(0.20)	(-10.89)	(2.88)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.456	0.828	0.562	0.514
Adj. R-sq	0.0974	0.713	0.258	0.166
Observations	512	561	557	518

[a]This table presents estimates from the following regression: R&D growth = b0 + b1*SWITCH + b2*LASTYEAR + b3*SWITCH* LASTYEAR + MVE + fixed firm effects + fixed year effects + e where: SWITCH = 1 if a firm switched from expensing under UK GAAP to capitalizing under IFRS; 0 for firms that capitalized pre- and post; LASTYEAR = 1 (0) for year t-1 where year t is the IFRS adoption year of each firm; SWITCH*LASTYEAR is an interaction term between SWITCH and LASTYEAR. Standard errors are clustered by firm and year. Detailed definitions of the variables are provided in Appendix A.

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

Table 11
Placebo tests[a]

Panel A: UK GAAP period

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	0.014	0.057***	0.007	-0.007
	(0.09)	(3.18)	(0.48)	(-0.78)
SWITCH*POST	0.063	-0.034	-0.013	-0.006
	(0.50)	(-1.06)	(-1.40)	(-0.54)
MVE	0.107***	0.004	0.011**	0.009**
	(3.18)	(0.42)	(2.58)	(2.57)
Constant	0.538***	0.115***	-0.041	-0.027*
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.342	0.820	0.447	0.384
Adj. R-sq	0.0902	0.749	0.224	0.130
Observations	663	723	720	669

Panel B: IFRS period

	Adj_RD_Gwth	Adj_RD_Sales	Adj_RD_TA	Adj_RD_MV
POST	-0.010	-0.014	0.000	-0.019
	(-0.18)	(-1.25)	(0.05)	(-1.14)
SWITCH*POST	0.010	0.014	-0.001	0.014
	(0.17)	(1.28)	(-0.06)	(0.84)
MVE	0.104***	-0.004	0.010***	0.002
	(3.15)	(-1.26)	(3.75)	(0.45)
Constant	-1.545***	0.042***	-0.047***	0.003
	(-11.03)	(23.81)	(-3.97)	(0.55)
Firm FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
R-sq	0.280	0.835	0.360	0.249
Adj. R-sq	0.0909	0.793	0.191	0.0483
Observations	963	1,057	1,063	994

Table 11 - Continued
Placebo tests[a]

[a]This table presents estimates from the following regression: R&D growth = b0 + b1*SWITCH + b2*POST + b3*SWITCH*POST + MVE + fixed firm effects + fixed year effects + e where: SWITCH = 1 if a firm switched from expensing under UK GAAP to capitalizing under IFRS; 0 for firms that capitalized pre- and post; POST = 1 (0) for year t-5 to year t-3 (year t-8 to year t-6) under UK GAAP period where year t is the IFRS adoption year of each firm; For the IFRS period POST = 1 (0) for year t+2 to year t+4 (year t+5 to year t+7) under UK GAAP period where year t is the IFRS adoption year of each firm; SWITCH*POST is an interaction term between SWITCH and POST. Standard errors are clustered by firm and year. Detailed definitions of the variables are provided in Appendix A.

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