The Information Benefits of R&D Capitalization*

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Abstract

We examine the information benefits of R&D capitalization in the UK after the adoption of IFRS (which mandates capitalization of development costs). Using the successful efforts model of Healy et al (2002), we find that the capitalization variables have significant explanatory power for both returns and earnings, that the market values the decomposition of current R&D expenditures into their expensed vs capitalized components. Most important, we examine whether the market could deduce the unrecognized capitalization information under expensing, by examining both the market's pricing of pro-forma capitalization information from the year before IFRS, and changes in bid-ask spreads around the switch. We find that the market could not infer the unrecognized capitalization under expensing, and that firms' switch to capitalization under IFRS revealed new information to the market. Together, our results attest to both the relevance and reliability of the capitalization information, and to the importance of mandating its disclosure.

The Information Benefits of R&D Capitalization

1. Introduction

In this paper, we examine the information benefits of R&D capitalization. We study UK firms, because after the adoption of IFRS, capitalization of development expenditures became mandatory in the UK. Under expensing, the amount of the expenditure is treated as an expense, and there is no other required recognition or disclosure. Under capitalization, the amount of the expenditure is disaggregated into an expensed component and a capitalized component, and the firm recognizes both an asset and its periodic amortization expense. If the asset declines in value, the firm recognizes an impairment charge (loss). Using the successful efforts model of Healy et al (2002), we investigate whether the capitalization information explains current stock returns and predicts future earnings, and whether the market values the decomposition of R&D expenditures into their expensed vs capitalized components. Most importantly, we examine whether the market could deduce the unrecognized capitalization information under expensing; i.e., whether the information affects prices. Even if the capitalization variables are value-relevant (help to explain returns and earnings), if the market could infer the information under expensing, then capitalization would not affect prices, as the information would have already been impounded. To examine whether the market could infer the unrecognized capitalization information for expensers under UK GAAP, we conduct two tests.

First, when UK firms adopted IFRS, any firms that had expensed R&D under UK GAAP (which was permitted), were now required to capitalize it.[1] In the year of IFRS adoption, these "switcher" firms were required to disclose pro-forma capitalization amounts for the last year under UK GAAP (i.e., the year prior to IFRS adoption). Using these pro-

[1] Under UK GAAP firms had the option to either fully expense their R&D or to capitalize their development expenditures if certain conditions were met. We discuss this in more detail in section 4.

forma data, we compare the association between the capitalization data and contemporaneous returns in the last UK GAAP year, for switchers vs for firms that had always capitalized (capitalizers).[2] If the market could infer switchers' undisclosed pro-forma information under UK GAAP, we expect no difference in return association between the two groups. However, if the market could not infer switchers' pro-forma information, the association between the capitalization data and returns should be stronger for the capitalizers. To be sure that any differences we find are due to the (lack of capitalization) information and not to innate differences between the firms in the two groups, we also compare the association (between contemporaneous returns and the capitalization data) in the first IFRS year. Since both groups capitalize under IFRS, the market has "real time" capitalization information for all firms, so we expect no difference in the return association between the two groups under IFRS.

Second, we compare the change in switchers' vs capitalizers' bid-ask spreads from the year before IFRS adoption (last year of UK GAAP) to the first IFRS year. Bid-ask spreads are a measure of liquidity, and a fundamental result in accounting research is that increased disclosure (information) increases liquidity, and thus reduces bid-ask spreads (Leuz and Verrecchia, 2000; Daske et al, 2008; Balakrishnan et al, 2014). Thus, if the market could have inferred switchers' capitalization information under UK GAAP, the switch to capitalization would not have resulted in an increase in information, and there should be no change in relative bid-ask spreads for the two groups. Alternatively, if the switch to capitalization revealed new information, switchers' bid-ask spreads should decrease relative to capitalizers.

We contribute three main findings. First, we show that the capitalization variables add to the explanation and prediction of returns and earnings, confirming with "real world" archival data the relevance vs reliability tradeoff found by Healy et al (2002) in their

[2]Leuz (2018, Sec. 5.3) lists as-if data as an example of information to help gauge the effects of policy changes.

simulations. Second, we find that capitalized expenditures are more value relevant than expensed expenditures, which has not been appreciated before. This shows that a key information benefit of R&D capitalization is the splitting of costs into their expensed vs capitalized components, which reveals evidence about projects that have passed the feasibility threshold.

Finally, and most importantly, we show that the market could not infer switchers' undisclosed capitalization information under UK GAAP, which indicates that firms' switch to capitalization revealed new information to the market and affected share prices. In particular, using the pro-forma disclosures, we find that the relation between the capitalization data and contemporaneous returns was weaker for switchers than for capitalizers under UK GAAP, but not under IFRS. This shows that the different results for the two groups are due to the lack of switchers' capitalization information, and not to innate differences between the two groups. Consistent with the results of our pro-forma tests, we find that switchers' bid-ask spreads decreased significantly relative to capitalizers', when the UK adopted IFRS. In sum, our results attest to both the relevance and reliability of the capitalization information, and to the importance of mandating its disclosure.

Understanding the effects of R&D capitalization is a fundamental issue for both academics and policymakers. Because of its importance, there has been a large debate about R&D accounting in the U.S. Moreover, R&D accounting is one of the main differences between U.S. GAAP and IFRS, and it is important for U.S. regulators to see the effects of R&D capitalization in a major capital market. Despite this, because of the dearth of capitalization data, very few papers have examined the information value of R&D capitalization, and no previous research has examined whether the market could infer undisclosed capitalization information for expensers, i.e., whether capitalization affects share prices. For example, in the U.S. the only internal R&D costs that may be capitalized are

development expenditures in the software industry. Thus, archival studies with U.S. data, such as Aboody and Lev (1998) and Mohd (2005) focus on this single industry. Alternatively, Healy et al (2002), use simulated data (also for one industry, pharmaceuticals). Our paper is the first to study the information value of R&D capitalization with archival data for multiple industries, in an important, major capital market, 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 and should be of interest to both academics and regulators.

The rest of the paper is organized as follows. Section 2 reviews the literature on the information value of R&D capitalization. Section 3 discusses our hypotheses and tests. Section 4 describes our data and sample. Section 5 reports test results for our information content models. Section 6 reports results showing that the market could not infer expensers' capitalization information before IFRS. Section 7 concludes.

2. Literature Review

Because most R&D research is conducted with U.S. data, and all U.S. firms except those in the software industry must expense their R&D costs, interest in R&D accounting has been devoted primarily to comparing the valuation relevance of actual R&D expenses (expenditures) to *estimates of what they would be* under capitalization.[3] The exceptions deal with either foreign firms where capitalization is allowed, or with software firms in the U.S., which after the introduction of SFAS 86 in 1985 could choose to capitalize software development costs. Most important, no previous papers address the issue of whether the

[3] See for example, Sougiannis (1994), Lev and Sougiannis (1996), and Chambers, Jennings, and Thompson (1998). Relatedly, Kothari, Laguerre, and Leone (2002) study the uncertainty of future benefits to R&D expenditures.

market could infer undisclosed capitalization under expensing; i.e., whether disclosure affects share prices.

Oswald and Zarowin (2007) and Oswald (2008) study UK firms, where until the UK switched to IFRS in 2005, firms could elect to expense or capitalize R&D. Oswald and Zarowin show that stock returns of R&D capitalizers reflect more future earnings information than stock returns of expensers, presumably because the additional information provided under capitalization is useful for forecasting future earnings. However, they do not examine which specific variables provide the additional forecasting power.

Oswald examines the value relevance of R&D data for UK expensers and capitalizers under UK GAAP. He compares the value relevance of reported and adjusted earnings and book value of equity (where the adjusted numbers restate the reported financial numbers to the alternative accounting method). He finds some evidence of higher value relevance under capitalization (reported for the capitalizers and 'as-if' capitalization for the expensers) but notes that any difference is small in magnitude. Most important, since both Oswald and Zarowin (2007) and Oswald (2008) study the UK GAAP period when firms could choose to capitalize or expense, the authors' results are potentially vulnerable to endogeneity, despite their attempts to control for firms' self-selection.

Mohd (2005) and Aboody and Lev (1998) study U.S. software firms. Mohd finds that after the introduction of SFAS 86, information asymmetry, as measured by bid-ask spreads and share turnover, decreased for software firms relative to other R&D firms (which must expense), and that among software firms, capitalizers have lower information asymmetry than expensers. He interprets these results as evidence of capitalization's information benefit, again due to the additional recognition.

Aboody and Lev (1998) examine whether the amount of the R&D expenditure that is capitalized, the amount that is expensed, and the periodic amortization, are associated with

both current and future earnings and with future returns of software firms. Overall, they find that these variables are "value relevant", attesting to the information value of capitalization. While Aboody and Lev's value relevance tests are similar to ours (below), there are a number of differences.

First, both Mohd (2005) and Aboody and Lev (1998) only study one industry, whereas we study multiple industries. As Mohd points out, software industry results might not be generalizable, and the FASB may have allowed capitalization precisely because in this one industry firms can reliably estimate the future benefits of R&D expenditures. Thus, it is important to know whether capitalization's information value generalizes across industries, in a major capital market.

Second, software firms can choose to capitalize or expense their R&D expenditures, and while both Mohd (2005) and Aboody and Lev (1998) control for this potential endogeneity, their results are subject to the same caveat as Oswald and Zarowin's and Oswald's mentioned above. Third, Aboody and Lev do not include write-offs in their analysis.

Healy et al (2002) conduct a simulation study of the pharmaceutical industry to compare the value relevance (R^2 for explaining contemporaneous stock returns) of capitalization vs expensing of R&D. Healy et al find that a successful efforts capitalization model (where expenditures on only potentially successful projects are capitalized and subsequently amortized, with write-downs if necessary, and the remaining expenditures are expensed) has greater value relevance than expensing (or a "full cost" model wherein all expenditures are capitalized), and that capitalization's greater value relevance holds even when earnings are managed by delaying R&D asset write-downs.[4]

[4] IFRS is de facto successful efforts, so the full cost model is irrelevant for us.

While Healy et al's value relevance analysis is similar to ours (it is also similar to Aboody and Lev's (1998), except that Healy et al include write-offs), there are a number of significant differences. First, like Mohd (2005) and Aboody and Lev (1998), Healy et al (2002) study only one industry (pharmaceuticals), so their results might not be generalizable. Second, their data is simulated, so it is unknown whether their conclusions hold with "real world" archival data. Third, we examine whether the market values the decomposition of R&D expenditures into their expensed vs capitalized components, whereas Healy et al assume that all R&D expenditures are capitalized. This is important, because the decomposition reveals expenditures on projects that have passed the feasibility test, and thus are more likely (than expensed expenditures) to result in future profits.

The most important difference between our paper and Mohd (2005), Aboody and Lev (1998) and Healey et al (2002) is that no previous paper examines whether the market could deduce the undisclosed capitalization information under expensing, and thus whether capitalization reveals new information to the market and affects share prices. Ours is the first paper to address this important question.

Overall, given the focus by previous research on a single industry and potential endogeneity, capitalization's information value, and whether the market could deduce undisclosed information, are unknown. The UK's switch to IFRS, requiring the capitalization of development costs and the disclosure of pro-forma capitalization information, provides the opportunity to address these important issues using archival data, in a major capital market, such that the results may be generalizable.

3. Hypotheses and Tests

3.1 Value relevance of Capitalization Information

For our first analysis, we examine the value relevance of R&D capitalization, compared to expensing, by estimating the following models:

$$\text{DEP VAR}_{it} = a_0 + a_1*\text{NIBRD}_{it} + a_2*\text{EXPEND}_{it} + a_3*\Delta\text{NIBRD}_{it} + a_4*\Delta\text{EXPEND}_{it} + e_{it} \quad (1)$$

$$\text{DEP VAR}_{it} = b_0 + b_1*\text{NIBRD}_{it} + b_2*\text{EXPEND}_{it} + b_3*\Delta\text{NIBRD}_{it} + b_4*\Delta\text{EXPEND}_{it} + b_5*\text{WD}_{it} + b_6*\text{RDEXP}_{\text{Excess}it} + b_7*\Delta\text{RDEXP}_{\text{Excess}it} + e_{it} \quad (2)$$

Where NIBRD_{it} is net income before R&D for firm i in year t; EXPEND_{it} is the current R&D expenditure for firm i in year t (the expense under expensing); $\text{RDEXP}_{\text{Excess}it}$ is the difference between the expense under capitalization for firm i in year t (periodic amortization plus the expensed amount of the current expenditure) and the expense under expensing for firm i in year t; (i.e., $\text{RDEXP}_{\text{Excess}it}$ = (R&D Amortization $_{it}$ + R&D Expense $_{it}$) - EXPEND $_{it}$); WD_{it} is the impairment write-down of the R&D asset in year t;[5] and DEP VAR_{it} is current annual stock return,, or future NIBRD (1 – 3 years) for firm i in year t. All accounting variables are scaled by lagged market capitalization.[6]

Equation (1) is the Full Expense model, and equation (2) is Healy et al's (2002) Successful Efforts (SE) model. Healy et al examine the relevance vs objectivity tradeoff of R&D capitalization by comparing the R^2's of (2) vs (1). An R^2 of (2) significantly greater than (1) indicates that relevance offsets any potential lack of reliability. Based on Healy et al, our first hypothesis is, in null form:

H1: The explanatory power of the Successful Efforts model is equal to the explanatory power of the Full Expense model.

[5] We do not include ΔWD in (2), because there are few write-downs, so in almost all cases, WD = ΔWD.
[6] As Lev and Sougiannis (1996) point out, simultaneity may affect the results of models like (1) and (2), when future income is regressed against current R&D. For example an exogenous shock may cause an increase in both current R&D and future income, so R&D is not exogenous. Simultaneity is not a problem for us, since we are using (1) and (2) as predictive models; so, it does not matter what the source of R&D's predictability is.

3.2 Value Relevance of Capitalized vs Expensed Components of R&D Expenditures

For our second analysis, we examine whether the market values the decomposition of the current R&D expenditure into its capitalized vs expensed components, using the following model:

$$\text{DEP VAR}_{it} = c_0 + c_1*\text{NIBRD}_{it} + c_2*\text{CAP}_{it} + c_3*\text{EXP}_{it} + c_4*\Delta\text{NIBRD}_{it} + c_5*\Delta\text{CAP}_{it} + c_6*\Delta\text{EXP}_{it} + c_7*\text{WD}_{it} + c_8*\text{RDEXP}_{\text{Excessit}} + c_9*\Delta\text{RDEXP}_{\text{Excessit}} + e_{it} \quad (3)$$

Where CAP_{it} and EXP_{it} are the amounts of the current R&D expenditure that are capitalized and expensed under capitalization for firm i in year t, respectively (i.e., $\text{EXPEND}_{it} = \text{CAP}_{it} + \text{EXP}_{it}$); All other variables are as above.

Equation (3) starts with Healy et al's Successful Efforts model, and decomposes current R&D expenditures into their expensed vs capitalized portions. We refer to this as our "Decomposition model". Empirical models of capitalization, such as Sougiannis (1994), Lev and Sougiannis (1996), Chambers et al (1998), and Chan et al (2001) assume that a fixed percentage (often 100%) of current R&D expenditures is capitalized. This percentage may be allowed to differ across industries, but it is assumed to be identical for all firms in an industry and constant over time (since the estimation is done on pooled industry observations). However, one of the most important pieces of information in the successful efforts model is the breakdown of current expenditures between the amounts capitalized vs expensed, which differs both across firms and over time. This information is valuable, because the capitalized amount, by definition, relates to expenditures on products that have passed a feasibility threshold (see Section 4, below), and thus are more certain to enhance the firm's value (than expensed costs). Alternatively, if firms manage the decomposition (for example, to manage earnings), the data's lack of reliability may exceed their relevance. Thus, we are interested in whether the two components of R&D expenditures have different associations with returns and earnings, and we test the following hypothesis, in null form.

H2: The coefficients on the two expenditure components are equal; i.e., $c_2 = c_3$.

Although we expect the capitalized portion to be more value relevant, as implied by passing the feasibility test, we use a two-sided alternative to be conservative.

In Healy et al's model, the superiority of the Successful Efforts model over the Full Expense model is due to the information conveyed by write-downs of capitalized R&D assets. Indeed, Healy et al show that even when earnings are managed by delaying write-downs (if unmanaged earnings or earnings changes are negative), the Successful Efforts model has greater explanatory power than the Full Expense model. However, in the "real world", write-downs, if they are anticipated due to other information, might not convey much information. Thus, we also focus on the WD coefficient in equations (2) and (3), and we test the following (null) hypothesis.

H3: The coefficient on write-downs is zero, i.e., $b_5 = 0$ (equation 2), or $c_7 = 0$ (equation 3).

As above, we use a two-sided alternative to be conservative.

3.3 Does Capitalization Reveal New Information (Affect Stock Prices)?

For our fourth and fifth analyses, we examine whether the market could deduce the unrecognized capitalization information under expensing, or whether the capitalization information was truly new to the market: in other words, whether the new information affected share prices. Even if the capitalization variables have information content, it is possible that the market could have deduced this unrecognized information for expensers, using other firm, industry, and market level information. In this case, the information was already known, and the firm's recognition of these variables would not add new information to the market, and the information would not affect prices.

As Healy et al (2002) point out, theirs and all previous studies assume that the R&D accounting method does not affect economic values. However, if the market could not deduce the unrecognized information, then capitalization may affect stock prices, which would attest to the importance of the disclosure of the capitalization information for valuation. Consistent

with this idea, Aboody and Lev (2000) find that insider trading gains in R&D intensive firms are greater than in non-R&D firms, which they attribute at least in part, to information asymmetry due to R&D expensing in the U.S. Thus, we want to examine whether the market could infer the unrecognized capitalization information; i.e., whether capitalization affects stock prices. To do this, we conduct two tests, one a value relevance regression using switchers' pro forma capitalization data, and the other a regression comparing changes in switchers' vs capitalizers' bid-ask spreads.

3.3.1 Pro-Forma Tests

When the UK switched to IFRS, firms that had expensed R&D, which was permitted under UK GAAP, were now required to capitalize it. In the first year of IFRS adoption, these "switcher" firms were required to disclose pro-forma values of their capitalized R&D assets for the last year under UK GAAP; i.e., the data was disclosed in the first IFRS year, but it pertained to the previous (last UK GAAP) year. Using these pro-forma data as independent variables and stock returns in the last UK GAAP year as the dependent variable, we estimate equations (2) and (3), above, using interactive terms to distinguish firms that switched vs firms that had always capitalized. Since switchers only have one year of pro-forma data, we can estimate the regressions in the levels only (in 2I and 3I, I indicates interactive).[7]

$$RET_{it} = b_0 + b_1*SWITCH_i + b_2*NIBRD_{it} + b_3*SWITCH_i*NIBRD_{it} + b_4*EXPEND_{it} + b_5*SWITCH_i*EXPEND_{it} + b_6*WD_{it} + b_7*SWITCH_i*WD_{it} + b_8*RDEXP_{Excessit} + b_9*SWITCH_i*RDEXP_{Excessit} + e_{it} \quad (2I)$$

$$RET_{it} = c_0 + c_1*SWITCH_i + c_2*NIBRD_{it} + c_3*SWITCH_i*NIBRD_{it} + c_4*CAP_{it} + c_5*SWITCH_i*CAP_{it} + c_6*EXP_{it} + c_7*SWITCH_i*EXP_{it} + c_8*WD_{it} + c_9*SWITCH*WD_{it} + c_{10}*RDEXP_{Excessit} + c_{11}*SWITCH_i*RDEXP_{Excessit} + e_{it} \quad (3I)$$

Where $SWITCH_i$=1 for firms that switched to capitalization under IFRS, and zero otherwise.

[7] We do an association test, because we cannot examine the stock market's response to the announcement of switchers' capitalization information, because the announcement date is unknown.

If the market could infer switchers' undisclosed pro-forma information under UK GAAP, we expect no difference in the association between returns and the capitalization data for the two groups. However, if the market could not infer switchers' pro-forma information, the association between the capitalization data and returns should be stronger for the capitalizers.

Thus, our fourth hypothesis is, in null form:

H4: Switchers and capitalizers had the same association between contemporaneous returns and the capitalization variables in the year before IFRS adoption; i.e., $b_7 = 0$ *and* $b_9 = 0$ *in (2I) and* $c_5 = 0$, $c_7 = 0$ $c_9 = 0$, *and* $c_{11} = 0$ *in (3I).*[8]

Note that in estimating (2I) and (3I), we are not comparing the value relevance of recognition vs disclosure, as is traditionally done in accounting research (for example, Espahbodi et al (2002)), since we are testing whether the pro-forma data was value relevant in the *previous* year, *before* it was disclosed.

To be sure that any differences we find are due to the (lack of) capitalization information and not to innate differences between the firms in the two groups, we also estimate (2I) and (3I) (compare the association between contemporaneous returns and the capitalization variables) in the first IFRS year. Since both groups capitalize under IFRS, the market has "real time" capitalization information, so we expect no difference in the return association between the two groups under IFRS (i.e., coefficients on the interaction terms should be zero), if information differences drive results in the last UK GAAP year.

3.3.2 Analysis of Changes in Bid-Ask Spreads

For our fifth and final analysis, we compare the change in switchers' vs capitalizers' bid-ask spreads from the last UK GAAP year to the first IFRS year:

[8] We do not make hypotheses about the coefficients on SWITCH*NIBRD and SWITCH*EXPEND because NIBRD and EXPEND were observable for all firms under UK GAAP.

$$\Delta\text{Bid-Ask Spread}_i = d_0 + d_1*\text{SWITCH}_i + \text{controls}_i + e_i \quad (4)$$

Consistent with prior literature (Cheng et al, 2013), we use changes in price, market value, return volatility and trading volume as control variables.

Bid-ask spreads are a measure of liquidity, and a fundamental result in accounting research is that increased disclosure (information) increases liquidity, and thus reduces bid-ask spreads. If the market could have inferred switchers' capitalization information under UK GAAP, the switch to capitalization would not have resulted in an increase in information, and there should be no change in relative bid-ask spreads for the two groups. Alternatively, if the switch to capitalization revealed new information, switchers' bid-ask spreads should decrease relative to capitalizers.

Our coefficient of interest in (4) is d_1, the coefficient on the Switch dummy variable. If d_1 is negative, then the switch to capitalization under IFRS caused switchers' bid-ask spreads to decrease relative to capitalizers, implying that capitalization increased liquidity, by revealing new information to the market.

Thus, our fifth hypothesis is, in null form:

H5: The switch to IFRS had no effect on the relative bid-ask spreads of switchers vs capitalizers, i.e., $d_1=0$.

Again, we use a two-sided alternative to be conservative.

Our key assumption in testing H4 and H5 is that even though switchers' capitalization information was unknown in the last year before IFRS adoption, if the market could have inferred it, then it would have been reflected in switchers' contemporaneous stock prices and bid-ask spreads. In this case, the return association should be the same for both switchers and capitalizers in the last UK GAAP year (H4) and there would be no change in the relative bid-ask spreads of the two groups from the last UK GAAP year to the first IFRS year (H5). However, if the market could not infer this information, then it would not have been reflected

in switchers' stock prices or B-A spreads. Switchers' return association should be lower than capitalizers' and switchers' bid-ask spreads should fall relative to capitalizers. In other words, had the market known this information in the last year before IFRS adoption, switcher firms' stock prices would have been different.

4. Data and Sample

Our sample consists of UK firms, because with the adoption of IFRS, capitalization of development 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].[9] Thus, by examining UK firms under IFRS, we are able to study the effect of capitalization in a major capital market, without being concerned about endogeneity (self-selection).[10]

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 – 2013. We begin in 2002 since 2005 was the first year of IFRS adoption and we examine up to three years of data under UK GAAP for our value relevance

[9] For our sample firms there is variation in the year in which they adopted IFRS dependent on the exchange on which they are traded. Specifically, EU Regulation No. 1606/2002 required that the consolidated financial statements of European companies whose securities traded on a regulated market (e.g., the London Stock Exchange) be prepared under IFRS for fiscal years beginning on or after January 1, 2005. The listing requirements of the Alternative Investment Market (AIM), which is not considered a regulated market by the EU, required European firms to adopt IFRS for fiscal years beginning on or after January 1, 2007. One of our AIM listed sample firms (Forbidden Technologies Plc) delayed adopting IFRS until their 2009 fiscal year,

[10] Research expenditures must be expensed. Only development expenditures may be capitalized. We use the term R&D to maintain consistency with the literature.

tests, and we end in 2013 to ensure comparable number of years in the sample before and after IFRS adoption (see below for the specific sample selection for each of our tests). 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, as well as any impairment write-downs.

From our larger sample, we then create our initial sample for the information content tests by including all firms that disclosed either an R&D asset or R&D expense under IFRS in any year t = 2005 – 2013 (Panel A). This step results in 3,892 firm-year observations (750 firms). We remove 101 firm-year observations that have missing lagged R&D expenditures. We also remove 401 firm-year observations (69 firms) with missing accounting and financial data. Our final sample for the information content tests has 3,390 firm-year observations (681 firms).

To construct our sample for the pro-forma and changes in bid-ask tests, we restrict our larger sample to only include data for the years 2004 – 2009 (Panel B). We begin in 2004 as this is the last year before some firms adopted IFRS, and we end in 2009 as this is the last year of IFRS adoption by our sample firms. We first remove 830 firm-year observations (126 firms) due to missing accounting and financial data needed to construct our variables. We then identify the IFRS adoption year for each firm. We remove 260 firm-year observations (127 firms) as these firms never adopted IFRS (i.e., they stopped trading before IFRS adoption); similarly we remove 448 firm-year observations (183 firms) that have always used IFRS (i.e., they began trading after the adoption of IFRS in the UK). For the remaining firms, we only keep two years of data (IFRS adoption year and the last year of UK GAAP), therefore, we remove 1,316 firm-year observations that are outside this two year window.

Finally, we remove 398 firm-year observations (199 firms) that have zero capitalization in their first year under IFRS.[11]

Our final step in sample construction for the pro-forma and bid-ask change tests is to identify our two primary sub-groups of firms by reviewing their method of accounting for R&D under UK GAAP and IFRS. This analysis resulted in: (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'). Our base sample has 224 firms (448 firm-year observations); 138 firms (276 firm-year observations) are classified as switchers and the remaining 86 firms (172 firm-year observations) are classified as capitalizers.

The pro-forma data for the last year under UK GAAP for the switchers is hand collected from their first IFRS annual report. In the intangible note these firms disclosed their R&D asset balances including the beginning and ending net-book value, the amount capitalized and amortized during the year, any amounts written-off during the year and any other adjustments (e.g., foreign currency translations). For comparative reasons, the prior year (i.e., last UK GAAP year) data are also disclosed. Since the prior year amounts must also be computed using IFRS, this is what gives us our pro-forma data. These amounts were not disclosed in the last year under UK GAAP as the full R&D expenditure was expensed. The pro-forma R&D expense is collected in a similar fashion, but it is typically reported either in the note disclosure discussing operating expenses, or on the income statement itself. To the best of our knowledge, ours is the first paper to use these pro-forma data.

Bid-ask spreads are calculated as the yearly average of the daily bid-ask difference scaled by the ask (ask – bid)/ask. The change in bid-ask spread is defined as the bid-ask

[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.

spread for the year starting 3 months after the first IFRS fiscal year end minus the bid-ask spread for the year starting 3 months after the beginning of the last UK GAAP fiscal year. The controls in equation (4) are the changes in PRC, MV, Retvol, and Vol defined for the same period as the dependent variable. PRC is the average daily price; MV is the average daily market value of equity; RetVol is the standard deviation of daily returns; and Vol is the average daily trading volume scaled by number of shares outstanding.

Table 2 shows the industry breakdown of both samples. In total there are eighteen industries represented ranging from automobiles and parts to utilities. For both samples, the majority of the firms are concentrated in three industries: healthcare, industrial goods and services, and technology; 68% (81%) of the sample firms are in these three industries for the information content sample (pro-forma sample). Within the pro-forma sample, 86% of the switchers and 73% of the capitalizers are in these three industries. 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 in the value relevance tests are all adjusted by subtracting the annual industry median.

Table 3, Panel A reports descriptive statistics of the variables used in the information content tests. It is notable that most of our sample firms' R&D expenditure (average of 9% of beginning market value) is expensed immediately (7% of beginning market value), with only a small portion capitalized (2% of beginning market value). Oswald (2008) reports similar findings for his sample of capitalizers under UK GAAP who immediately expense around 80% of their R&D expenditure. Additionally, Aboody and Lev (1998) report a capitalization intensity (the percentage of R&D expenditure that is capitalized) of between 8% - 29% over the period 1987 -1995 for U.S. software firms. During our sample period there are 212 write-downs, about 6% of the observations. The mean (median) write-down is £2 million (£550,000) (result not tabulated). Thus, overall, write-downs are a small component of firm

value. Mean contemporaneous annual returns are 11%. By comparison, the mean annual return on the FTSE All-Share Index over 2005-2013 was 9.8% (http://www.swanlowpark.co.uk/ftseannual.jsp), so our firms were just over 1% higher, consistent with R&D firms being riskier than average. Finally, most of the variables have extreme observations; to mitigate their effect, we winsorize 0.5% on each tail in the regressions.

Table 3, Panel B reports correlations among the variables in the information content tests. Pearson (Spearman) correlations are shown above (below) the diagonal. As expected, contemporaneous returns are significantly positively correlated with NIBRD (Pearson correlation = 0.147). Consistent with our arguments, above, about the relative importance of the capitalized vs expensed components of R&D expenditures, returns are more highly correlated with CAP, and not significantly correlated with EXP (Pearson correlations of 0.071 vs 0.007). Returns are not significantly correlated with write-downs, which likely reflects the fact that write-downs are a small component of firm value, as mentioned above.

5. Test Results - Information Content Regression Models

Table 4 shows the results of the Successful Efforts and Decomposition models (equations 2 and 3).[12] Panels A shows the results for the Successful Efforts model (equation 2), using future NIBRD or current returns, respectively, as dependent variables, while Panel B shows the results of our Decomposition model (equation 3), where we decompose the R&D expenditure into its capitalized and expensed components. All variables are winsorized at 0.5% on each tail.

After reporting the coefficient estimates and t-statistics, in Panels A and B we also report:

[12] In the interest of brevity, we do not show the results of the Full Expense model (equation 1), since we are interested in the incremental effects of capitalization.

1. R^2 from a Benchmark model with only NIBRD (net income before R&D) and ΔNIBRD as independent variables;
2. R^2 from the Full Expense model (equation 1), which includes both NIBRD and EXPEND, the R&D expenditure, and their first differences, as independent variables;
3. R^2 from the Successful Efforts model (equation 2);
4. P-value for the test R^2 (Full Expense model (equation 1)) = R^2 (Benchmark model);
5. P-value for the test R^2 (Successful Efforts model (equation 2)) = R^2 (Full Expense model (equation 1));

We include the Benchmark model to calibrate the information value of R&D expenditures in the Full Expense model (equation 1).

For all four models in Panel A, current R&D expenditure in the Full Expense model adds significant explanatory power to the benchmark model with just NIBRD, as shown by the highly significant P-values for "Full Expense vs Benchmark". This is not surprising, indicating that the amount firms spend on R&D has significant information content. More important for our purposes, in all 4 regressions, the capitalization variables add significant explanatory power beyond current R&D expenditure, as shown by the significant P-values for "Successful Efforts vs Full Expense". The significant incremental R^2 of the Successful Efforts model shows that R&D capitalization meets the relevance vs objectivity tradeoff, consistent with Healy et al's (2002) simulation results, attesting to the information value of R&D capitalization.

As Healy et al point out, a major benefit of the successful efforts model is provided by R&D asset write-downs, which provide information about project success (or lack thereof). Healy et al (Table 1) report a significant negative coefficient on WD, where the dependent variable is contemporaneous return. By contrast, we find an insignificant coefficient on WD when contemporaneous return is the dependent variable (Panel A, column 4). In Healy et al's

simulations, the coefficient on write-downs is negative by construction, since write-downs represent declines in value. That is, there is no alternative information, so write-downs are not anticipated. But, in the "real world", the coefficient on write-downs (when contemporaneous return is the dependent variable) captures not only the decline in value, but how write-downs change expectations of future profits. As shown in Table 4, Panel A, write-downs are significantly positively related to future pre-R&D net income in 2 of the 3 regressions; since this relation may be somewhat anticipated, it is not surprising that we find that current returns are not significantly negatively associated with write-downs.

In addition, Healy et al report (footnote 21) that 79% of sample firm-years have write-downs in their successful efforts model. By contrast, we find only about 6% (Table 3, Panel A). This large difference in the percentage of write-downs is likely due to the fact that Healy et al assume that 100% of R&D costs are capitalized, whereas as we pointed out above, a relatively small portion of costs is capitalized. Due to the 100% capitalization, the capitalized asset is greater, and therefore more vulnerable to impairment. This evidence confirms our point above that a benefit of using archival data in R&D research is not having to assume 100% capitalization, as most previous papers have done. Finally, Healy et al assume that economic values are unaffected by deferrals of WDs. This is unlikely in reality, since although the market has alternative information, it likely isn't sure of the write-down until it actually happens. Thus, our results highlight the difference between simulations and tests with real-world (archival) data.[13]

[13] We incorporated delayed write-downs (defined as write-downs of firms with positive current income and negative prior year income after the current write-down (definition 1), or firms with positive change in current income and negative change in prior year income after the current write-down (definition 2), or a combination of both (definition3) by including an interaction term DELAY*WD in equations (2) and (3). However, there are too few delays (11 using definition 1, 38 using definition 2 and 41 using definition 3) so we did not find significant results on the interaction term, and the rest of our results were largely unchanged. These results are untabulated in the interest of brevity.

In Table 4, Panel B, we re-estimate the Successful Efforts model, decomposing the R&D expenditure into its expensed vs capitalized components (EXP and CAP in the table). As discussed above, this decomposition is important, because it reveals expenditures on projects that have passed the feasibility test, and thus are more likely (than expensed expenditures) to result in future profits. However, if firms manage this information, then its lack of reliability may compromise its relevance. In addition to the individual coefficients and t-statistics, we also report the R^2 from this Decomposition model and the P-values for the tests that the coefficients on CAP and EXP are equal. Since capitalized expenditures are closer to profitability, we expect CAP to have a higher coefficient than EXP. In all 4 models, we find that CAP has a higher coefficient than EXP. Altogether the results confirm that a primary benefit of R&D capitalization is information on capitalized vs expensed expenditures.

The effect of capitalizing rather than expensing costs is economically, as well as statistically, significant. When current return is the dependent variable (Panel B, column 4), the difference in the coefficients on CAP and EXP is 2.086 (3.017 – .931). Thus, a shift from expensed costs to capitalized costs of 1% of beginning market value (in Table 3, Panel A, mean and median values of capitalized expenditures relative to beginning market value are 0.02 and 0, respectively), is associated with an additional annual return of about 2%. The coefficients of the write-down variables are statistically insignificant (in 3 out of 4 models).

In summary, we find that R&D capitalization has information value, confirming Healy et al's (2002) simulation analysis. In other words, R&D capitalization passes the relevance vs objectivity trade-off. We also show that an important source of capitalization's information value is the decomposition of R&D expenditures into their capitalized vs expensed components. Our result is consistent with Aboody and Lev (1998), who find that when the dependent variable is future earnings, the coefficient on capitalized costs is statistically

greater than the coefficient on expensed costs. We contribute beyond Aboody and Lev (1998), by showing that capitalized costs are also more value relevant than expensed costs for explaining returns.[14] We now turn to our most important test: whether the market could infer undisclosed capitalization information under expensing.

6. Could the Market Infer the Undisclosed Capitalization Information Before IFRS?

We now address our final and most important question of whether the market could infer switchers' undisclosed capitalization information before IFRS. This is important, because even if the capitalization information is value relevant, if the market could figure it out on its own, it is not necessary to mandate its disclosure; however, if the market could not infer it, then the case for mandatory disclosure becomes more compelling. While a number of studies (Lev and Sougiannis, 1994; Aboody and Lev, 1998; Chan et al, 2001; and, Eberhart et al, 2004) argue that the market is (semi-strong form) inefficient with respect to *disclosed* R&D information[15], ours is the first paper to examine whether the market can infer *undisclosed* R&D information. Thus, our tests are fundamentally different from theirs. To address this question, we conduct two tests, one a value relevance regression using switchers' pro forma capitalization data, and the other a regression comparing changes in switchers' vs capitalizers' bid-ask spreads around the adoption of IFRS.

6.1 Regression Models with Switchers' Pro-Forma Data

While capitalizers' capitalization data was always known to the market, switchers' pro-forma data was not disclosed until after the switch to IFRS. We want to know whether the market figured out these undisclosed data under UK GAAP. If yes, then there should be no difference between the two groups, in the association between contemporaneous returns and

[14]Aboody and Lev (1998) find that when the dependent variable is returns, the coefficient on capitalized costs is higher, but they do not provide evidence of statistical significance.

[15]More recent studies such as Li (2011) and Lin and Wang (2016) find that R&D return predictability is due to a risk premium and not to market inefficiency (the famous Fama (1970) joint test).

the capitalization variables; i.e., the coefficients on the interactive variables $SWITCH_i*WD_{it}$ and $SWITCH_i*RDEXP_{Excessit}$ in (2I) and on $SWITCH_i*CAP_{it}$, $SWITCH_i*EXP_{it}$, $SWITCH_i*WD_{it}$, and $SWITCH_i*RDEXP_{Excessit}$ in (3I) should be zero. If the market could not infer these data, we expect switchers to have a lower association (i.e., negative slope coefficients on the interactions), indicating that returns are unrelated to switchers' R&D data. To ensure that any differences we find in the last UK GAAP year are due to the (lack of capitalization) information and not to innate differences between the two groups, we also estimate (2I) and (3I) in the first IFRS year, when all firms disclosed the capitalization information in "real time". If information differences drive the results under UK GAAP, then we should not find different results between the two groups under IFRS. However, if innate differences drive the results under UK GAAP, then we should continue to find different results between the two groups under IFRS. Thus, the estimation in the first IFRS year is like a placebo (falsification) test (Bertrand, Duflo, and Mullainathan, 2004), since we should not find a significant effect if our information hypothesis is true.

As pointed out above, since we have only one year of pro-forma data, we can construct only the levels of the independent variables, and not the changes. Thus, we first validate that our primary results in Table 4 hold for the levels only models (with contemporaneous returns as the dependent variable). Column 1 of each panel in Table 5 shows the results of equations (2) and (3) for our original pooled sample, with only the levels of the independent variables.[16] For both the Healy et al SE model in Panel A and the decomposition model in Panel B, we find that the capitalization variables add significantly to the explanatory power for returns; for the decomposition model in Panel B we find that the coefficient on CAP exceeds the coefficient on EXP. These results confirm the validity of the levels-only model.

[16] As in the Table 4 regressions, in Tables 5 and 6 we winsorize 0.5% at the tails.

Table 3, Panel C reports descriptive statistics of the variables used in the pro-forma tests. As previously stated, in the IFRS adoption year firms were required to report their last year of UK GAAP financial statements on a pro-forma IFRS basis to facilitate yearly comparisons. For the switchers, they had to retroactively apply IAS 38 and the determine the net book value of the R&D asset as if they had always been capitalizing their R&D. Additionally, they had to report the yearly amount of R&D capitalization and amortization and the restated R&D expense for the last year under UK GAAP. As capitalizers had always been capitalizing, we use their capitalization data from the last UK GAAP year. Both the level of R&D expenditures, and the percent capitalized vs expensed, are similar in both periods.

Table 6, Panels A and B show the results of models (2I) and (3I), where we use switchers' pro-forma capitalization data in the last UK GAAP year, and intercept and slope (interaction) dummy variables to allow the coefficients to vary between switchers and firms that always capitalized (capitalizers). Panels A and B show the results for (2I) and (3I) respectively. Columns 1 and 2 of each panel show the results for the last UKGAAP year and the first IFRS year, respectively.

We focus our discussion on the key coefficients of interest, those on the capitalization interactive terms.[17] In Panel A, the coefficient on SWITCH*$RDEXP_{Excess}$ is negative and significant (t = -2.87) in the last UK GAAP year, but this coefficient is completely insignificant in the first IFRS year (t = -0.67). This combination is consistent with our (lack of) information story for switchers; i.e., the market did not know their pro-forma data under UK GAAP, but it did under IFRS. In Panel B, we also find that the coefficient on SWITCH*$RDEXP_{Excess}$ is negative and significant, at the .10 level, under UKGAAP, but

[17] The coefficients on the write-downs (WD) are almost always insignificant, because there are few write-downs, 9 and 20 in the last UK GAAP year and the first IFRS year, respectively.

insignificant under IFRS. The coefficients on both SWITCH*CAP and on SWITCH*EXP are insignificant in both periods, so SWITCH*$RDEXP_{Excess}$ is explaining the difference between the two groups.

Since the pro-forma data have some extreme observations, as a robustness test, we follow Johnston et al (2012) and estimate (2I) and (3I) using the ranks of the observations.[18] Columns 3 and 4 of Table 6, Panels A and B show the results of the rank regressions, in the last UK GAAP year and the first IFRS year, respectively. As above, Panel A shows the results for the Healy et al SE model (2I), and Panel B shows the results for the decomposition model (3I). In Panel A, the coefficient on SWITCH*$RDEXP_{Excess}$ is negative and significant at the 10% level (t = -1.74) in the last UK GAAP year, but this coefficient is completely insignificant in the first IFRS year (t = -0.40). This combination is similar to columns 1 and 2, and is consistent with our (lack of) information story for switchers; i.e., the market did not know their pro-forma data under UK GAAP, but it did under IFRS.[19] In Panel B, the coefficients on SWITCH*CAP and SWITCH*$RDEXP_{Excess}$ are both significantly negative in the last UK GAAP year (t = -2.01 and -2.19, respectively) and insignificant in the first IFRS year (t = -0.66 and -0.19, respectively). This combination, combined with the results in Table 6, Panel A, is consistent only with the information story. Thus, the results in Table 6 imply that the most likely explanation for our findings is that market could not infer switchers' undisclosed pro-forma capitalization under UK GAAP. Only the switch to IFRS, mandating

[18] Kraft et al (2006) advocate the use of rank transformations, which are also used by Rangan and Sloan (1998) and by Hutton, Miller, and Skinner (2003). The coefficients of the regression on the ranks cannot be interpreted like the coefficients of the original regression. However, this is not a problem for us, as we are concerned only with the sign and statistical significance of the coefficients on the interactive terms.
We also estimated the information content regressions in Tables 4 and 5 with ranked observations, and results are very similar to those reported in the paper. These are untabulated in the interest of brevity.

[19] In columns 2, 3, and 4 of Table 6, Panel A, the coefficients on SWITCH*EXPEND are significantly negative. This can't be due to information differences, because the market knew both groups' R&D expenditures in real time. Thus, it is likely due to group differences.

that these firms capitalize their development expenditures, enabled the market to know their capitalization information. In other words, capitalization of R&D affects stock prices.[20]

6.2 Regressions Comparing Changes in Bid-Ask Spreads

Table 7, Panel A reports descriptive statistics for the variables in our bid-ask (B-A) spread analysis. Since we do not know exactly when the market learned the capitalization information for switchers, we measure bid-ask spreads and related variables over a year starting 3 months after year-end, to be confident that the information is incorporated in the spreads. We show separate statistics for capitalizers and switchers, since we want to compare how the two groups' spreads changed.

Table 7, Panel A shows that capitalizers' B-A spreads increased by an average of .048 (.147 - .099) from the last UK GAAP year to the first IFRS year, while switchers' B-A spreads increased by an average of only .017 (.072 - .055). Median results show an even stronger difference, .087 change for capitalizers and .003 change for switchers.[21] Consistent with Hypothesis 5, switchers' B-A spreads fell relative to capitalizers.

In addition to R&D capitalization, we examine the six other accounting changes most affected by the switch from UK GAAP to IFRS (Horton and Serafeim, 2010). Specifically, these changes were related to accounting for leases, pensions, stock option compensation, deferred taxes, goodwill, and derivatives. Since changes to these accounts may affect the information environment, and since switchers and capitalizers may differ along these dimensions, we must control for these changes. We do this by adding indicator (dummy) variables to equation (4) for each of the six accounts, where the dummy equals 1 (0) if a firm

[20] To be sure that switchers experienced no concurrent changes in their R&D behavior that might affect our results, we compared their R&D expenditures and their R&D expense (both relative to beginning of year equity market value) in the last UK GAAP year vs the first IFRS year (R&D expense in last UK GAAP is the pro-forma figure). We find no differences in the means or medians in either variable between the two years, increasing our confidence in our information interpretation of the results in Table 6, Panel B.

[21] The increase in bid-ask spreads for both capitalizers and switchers from the UK GAAP period to the IFRS period is consistent with an increase in the average daily bid-ask spreads for the UK market from 0.07in 2004 to 0.15 in 2009.

disclosed in its reconciliation between IFRS and UK GAAP that their accounts were impacted by the particular accounting item (did not disclose in the reconciliation), and we estimate the following regression model:

$$\Delta\text{B-A Spread}_i = d_0 + d_1*\text{SWITCH}_i + \sum d_k*\text{IFRS}_{ik} + \text{controls}_i + e_i \quad (5)$$

Where IFRS is a dummy variable for each of the six accounts (i.e., k = 1…6).

Table 7, Panel B shows the percentage of capitalizers and switchers that has each of the six accounts, and p-values for the difference in the percentage between the two groups. Since the percentage is statistically different for all accounts except Goodwill, it is important to control for these accounts affected by IFRS.

Table 7, Panel C reports the results of equation (5). Since switchers and capitalizers may differ, we use both raw and entropy balanced (Hainmueller, 2012) samples, in columns 1 and 2, respectively. The entropy balanced sample is formed after matching capitalizers and switchers in the year before IFRS adoption on the following matching covariates: size (MVE), R&D intensity (RD/TA), leverage (LEV), age (AGE) and steady-state (STATE). They are statistically significant determinants of the capitalization choice in our estimation of Oswald's (2008) model. As in all our previous regressions we winsorize 0.5% at the tails.

For both samples, Table 7, Panel C shows that the coefficient on SWITCH is significantly negative, indicating that switchers' bid-ask spreads fell relative to capitalizers, when the UK switched to IFRS. Since we control for the other IFRS changes, the relative decline in switchers' spreads was most likely due to the disclosure of their previously unknown capitalization information. The coefficient on SWITCH, which represents the average change in switchers' bid-ask spreads relative to capitalizers' (controlling for the other regressors), shows that R&D capitalization was a major factor in the difference between the two groups. This is likely due to the new information revealed by capitalization, as discussed above. Thus, the bid-ask results in Table 7 support the pro-forma results in Table 6, both indicating

that the market could not infer switchers' capitalization information before IFRS, and that the disclosure of the information affected prices. Our results are consistent with Aboody and Lev (2000), who argue that insider gains in R&D intensive firms are due, at least to some extent, to the information asymmetry created by R&D expensing.

Finally, we conduct two placebo (falsification) tests (Bertrand, Duflo, and Mullainathan, 2004) using pseudo-event dates to analyze changes in bid-ask spreads. In the first, we shift the adoption year back by two years so that both the pre and post periods are entirely within the UK GAAP period. In the second, we shift the adoption forward by two years so that both the pre and post periods as entirely within the IFRS period. The bid-ask spread changes and the changes in the independent variables around the placebo adoption year are defined consistently with those in the main test in Table 7. 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. However, if our hypothesis is correct that the relative decline of Switchers' B-A spreads is due to the change to IFRS, we should not find significant results with the placebos, since there was no mandatory accounting change during either test period.

The regressions for the placebo tests are the same as equation (5), but with the pre and post periods defined as at the beginning of the previous paragraph. The results are shown in Table 8. Columns 1 and 2 are for the UK GAAP period, raw data and entropy balanced data, respectively; columns 3 and 4 are for the IFRS period, raw and entropy balanced, respectively. For all four regressions, the coefficients on SWITCH are insignificant. This increases our confidence in our interpretation of our main results: mandatory capitalization

caused new information to be revealed to the market, resulting in the relative decline of switchers' bid-ask spreads compared to capitalizers'.

7. Conclusion

We examine the information benefits of R&D capitalization in the UK since it adopted IFRS (which mandates capitalization of development costs) in 2005. Under expensing the expense equals the expenditure, and there is no other required recognition or disclosure. Under capitalization, the expenditure is disaggregated into an expensed component and a capitalized component, and the firm recognizes both an asset and its periodic amortization, and if necessary, the asset write-down (impairment charge). Using the successful efforts model of Healy et al (2002), we examine whether the capitalization information helps to explain current stock returns, and to predict future earnings, and whether the market values the decomposition of R&D expenditures into their expensed vs capitalized components. We also examine whether the market could deduce the unrecognized capitalization information under expensing; i.e., whether the information affects share prices, by examining the market's pricing of pro-forma capitalization information from the year before IFRS, and by comparing that change in capitalizers' vs switchers' bid-ask spreads around the switch to IFRS.
Our paper is the first to study the information value of R&D capitalization with archival data for multiple industries, in an important, major capital market, and the first to examine whether the market could infer R&D capitalization information without it being disclosed.

We contribute three main results. First, we find that the capitalization variables have significant explanatory power for both returns and earnings, confirming with "real world" data the relevance vs reliability tradeoff found by Healy et al (2002) in their simulations. Second, we find that capitalized expenditures are more value relevant than expensed expenditures, which has not been appreciated before. This shows that a key information

benefit of R&D capitalization is the splitting of costs into their expensed vs capitalized components, which reveals evidence about projects that have passed the feasibility threshold. Finally, and most importantly, we find evidence that the market could not figure out the capitalization information unless it is disclosed; i.e., firms' switch to capitalization under IFRS revealed new information to the market and affected share prices. Together, these results attest to both the importance of the capitalization information, and make a compelling case for increased disclosure about firms' R&D investments.

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Table 1
Sample Observations

Panel A: Information Content Sample[a]

	# Observations	#Firms
Initial Sample (2005 - 2013)	3,892	750
Remove:		
Missing lagged R&D data	(101)	(0)
Missing Accounting / Financial Data	(401)	(69)
Information Content Sample	3,390	681

Panel B: Pro-Forma Bid-Ask Samples[b]

	# Observations	#Firms
Initial Sample (2004 - 2009)	3,700	859
Remove:		
Missing Accounting / Financial Data	(830)	(126)
Firms that never adopted IFRS	(260)	(127)
Firms with no UK GAAP data	(448)	(183)
Outside two year IFRS adoption window	(1,316)	(0)
Firms that never capitalize under IFRS	(398)	(199)
Pro-Forma Bid-Ask Samples	448	224
Switchers[c]	276	138
Capitalizers[c]	172	86

[a]The information content sample consists of all firm-year observations over the period 2005-2013 with R&D data and available accounting and financial data.

[b]The pro-forma and Bid-Ask samples consists of two observations per firm centered on the firm's IFRS adoption year with available R&D data, and other accounting and financial data.

[c]Switchers are firms that switched from expensing R&D under UK GAAP to capitalizing R&D under IFRS. Capitalizers are firms that capitalized R&D under both UK GAAP and IFRS.

Table 2
Industry Membership[a]

Industry	Information Content Sample	Pro-forma & B-A Samples	
		Switchers	Capitalizers
Automobiles & Parts	8	1	2
Banks	2	1	0
Basic Resources	6	1	1
Chemicals	25	2	3
Construction & Materials	14	2	2
Financial Services	18	0	4
Food & Beverage	19	3	0
Healthcare	107	16	11
Industrial Goods & Services	176	37	28
Media	24	2	3
Oil & Gas	23	1	1
Personal & Household Goods	23	4	3
Real Estate	2	0	0
Retail	11	0	1
Technology	182	65	24
Telecommunications	14	0	2
Travel & Leisure	14	1	1
Utilities	13	2	0
Total Number of Firms	681	138	86

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

Table 3
Descriptive Statistics

Panel A: Variables for the Information Content Tests[a]

	N	Min	25th Pctl	Mean	Median	75th Pctl	Max
Ret (-9,+3)	3,390	-0.97	-0.30	0.11	0.03	0.35	10.92
NIBRD	3,390	-7.30	-0.02	0.03	0.07	0.13	10.01
EXPEND	3,390	0.00	0.01	0.09	0.04	0.10	11.05
CAP	3,390	0.00	0.00	0.02	0.00	0.02	2.85
EXP	3,390	0.00	0.00	0.07	0.02	0.07	11.05
RDCAP	3,390	0.00	0.00	0.05	0.00	0.03	4.92
AMORT	3,390	0.00	0.00	0.02	0.00	0.01	3.23
WD	212	0.00	0.00	0.04	0.01	0.03	0.69

Table 3 - Continued
Descriptive Statistics

Panel B: Pearson (Spearman) correlations above (below) the diagonal

	Ret (-9,+3)	NIBRD	EXPEND	CAP	EXP	RDCAP	AMORT	WD
Ret (-9,+3)		0.147***	0.030*	0.071***	0.007	0.072***	0.058***	0.013
NIBRD	0.412***		-0.163***	-0.064***	-0.153***	-0.134***	-0.019	-0.113***
EXPEND	0.021	0.209***		0.371***	0.944***	0.279***	0.199***	0.040**
CAP	0.024	0.117***	0.314***		0.045***	0.673***	0.412***	0.100***
EXP	0.036**	0.216***	0.773***	-0.162***		0.062***	0.068***	0.008
RDCAP	0.029*	0.085***	0.177***	0.767***	-0.208***		0.637***	0.177***
AMORT	0.049***	0.134***	0.206***	0.791***	-0.173***	0.856***		0.080**
WD	-0.034**	-0.031*	0.049***	0.206***	-0.020	0.274***	0.208***	

Panel C: Variables for the Pro-forma Tests[b]

UK GAAP	N	Min	25th Pctl	Mean	Median	75th Pctl	Max	Stdev
EXPEND	224	0.000	0.014	0.076	0.039	0.091	1.596	0.137
CAP	224	0.000	0.000	0.026	0.006	0.020	0.630	0.070
EXP	224	0.000	0.002	0.050	0.020	0.066	0.966	0.088
$RDEXP_{Excess}$	224	-0.410	-0.010	-0.009	-0.002	0.000	0.292	0.048

IFRS	N	Min	25th Pctl	Mean	Median	75th Pctl	Max	Stdev
EXPEND	224	0.000	0.015	0.078	0.039	0.097	1.345	0.133
CAP	224	0.000	0.002	0.032	0.013	0.037	0.496	0.057
EXP	224	0.000	0.000	0.046	0.015	0.055	0.849	0.093
$RDEXP_{Excess}$	224	-0.322	-0.021	-0.011	-0.006	0.000	1.437	0.104

Table 3 - Continued
Descriptive Statistics

[a]Panel A reports the number of observations (N) and the descriptive statistics for the variables used in the information content tests. Ret (-9,+3) is stock return over the period 9 months before fiscal year end to 3 months after fiscal year end; NIBRD is net income before R&D in the current year t; EXPEND is the amount of current R&D expenditure in year t; CAP is the current amount of R&D capitalized in year t; EXP is the current amount of R&D expense in year t; RDCAP is the net book value of the capitalized R&D asset (net of accumulated amortization) in year t; AMORT is the periodic amortization expense in year t; WD is the impairment write-down of the R&D asset in year t; All accounting variables are scaled by lagged market value.

[b]Panel B reports Pearson (Spearman) correlation coefficients above (below) the diagonal. In calculating the correlations, WD is set to zero for firm-years with no impairment write-down.

[c]Panel C reports the number of observations (N) and the descriptive statistics for the variables used in the pro-forma tests.

Table 4
Information Content Tests[a]

Panel A: Successful Efforts model – Future Earnings and Current Returns as Dependent Variable

	NIBRD - 1 yr	NIBRD - 2 yr	NIBRD - 3 yr	Ret (-9,+3)
NIBRD	0.327***	0.388**	0.576**	0.277**
	(3.67)	(3.48)	(2.73)	(3.17)
ΔNIBRD	-0.126*	-0.125	-0.137	0.131**
	(-2.11)	(-1.44)	(-0.82)	(3.05)
EXPEND	0.629***	1.727***	2.112***	1.178***
	(4.76)	(6.22)	(4.50)	(5.04)
ΔEXPEND	0.001	0.509	0.851	-0.235
	(0.01)	(1.09)	(0.94)	(-0.47)
WD	1.224*	1.055	3.621**	0.254
	(2.01)	(1.01)	(3.17)	(0.28)
$RDEXP_{Excess}$	0.935	2.215**	1.074	0.574
	(1.59)	(2.94)	(1.14)	(1.15)
$\Delta RDEXP_{Excess}$	0.156	0.490	2.058**	0.307
	(0.56)	(0.85)	(2.89)	(0.58)
Observations	2,705	2,118	1,624	3,295
Firm_FE	Yes	yes	Yes	yes
Year_FE	Yes	yes	Yes	yes
Benchmark R^2	0.538	0.645	0.682	0.291
Full Expense R^2	0.551	0.675	0.719	0.311
Successful Efforts R^2	0.565	0.696	0.729	0.312
Full Expense vs Benchmark	0.000	0.000	0.000	0.000
Successful Efforts vs Full Expense	0.000	0.000	0.000	0.000

Table 4 - Continued
Information Content Tests[a]

Panel B: Decomposition model – Future Earnings and Current Returns as Dependent Variable

	NIBRD - 1 yr	NIBRD - 2 yr	NIBRD - 3 yr	Ret (-9,+3)
NIBRD	0.327***	0.406**	0.542**	0.277**
	(3.52)	(3.44)	(3.00)	(3.26)
ΔNIBRD	-0.130	-0.143	-0.145	0.121**
	(-1.83)	(-1.58)	(-0.91)	(3.13)
CAP	1.198*	3.525***	5.616**	3.017***
	(2.02)	(3.76)	(3.63)	(4.40)
EXP	0.682***	1.640***	1.971***	0.931***
	(3.80)	(5.48)	(4.35)	(3.90)
ΔCAP	-1.583*	-0.126	-1.965	-0.642
	(-2.22)	(-0.06)	(-0.62)	(-0.59)
ΔEXP	-0.037	0.453	0.885	-0.169
	(-0.17)	(1.02)	(1.07)	(-0.39)
WD	0.924	0.509	2.593*	-0.213
	(1.58)	(0.54)	(2.14)	(-0.23)
$RDEXP_{Excess}$	0.812*	2.055**	2.295**	0.636
	(2.03)	(3.69)	(2.63)	(1.24)
$\Delta RDEXP_{Excess}$	-0.700	0.307	0.020	0.443
	(-1.50)	(0.22)	(0.01)	(0.56)
Observations	2,615	2,066	1,574	3,295
Firm_FE	yes	yes	Yes	Yes
Year_FE	yes	yes	Yes	Yes
Decomposition model R^2	0.578	0.705	0.741	0.318
CAP=EXP	0.008	0.000	0.000	0.000

Table 4 - Continued
Information Content Tests[a]

[a]This table reports the coefficient estimates, t-statistics and R^2 from the Successful Efforts model (Panel A): $DEP\ VAR_{it} = b_0 + b_1*NIBRD_{it} + b_2*EXPEND_{it} + b_3*\Delta NIBRD_{it} + b_4*\Delta EXPEND_{it} + b_5*WD_{it} + b_6*RDEXP_{Excessit} + b_7*\Delta RDEXP_{Excessit} + e_{it}$, and the Decomposition model (Panel C): $DEP\ VAR_{it} = c_0 + c_1*NIBRD_{it} + c_2*CAP_{it} + c_3*EXP_{it} + c_4*\Delta NIBRD_{it} + c_5*\Delta CAP_{it} + c_6*\Delta EXP_{it} + c_7*WD_{it} + c_8*RDEXP_{Excessit} + c_9*\Delta RDEXP_{Excessit} + e_{it}$. Panel A also reports the R^2 from the Benchmark model: $DEP\ VAR_{it} = a_0 + a_1 NIBRD_{it} + a_2 \Delta NIBRDit + e_{it}$, and the Full Expense model: $DEP\ VAR_{it} = a_0 + a_1*NIBRD_{it} + a_2*EXPEND_{it} + a_3*\Delta NIBRD_{it} + a_4*\Delta EXPEND_{it} + e_{it}$.

The dependent variable ($DEP\ VAR_{it}$) is firm's i's future cumulative net income before R&D (NIBRD) over one, two and three years or contemporaneous returns. NIBRD - 1 yr is net income before R&D in year t+1; NIBRD - 2 yr is the cumulative net income before R&D in years t+1 and t+2; NIBRD - 3yr is the cumulative net income before R&D in years t+1 to t+3; Ret (-9,+3) is stock return over the period 9 months before fiscal year end to 3 months after fiscal year end; $NIBRD_{it}$ is net income before R&D for firm i in year t; $EXPEND_{it}$ is the amount of current R&D expenditure for firm i in year t; CAP_{it} is the current amount of R&D capitalized for firm i in year t; EXP_{it} is the current amount of R&D expense for firm i in year t; $RDCAP_{it}$ is the net book value of the capitalized R&D asset (net of accumulated amortization) for firm i in year t; WD_{it} is the impairment write-down of the R&D asset for firm i in year t; $RDEXP_{Excessit}$ is the difference between the expense under capitalization and expense under expensing for firm i in year t.

The Full Expense vs Benchmark and Successful Efforts vs Full Expense rows (Panel A) report the P-value from comparing the R^2 from the respective regressions. The Decomposition vs Successful Efforts row (Panel B) reports the P-value from comparing the R^2 from the respective regressions. The CAP = EXP row reports the p-values from testing the coefficient restrictions in the Decomposition regressions.

Standard errors are clustered by firm and year.

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

Table 5
Information Content Tests – Levels Specification[a]

Panel A: Successful Efforts

	Ret (-9,+3) raw	Ret (-9,+3) Ranked
NIBRD	0.353***	0.462***
	(3.41)	(8.74)
EXPEND	1.231***	0.229***
	(5.07)	(3.40)
WD	0.252	0.090
	(0.21)	(1.12)
$RDEXP_{Excess}$	0.692	0.039
	(1.57)	(0.74)
Observations	3,295	3,295
Firm_FE	yes	Yes
Year_FE	yes	Yes
Benchmark R^2	0.285	0.727
Full Expense R^2	0.306	0.734
Successful Efforts R^2	0.308	0.735
Full Expense vs Benchmark	0.000	0.000
Successful Efforts vs Full Expense	0.000	0.000

Table 5 - Continued
Information Content – Levels Specification Tests[a]

Panel B: Decomposition model

	Ret (-9,+3) raw	Ret (-9,+3) Ranked
NIBRD	0.341***	0.469***
	(3.38)	(8.79)
CAP	3.013***	0.145*
	(4.13)	(1.83)
EXP	0.994***	0.108*
	(4.12)	(1.70)
WD	-0.172	0.065
	(-0.14)	(0.67)
$RDEXP_{Excess}$	0.831	0.056
	(1.58)	(0.88)
Observations	3,295	3,075
Firm_FE	yes	yes
Year_FE	yes	yes
Decomposition model R^2	0.313	0.737
CAP=EXP	0.000	0.673

Table 5 - Continued
Information Content Tests[a]

[a]This table reports the coefficient estimates, t-statistics and R^2 from the Successful Efforts model in levels (Panel A): Ret $(-9,+3)_{it} = b_0 + b_1*NIBRD_{it} + b_2*EXPEND_{it} + b_3 WD_{it} + b_4*RDEXP_{Excessit} + e_{it}$, and the Decomposition model in levels (Panel C): Ret $(-9,+3)_{it} = c_0 + c_1*NIBRD_{it} + c_2*CAP_{it} + c_3*EXP_{it} + c_4 WD_{it} + c_5*RDEXP_{Excessit} + e_{it}$. Panel A also reports the R^2 from the Benchmark model in levels: Ret $(-9,+3)_{it} = a_0 + a_1 NIBRD_{it} + e_{it}$, and the Full Expense model in levels: DEP $VAR_{it} = a_0 + a_1*NIBRD_{it} + a_2*EXPEND_{it} + e_{it}$. The first (second) column in each panel reports results with raw (ranked) observations.

Ret $(-9,+3)_{it}$ is stock return over the period 9 months before fiscal year end to 3 months after fiscal year end; $NIBRD_{it}$ is net income before R&D for firm i in year t; $EXPEND_{it}$ is the amount of current R&D expenditure for firm i in year t; CAP_{it} is the current amount of R&D capitalized for firm i in year t; EXP_{it} is the current amount of R&D expense for firm i in year t; $RDCAP_{it}$ is the net book value of the capitalized R&D asset (net of accumulated amortization) for firm i in year t; WD_{it} is the impairment write-down of the R&D asset for firm i in year t; $RDEXP_{Excessit}$ is the difference between the expense under capitalization and expense under expensing for firm i in year t.

The Full Expense vs Benchmark and Successful Efforts vs Full Expense rows (Panel A) report the P-value from comparing the R^2 from the respective regressions. The Decomposition vs Successful Efforts row (Panel C) reports the P-value from comparing the R^2 from the respective regressions. The CAP = EXP row reports the P-value from testing the respective coefficient restriction in the Decomposition regressions.

Standard errors are clustered by firm and year.

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

Table 6
Pro-Forma Tests[a]

Panel A: Successful Efforts

	UK GAAP Raw	IFRS Raw	UK GAAP Ranked	IFRS Ranked
SWITCH	-0.003	-0.101	105.792**	40.111
	(-0.02)	(-1.56)	(2.44)	(0.77)
NIBRD	1.487**	0.433	0.570***	0.430***
	(2.16)	(1.46)	(9.12)	(5.65)
SWITCH*NIBRD	-0.087	0.994**	-0.122*	-0.001
	(-0.13)	(2.59)	(-1.87)	(-0.01)
EXPEND	-0.259	0.361	0.021	0.090***
	(-0.41)	(0.94)	(0.33)	(3.16)
SWITCH*EXPEND	0.669	-1.413**	-0.179***	-0.281***
	(0.86)	(-2.28)	(-4.94)	(-4.60)
WD	-1.422	-0.137	0.075	0.019
	(-0.60)	(-0.65)	(0.21)	(0.08)
SWITCH*WD	-5.221*	1.810	-0.404	-0.129
	(-1.70)	(0.79)	(-1.04)	(-0.55)
$RDEXP_{Excess}$	-0.225	0.120	0.102	0.006
	(-0.24)	(1.60)	(1.08)	(0.09)
SWITCH* $RDEXP_{Excess}$	-3.768***	-1.456	-0.154*	-0.078
	(-2.87)	(-0.67)	(-1.74)	(-0.40)
Observations	224	224	224	224
Year_FE	Yes	Yes	Yes	Yes
Benchmark R2	0.152	0.270	0.285	0.423
Full Expense R2	0.162	0.282	0.298	0.439
Successful Efforts R2	0.235	0.285	0.308	0.442

Table 6 - Continued
Pro-Forma Tests[a]

Panel B: Decomposition model

	UK GAAP Raw	IFRS Raw	UK GAAP Ranked	IFRS Ranked
SWITCH	0.032	-0.076	192.192***	27.424
	(0.28)	(-1.62)	(6.99)	(0.39)
NIBRD	1.466**	0.484	0.659***	0.443***
	(2.08)	(1.60)	(14.67)	(8.55)
SWITCH *NIBRD	0.122	0.923**	-0.214***	-0.010
	(0.18)	(2.51)	(-4.38)	(-0.12)
CAP	-0.910	2.292	0.429*	0.042
	(-0.46)	(1.08)	(1.95)	(0.32)
SWITCH*CAP	2.101	-3.008	-0.583**	-0.111
	(1.17)	(-1.11)	(-2.01)	(-0.66)
EXP	-0.129	-0.649	-0.161*	-0.046
	(-0.11)	(-0.95)	(-1.93)	(-0.46)
SWITCH*EXP	-0.567	-0.267	0.060	-0.089
	(-1.46)	(-0.18)	(0.81)	(-0.54)
WD	-1.585	0.495	0.015	0.008
	(-0.63)	(0.72)	(0.04)	(0.03)
SWITCH*WD	-3.635	1.203	-0.339	-0.115
	(-1.50)	(0.55)	(-0.81)	(-0.58)
$RDEXP_{Excess}$	-0.773	0.255***	0.385	0.006
	(-0.54)	(7.19)	(1.60)	(0.07)
SWITCH* $RDEXP_{Excess}$	-2.932*	-1.054	-0.515**	-0.033
	(-1.76)	(-0.87)	(-2.19)	(-0.19)
Observations	224	224	224	224
Year_FE	Yes	Yes	Yes	Yes
Decomposition model R2	0.242	0.295	0.331	0.440

Table 6 - Continued
Pro-forma Tests[a]

[a]This table reports the coefficient estimates, t-statistics and R^2 from the interactive Successful Efforts model in levels (Panel A): $RET(-9,+3)_{it} = b_0 + b_1*SWITCH_i + b_2*NIBRD_{it} + b_3*SWITCH_i*NIBRD_{it} + b_4*EXPEND_{it} + b_5*SWITCH_i*EXPEND_{it} + b_6**WD_{it} + b_7*SWITCH_i*WD_{it} + b_8*RDEXP_{Excessit} + b_9*SWITCH_i*RDEXP_{Excessit} + e_{it}$ and the interactive Decomposition model in levels: $RET(-9,+3)_{it} = c_0 + c_1*SWITCH_i + c_2*NIBRD_{it} + c_3*SWITCH_i*NIBRD_{it} + c_4*CAP_{it} + c_5*SWITCH_i*CAP_{it} + c_6*EXP_{it} + c_7*SWITCH_i*EXP_{it} + c_8*WD_{it} + c_9*SWITCH_i*WD_{it} + c_{10}*RDEXP_{Excessit} + c_{11}*SWITCH_i*RDEXP_{Excessit} + e_{it..}$ Panel A also reports the R^2 from the interactive Benchmark model in levels: $RET(-9,+3)_{it} = b_0 + b_1*SWITCH_i + b_2*NIBRD_{it} + b_3*SWITCH_i*NIBRD_{it} + e_{it}$ and the interactive Full Expense model in levels: $RET(-9,+3)_{it} = b_0 + b_1*SWITCH_i + b_2*NIBRD_{it} + b_3*SWITCH_i*NIBRD_{it} + b_4*EXPEND_{it} + b_5*SWITCH_i*EXPEND_{it} + e_{it}$. The first two columns in each panel report the results of regressions with raw (ranked) observations.

$Ret\ (-9,+3)_{it}$ is stock return over the period 9 months before fiscal year end to 3 months after fiscal year end; $NIBRD_{it}$ is net income before R&D for firm i in year t; $EXPEND_{it}$ is the amount of current R&D expenditure for firm i in year t; CAP_{it} is the current amount of R&D capitalized for firm i in year t; EXP_{it} is the current amount of R&D expense for firm i in year t; $RDCAP_{it}$ is the net book value of the capitalized R&D asset (net of accumulated amortization) for firm i in year t; WD_{it} is the impairment write-down of the R&D asset for firm i in year t; $RDEXP_{Excessit}$ is the difference between the expense under capitalization and expense under expensing for firm i in year t. $SWITCH_i$=1 for firms that switched to capitalization under IFRS, and zero otherwise.

Standard errors are clustered by firm and year.

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

Table 7
Bid-Ask Test[a]

Panel A Descriptive statistics

UK GAAP	N	Mean	Median	Min	Max	Std Dev
Capitalizers						
Bid_Ask	86	0.003	0.099	0.057	0.517	0.099
PRC	86	0.643	87.005	29.190	635.821	124.873
MV	86	1.325	108.328	17.329	4180.550	461.564
RetVol	86	0.018	0.148	0.128	0.394	0.091
Vol	86	0.000	0.003	0.002	0.015	0.002
Switchers						
Bid_Ask	138	0.002	0.055	0.036	0.274	0.056
PRC	138	1.003	183.930	115.880	1,353.190	224.700
MV	138	1.123	388.100	43.606	7,266.080	1,067.610
RetVol	138	0.020	0.117	0.098	0.416	0.075
Vol	138	0.000	0.003	0.002	0.019	0.003

IFRS	N	Mean	Median	Min	Max	Std Dev
Capitalizers						
Bid_Ask	86	0.002***	0.147***	0.124	0.432	0.120
PRC	86	0.347	95.905**	11.601	1977.080	250.853
MV	86	0.403	167.598***	9.939	8013.200	879.316
RetVol	86	0.030***	0.195***	0.192	0.503	0.097
Vol	86	0.000	0.003	0.002	0.036	0.004
Switchers						
Bid_Ask	138	0.002*	0.072	0.039	0.492	0.082
PRC	138	0.337	211.750	102.496	1,470.100	293.610
MV	138	1.509	554.792	45.818	12,903.950	1,709.980
RetVol	138	0.025	0.124	0.090	0.473	0.087
Vol	138	0.000	0.004	0.002	0.022	0.004

Table 7 - Continued
Bid-Ask Test[a]

Panel B: Percentage of firms with other accounting items affected by the switch to IFRS

	Capitalizers		Switchers			
Accounting Item	N	%	N	%	Diff in %	p-value
Leases	86	5.8	138	13.8	-8.0	0.0419
Pensions	86	19.8	138	34.1	-14.3	0.0167
SB_payments	86	34.9	138	66.7	-31.8	<.0001
Taxation	86	50.0	138	65.9	-15.9	0.0179
Goodwill	86	73.3	138	73.2	0.1	0.9912
Fin instruments	86	22.1	138	39.9	-17.8	0.0043

Table 7 – Continued
Bid-Ask Test[a]

Panel C: Bid-Ask Changes Regression Results

	Raw sample	Entropy balanced sample
SWITCH	-0.021*	-0.042***
	(-1.73)	(-2.86)
ΔRetVOL	0.142***	-0.000
	(2.81)	(-0.01)
ΔVOL	0.394	8.516**
	(0.19)	(1.98)
ΔMV	0.000	0.000
	(0.92)	(0.71)
ΔPRC	-0.000***	-0.000*
	(-3.13)	(-1.67)
Leases	0.003	0.012
	(0.30)	(0.70)
Pensions	-0.019**	-0.036***
	(-2.41)	(-2.82)
SB_payments	-0.004	0.004
	(-0.37)	(0.26)
Taxation	-0.013	-0.049***
	(-1.06)	(-2.92)
Goodwill	-0.007	0.024
	(-0.54)	(1.20)
Fin_instruments	0.006	0.001
	(0.60)	(0.11)
Observations	224	162
Adj. R-squared	0.118	0.265

Table 7 - Continued
Bid-Ask T-test[a]

[a]Panel A reports the number of observations (N) and the descriptive statistics for the variables used in the bid-ask tests. Bid-Ask is the yearly average of the daily bid-ask spread scaled by the ask (ask – bid)/ask. PRC is the average daily price; MV is average daily market value of equity; RetVol is standard deviation of daily returns; and Vol is the average daily trading volume. All variables are averaged over a year, starting 3 months after the firm's first IFRS fiscal year end for the IFRS period and 3 months after the beginning of the last UK GAAP fiscal year for the UK GAAP period. *, ** and *** on the mean/medians for switchers (capitalizers) in the IFRS section of Panel A indicate significance at the 0.10, 0.05 and 0.01 levels, respectively of the mean/median differences between IFRS and UK GAAP for switchers (capitalizers).
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Panel B reports the percentage of firms who reported a reconciliation impact from switching from UK GAAP to IFRS for the following accounting items: Leases (IAS 17), Pensions (IAS 19), Share-based Payments (IAS 2), Taxation (IAS 12), Goodwill (IAS 3 / IAS 38) and Financial Instruments (IAS 32 / IAS 39).

Panel C reports the coefficient estimates, t-statistics and R^2 from the following model: ΔB-A Spread$_i$ = d_0 + d_1*SWITCH$_i$ + $\sum d_k$*IFRS$_{ik}$ + controls$_i$ + e_i The dependent variable is the change in bid-ask spread, defined as the bid-ask spread for the year starting 3 months after the first IFRS fiscal year end minus the bid-ask spread for the year starting 3 months after the beginning of the last UK GAAP fiscal year. SWITCH$_i$=1 for firms that switched to capitalization under IFRS, and zero otherwise. PRC is the average daily price; MV is the average daily market value of equity; RetVol is the average daily standard deviation of daily returns; and Vol is the the average daily trading volume scaled by number of shares outstanding. The PRC, MV, RetVol and LogVol variables are defined in changes and measured over the same period as the dependent variable. Leases is an indicator variable equal to 1 if the firm reported a reconciliation impact for leases (IAS 17) and 0 otherwise; Pensions is an indicator variable equal to 1 if the firm reported a reconciliation impact for pensions (IAS 19) and 0 otherwise; SB_payments is an indicator variable equal to 1 if the firm reported a reconciliation impact for share-based payments and 0 otherwise; Taxation is an indicator variable equal to 1 if the firm reported a reconciliation impact for taxation (IAS 12) and 0 otherwise; Goodwill is an indicator variable equal to 1 if the firm reported a reconciliation impact for goodwill (IAS 3 / IAS 38) and 0 otherwise; and Fin_instruments is an indicator variable equal to 1 if the firm reported a reconciliation impact for financial instruments (IAS 32 / IAS 39) and 0 otherwise.

Table 7 - Continued
Bid-Ask Test[a]

The entropy balanced sample in column 2 is formed after matching capitalizers and switchers in the year before IFRS adoption on the following matching covariates: size (MVE), R&D intensity (RD/TA), leverage (LEV), age (AGE) and steady-state (STATE). They are statistically significant determinants of the capitalization choice in our estimation of Oswald (2008)'s model: $CAP = \beta_0 + \beta_1 EARN\_VAR + \beta_2 EARN\_SIGN + \beta_3 SIZE + \beta_4 M/B + \beta_5 RD/TA + \beta_6 LEV + \beta_7 BETA + \beta_8 AGE + \beta_9 STATE$ + industry fixed effects + year fixed effects + ε. CAP is an indicator variable equal to 1if the firm capitalized its R&D under UK GAAP, 0 if the firm expensed its R&D under UK GAAP; MVE is the natural logarithm of market value of equity; M/B is market value of equity divided by book value of equity (converted to an 'as-if-expense' basis); RD/TA is R&D expenditures divided by total assets (converted to an 'as-if-expense' basis); LEV is the firm's leverage measured as debt divided by book value of equity (converted to an 'as-if-expense' basis); AGE is the firm's age measured as the number of years between the date of incorporation and fiscal year-end; STATE is an indicator variable equal to 1 if the firm is estimated to be in steady-state with respect to its R&D program, 0 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 an amortization rate of 20%. The capitalization and amortization rates are from Oswald (2008). All variables in the logit regression, unless otherwise noted, are measured at fiscal-year end, and all explanatory variables are measured as the percentile ranking of each firm within its industry-year.

Standard errors are clustered by firm.

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

Table 8
Bid-Ask Placebo Test[a]

	UK GAAP period		IFRS period	
	Raw sample	Entropy balanced sample	Raw sample	Entropy balanced sample
SWITCH	-0.001	-0.003	0.017	0.015
	(-0.14)	(-0.39)	(1.49)	(1.25)
LogRetVOL_lag	0.145***	0.195***	0.186***	0.128**
	(3.99)	(3.75)	(4.62)	(2.13)
LogVOL_lag	-3.232**	-1.910	-7.512*	-13.811**
	(-2.38)	(-1.45)	(-1.93)	(-2.60)
LogMV_lag	0.000**	0.000*	0.000*	0.000*
	(2.12)	(1.92)	(1.66)	(1.71)
LogPRC_lag	-0.000***	-0.000**	0.000	-0.000
	(-4.23)	(-2.52)	(0.87)	(-0.65)
Leases	0.008	0.001	-0.019**	-0.039**
	(1.12)	(0.08)	(-2.24)	(-2.51)
Pensions	0.003	0.011	0.000	-0.007
	(0.47)	(1.43)	(0.00)	(-0.59)
SB_payments	0.001	-0.006	0.017	0.008
	(0.16)	(-0.61)	(1.16)	(0.40)
Taxation	0.002	0.009	0.006	0.008
	(0.16)	(0.80)	(0.42)	(0.43)
Goodwill	0.003	0.006	-0.001	-0.017
	(0.23)	(0.43)	(-0.07)	(-0.80)
Fin_instruments	0.008	0.005	-0.007	-0.020**
	(1.12)	(0.53)	(-0.81)	(-2.11)
Observations	203	160	158	118
Adj. R-squared	0.126	0.223	0.220	0.129

Table 8 - Continued
Bid-Ask Placebo Test[a]

[a]This table reports the coefficient estimates, t-statistics and R^2 from the following model:
ΔB-A Spread$_i$ = d_0 + d_1*SWITCH$_i$ + $\sum d_k$*IFRS$_{ik}$ + controls$_i$ + e_i
In columns 1 and 2 the IFRS adoption year is shifted back by two years so that the test is completely in the UK GAAP period. In columns 3 and 4, the IFRS adoption year is shifted forward by two years so that the test is completely in the IFRS period. The bid-ask spread changes and the changes in the independent variables around the placebo adoption year are defined consistently with those in the main test in Table 7.

See notes to Table 7 for additional variable definitions.