Can the Stock Market Capitalize R&D Expenditures?*

(*when firms aren't mandated to)

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Abstract

We examine the UK stock market's valuation of firms' R&D expenditures around the time of the switch from UK GAAP to IFRS in 2005. Under both regimes, research expenditures and development expenditures that did not meet capitalization conditions must be expensed. Under UK GAAP, firms had the option to expense or capitalize development expenditures that met capitalization conditions. *Mandatory* expensers did not have capitalizable R&D expenditures. *Voluntary* expensers had such expenditures, but chose to expense them. The distinction is important, because capitalizable R&D expenditures have a higher market valuation than ineligible expenditures. Under IFRS, capitalizable expenditures must be capitalized, so voluntary expensers were required to reveal their type. We find that under UK GAAP, the UK stock market valued the R&D expenditures of both expensers equally; R&D of voluntary expensers was valued more highly only under IFRS. Thus, without mandatory capitalization, the market could not properly value firms' R&D expenditures.

1. Introduction

We investigate whether the stock market can distinguish firms whose R&D expenditures are eligible for capitalization, from firms whose R&D expenditures are not, when firms expense all of their R&D expenditures. Our research question is important, because as theory predicts and as we show, capitalized expenditures are more valuable (have a greater return response coefficient) than expensed expenditures. This is as predicted, because capitalized costs are closer to fruition and more certain to produce benefits, by definition. Thus, firms that have capitalization-eligible R&D expenditures have more valuable R&D than firms that don't, but this is not revealed when all R&D is expensed. We seek to know if the market is capable of accurately valuing R&D firms, without capitalization. That is, does expensing all R&D expenditures result in a pooling or a separating equilibrium (Spence, 1978)? Our investigation is particularly applicable to markets like the U.S, where expensing R&D is mandated and no additional disclosures are required (except for the Software Development, SFAS 86).

Our setting is the UK capital market around the time of its switch from UK GAAP to IFRS in 2005. The UK is particularly interesting for our purposes for two reasons. First, under UK GAAP, research expenditures, and development expenditures that did not meet the capitalization conditions, must be expensed, but firms had the option to expense or to capitalize development expenditures that met the conditions (detailed in Section 3). The central insight of our paper is that there were thus two different types of firms that expensed all of their R&D expenditures: *mandatory* expensers, who only had research expenditures or whose development expenditures did not meet the capitalization conditions; and *voluntary* expensers, who had capitalization-eligible development expenditures but chose to expense them. Under IFRS, while mandatory expensers continued to expense all of their R&D expenditures, voluntary expensers

were now required to capitalize their eligible development expenditures, disclosing both the expensed and capitalized components of their R&D expenditures.[1] Thus, they were forced to reveal that they had capitalizable expenditures. Figure 1 shows the pooling of both groups of expensers under UK GAAP, and the subsequent separation under IFRS. We refer to the two groups as *mandatory expensers* and *voluntary expensers*, respectively.[2] Ours is the first research to exploit the difference in R&D expenditures between the two groups.

Second, it is widely agreed that the U.K.'s capital market is the most comparable to the U.S'. For example, Michaely and Roberts (2012) note that U.K. has an economic environment that shares many similarities to that found in the U.S. Acharya, Sundaram, and John (2011) note that the financial systems in the U.K. and U.S. are similar. Allen, Carletti, and Marquez (2009) also note that systems of corporate governance in the U.S. and U.K. are very similar. Since the two countries have similar institutions, accounting and legal frameworks (Ball, Kothari, and Robin, 2000), among others, the U.K. results act as a benchmark for what U.S. results with R&D capitalization might be. As Chen, Gavious, and Lev (2017) point out, R&D accounting is "one of the most pronounced 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, our results can serve as a basis for evidence-based policymaking (Leuz, 2018) in the U.S.

We find that under UK GAAP, the market valued the R&D expenditures of mandatory and voluntary expensers equally; i.e., the market could not separate the two groups of firms, and

[1] Firms do not have to disclose the breakdown of their R&D expenditures between R vs D, and it is rarely done. Since development expenditures that don't meet the capitalization conditions must be expensed just like research, there is not a direct connection between expensed vs capitalized costs on the one hand, and research vs development on the other hand.

[2] There were also some firms that voluntarily capitalized eligible development expenditures under UK GAAP. Although they are not our main focus, we report results for these firms in some of our tests. We refer to these firms as *capitalizers*.

there was a pooling equilibrium. Only once voluntary expensers were required to reveal their type under IFRS, did the market value their R&D expenditures more highly than mandatory expensers', thereby separating the two groups. In other words, without the information provided by capitalization, the market could not distinguish firms with more valuable vs less valuable R&D expenditures. Consistent with the revelation of the R&D's value, we show that the Future Earnings Response Coefficient (FERC) of voluntary expensers increased relative to those of mandatory expensers, in the switch from UK GAAP to IFRS.

A crucial assumption of our tests is that the identity of firms as voluntary expensers revealed under IFRS also held during UK GAAP. Thus, real changes in the composition of voluntary expensers' R&D expenditures did not drive the valuation change; i.e., it was due to a change in financial reporting that revealed new information to the market. In fact, in the first IFRS year, voluntary expensers were required to disclose pro-forma (as-if IFRS) capitalized amounts pertaining to the *previous* (last UK GAAP) year. These disclosures, which we use for some of our tests, confirm that voluntary expensers could have capitalized under UK GAAP, and the change in financial reporting is the cause of our results. Thus, mandating capitalization had real valuation consequences.

We proceed as follows. As a first step to establish the relative value of capitalized vs expensed R&D, we regress contemporaneous annual stock returns against earnings before R&D expense (NIRD, as control for performance), and the expensed and capitalized portions of R&D expenditures, for voluntary expensers under IFRS.[3] As hypothesized, we find that capitalized

[3] We cannot estimate this regression for voluntary expensers under UK GAAP or Mandatory Expensers under either regime, since these firms did not have any capitalized expenditures.

costs have a greater response coefficient than expensed costs; i.e., capitalized costs are more highly valued by the market.

Next, using the mandatory vs voluntary expenser identities that became known under IFRS, we regress annual stock returns against NIRD and the *total* R&D expenditure (i.e., expensed plus capitalized costs), separately for both groups, for the last 3 years under UK GAAP and the first 3 years under IFRS. We refer to the coefficient on R&D expenditures as the *R&D response coefficient*. We find that under UK GAAP, the R&D response coefficient is similar (and statistically indistinguishable) for both groups. This indicates that the market could not separate them, and a pooling equilibrium existed. Under IFRS, once their types were revealed, voluntary expensers had a higher R&D response coefficient. Since we use the exact same firms over equal 3-year windows, our insignificant results under UK GAAP cannot be due to low power or some other econometric problems, and are almost certainly the result of the change in financial reporting revealing new information.

Next, we examine how each group's Future Earnings Response Coefficient changed from UK GAAP to IFRS. FERC, the coefficient on future earnings, in a regression of current returns on current and future earnings, captures the amount of future earnings information capitalized into current returns, higher FERC indicating more informative stock prices (Gelb and Zarowin 2002, Lundholm and Myers 2003, Durnev, et al, 2003). Consistent with our R&D response coefficient results, we find that voluntary expensers experienced an increase in FERC relative to mandatory expensers, which indicates that capitalization revealed information that the stock market previously did not know.

Together, our results show that voluntary disclosure was not sufficient; without mandatory capitalization, the market did not have enough information to accurately value firms'

R&D expenditures, and capitalization revealed new information to the market. More generally, our evidence points to the importance of disclosure regulation (Leuz and Wysocki, 2016).

To understand the mechanism behind our results, we show that the percentage of R&D expenditures that are capitalized varies substantially, both across firms and for a given firm over time. Without the proprietary information revealed by mandatory capitalization, it is likely impossible for the market to know what percentage of a firm's R&D expenditures pass the capitalization threshold. This explains why the market can't distinguish firms with, vs firms without, capitalizable R&D expenditures, when firms expense all of their R&D expenditures. Moreover, since capitalization represents projects close to fruition, our evidence shows that previous research's use of a uniform capitalization rate is incorrect and misses important information about the status of firms' R&D projects.

Finally, in addition to our primary results, we make an important contribution by showing that write-offs of capitalized R&D are rare and small (likely due to IFRS's stringent capitalization criteria), even when compared to write-offs of PPE. Since no one challenges capitalization of PPE, our write-off evidence shows that U.S. regulators' fear of recognizing "soft" intangible R&D assets is likely overblown.[4]

In summary, our research addresses the fundamental question in the debate between Skinner (2008a,b) and Lev (2008): whether a regime without mandatory capitalization, such as the U.S. where full expensing is mandated, has negative capital market effects. Consistent with Lev, we find that the market cannot distinguish the relative progress of firms' R&D programs, when all firms expense R&D. Presaging our results, Lev writes "Capitalization thus conveys important inside information – success of the development program – to investors" (Lev, 2008).

[4] The FASB currently has a project on recognition of intangibles.

The rest of the paper is organized as follows. Section 2 reviews the literature on R&D capitalization. Section 3 describes our sample and data, while Section 4 discusses our hypotheses and tests. Section 5 discusses our results. Section 6 discusses the mechanism behind our findings. 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, and to assessing whether the U.S. stock market efficiently values R&D firms. The exceptions deal with either foreign settings where capitalization is allowed or mandated, or with software firms in the U.S., which after the introduction of SFAS 86 in 1985, could choose to capitalize software development costs.[5] Most importantly, prior research has not addressed whether the market could infer unrecognized capitalization under expensing; i.e., whether mandating capitalization reveals new information. This gap exists because no previous paper uses the same sample of firms under different accounting regimes as a counterfactual.

A robust result in research with U.S. data is that despite almost all R&D costs being expensed for accounting purposes, the stock market capitalizes R&D costs on its own (Sougiannis 1994, Lev and Sougiannis 1996, Chambers, Jennings, and Thompson 1998). For example, firms with high R&D expenditures have high market-to-book ratios, and capitalization-adjusted book values are more closely related to stock market values than actual book values,

[5] As Mohd (2005) discusses, SFAS 86 allows enough flexibility so that capitalization is *de facto* optional.

indicating that market values of R&D firms reflect assets that are missing from their accounting book values. However, most studies with U.S. data assume 100% capitalization and a life of five years (Chan et al. 2001; Falato et al. 2022), so these studies are unable to determine the market's ability to distinguish capitalizable vs non-capitalizable costs.[6] More importantly, the fact that the market recognizes that (at least some of) expensed R&D should be capitalized does not imply that the market can distinguish firms with capitalizable vs non-capitalizable R&D. Relatedly, Amir, Lev, and Sougiannis (2003) find that analysts' earnings forecasts of R&D intensive firms are more biased and less accurate than forecasts for non-R&D intensive firms. However, their results cannot distinguish whether these differences in forecast quality are due to financial reporting deficiencies (i.e., full expensing) or the greater business uncertainty of R&D intensive firms.

Among studies with foreign data, Oswald and Zarowin (2007) and Oswald (2008) study R&D capitalization vs expensing in the UK before IFRS (i.e., under UK GAAP). Oswald and Zarowin (2007) compare FERC for R&D expensers (firms that expensed all of their R&D expenditures) vs capitalizers (firms that capitalized their eligible development expenditures) under UK GAAP. They find that capitalizers had higher FERC, which they interpret as capitalization providing more information to the market about future earnings. However, they do not distinguish between voluntary vs mandatory expensers, but instead view them as one. Additionally, Oswald and Zarowin (2007) study only the UK GAAP period, when capitalization of eligible development expenditures was voluntary; thus, there was a self-selection of

[6] Lev and Sougiannis (1996) estimate industry specific R&D capitalization, while Iqbal, Rajgopal, Srivastava, and Zhao (2024) use an industry-year-specific basis.

capitalizers vs expensers, and some unobservable firm characteristic, rather than capitalization per se, might have been responsible for capitalizers' higher FERC.[7]

Like us, both Oswald, Simpson, and Zarowin (2022) and Oswald, Ryu, and Zarowin (2023) use the setting of the UK's switch from UK GAAP to IFRS in 2005 to study the R&D related behavior of voluntary expensers (which they refer to as "Switchers", since they switched from expensing under UK GAAP to capitalizing under IFRS). Oswald et al (2022) find that Switchers increased their R&D expenditures around the time of the switch, presumably because of capitalization's expense deferral, which allowed both increased R&D expenditures and higher profits. Oswald et al (2023) find that Switchers reduced their use of R&D cuts (real earnings management) to meet earnings benchmarks, because reductions in R&D expenditures no longer have the same profit boost under capitalization. While both papers find that change in accounting rule had real effects, neither paper investigates whether the market could infer the relative profitability of R&D projects without mandatory capitalization.

Mohd (2005) studies U.S. software firms. He 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. Mohd also finds that information asymmetry decreased for both capitalizers and expensers (again, relative to other R&D firms).

A number of U.S. studies such as Lev and Sougiannis (1996), Aboody and Lev (1998), Chan, Lakonishok, and Sougiannis (2001), Eberhart, Maxwell, and Siddique (2004), and Cohen,

[7]Oswald (2008) finds that the value-relevance of capitalized vs expensed R&D is similar under UK GAAP. He also finds that there are differences between voluntary vs mandatory expensers, but like Oswald and Zarowin (2007), he does not compare the two types of expensers with each other. Since Oswald's (2008) sample was before IFRS, he must approximate voluntary and mandatory expensers.

Diether, and Ma (2013) find that recognized R&D expenditures (expenses) predict excess returns; i.e., the stock market is (semi-strong form) inefficient with respect to R&D expenditures. However, 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), so market efficiency with respect to R&D is an open question. While these papers investigate whether the market is (in)efficient with respect to *recognized* R&D information, ours is the first paper to examine whether the market can infer *unrecognized* R&D information (capitalizable values when firms expense). Thus, our tests are fundamentally different from any previous research on R&D accounting.

Importantly, our results hold whether or not the market is efficient with respect to recognized R&D information. This is because if the market is (semi-strong) efficient, but can't infer unrecognized information, then capitalization can make the market more efficient. If the market is not efficient, the additional capitalization information might make it efficient.

Two recent papers study the market's valuation of R&D expenditures under IFRS. Park, Lee, Baber, and Kang (2023) show that in Korea, firms that expense most of their R&D hold more cash and have lower leverage than firms that capitalize more, and SEOs are positively associated with capitalized R&D. Their results are consistent with ours that capitalized R&D is more valuable than expensed R&D (likely due to lower risk), but they do not test this. Campbell, Chen, Guan, and Ye (2023) use labor intensity as a proxy for R&D quality, and show that firms with greater labor intensity capitalize more R&D costs. Assuming the validity of their proxy, this is consistent with our result that capitalized costs are more valuable than expensed costs, although like Park et al (2023), they do not test this. Most important, neither Park et al (2023) nor Campbell et al (2023) asks whether the market can infer the valuation of firms' R&D under

full expensing (i.e., a different accounting regime), and thus whether capitalization reveals new information.

The closest paper to ours is Aboody and Lev (1998), who study the value relevance of software capitalization under SFAS 86. They find that 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 and that capitalized costs have a higher association with returns than expensed costs. While Aboody and Lev find that the capitalization information is value relevant, they do not address the primary research question of our paper: whether the market can distinguish firms that have capitalizable R&D costs vs those that don't, when all firms expense all of their R&D expenditures. Indeed, Aboody and Lev (1998) *can't* answer this question, because they don't observe the firms in a different accounting regime (before capitalization). Thus, our paper is fundamentally different from theirs.[8]

Whether the market can distinguish firms that have capitalizable costs vs those that don't is crucial to know, 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 recognition; i.e., if the information were already known, formal capitalization would not add new information to the market, and the information would not affect prices. As Healy, Myers, and Howe (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 infer it, then the case for mandatory capitalization becomes more compelling.

[8] The difference between our paper and Aboody and Lev (1998) can be elucidated by the following analogy (with smoking substituting for R&D capitalization). Disclosing that you are a smoker on a life insurance application certainly affects the pricing of the insurance; i.e., smoking is value-relevant. This is Aboody and Lev. In contrast, could the life insurance company figure out who was a smoker, and price them accordingly, if no such disclosure were required on the application? This is our paper.

Ours is the first paper to examine whether the market could infer which firms have the most valuable R&D expenditures, *without mandatory capitalization*. To address this question, we compare the market's valuation of voluntary vs mandatory expensers' R&D expenditures under UK GAAP, when both groups expensed, and under IFRS, when voluntary expensers capitalized eligible development expenditures, thereby allowing the same sample of firms under different accounting regimes to serve as a counterfactual. By doing so, we address the fundamental question in the debate between Skinner (2008a,b) and Lev (2008): whether a regime without mandatory capitalization, such as the U.S. where full expensing is mandated, has negative capital market effects. Consistent with Lev, we find that the market cannot distinguish the relative progress of firms' R&D programs, when all firms expense R&D. Presaging our results, Lev writes "Capitalization thus conveys important inside information – success of the development program – to investors" (Lev, 2008). Inconsistent with Skinner, we find that voluntary disclosure does not solve this problem. The UK's switch to IFRS, mandating the capitalization of eligible development expenditures, provides the opportunity to address these important issues using archival data, in a major capital market, such that the results may be generalizable.

3. 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 capitalize-eligible development expenditures [SSAP 13, para. 25, (1989)]. However, with the adoption of IFRS in 2005, capitalization of eligible development expenditures became mandatory. Specifically, IAS 38 (para. 57) states that an intangible development asset shall be recognized if

the firm could demonstrate the following conditions: (a) The technical feasibility of completing the intangible asset so that it will be available for the use or sale; (b) its intention to complete the intangible asset and use or sell it; (c) its ability to use or sell the intangible asset; (d) how the intangible asset will generate probable future economic benefits; (e) the availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset; and (f) its ability to measure reliably the expenditure attributable to the intangible asset during its development [International Accounting Standard (IAS) 38, 1998]. Since the capitalization criteria are essentially the same under both reporting regimes, a firm that could have capitalized under UK GAAP but chose not to, would be mandated to capitalize under IFRS. Thus, by examining UK firms, we are able to investigate whether the market can identify firms with capitalize-eligible R&D expenditures, before they capitalized.[9]

Table 1, Panel A 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 - 2010. We begin in 2002 since 2005 was the first year of IFRS adoption in our sample, and we use three years of data under UK GAAP. We finish in 2010 since 2008 was the last year of IFRS adoption, and we require three years of data under IFRS. 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). For firms that have valid

[9] In both SSAP 13 and IAS 38 research expenditures must be expensed; only development expenditures meeting the conditions detailed in this paragraph may be capitalized, resulting in a development asset. We use the term R&D to maintain consistency with the literature.

R&D datapoints, we also require them to have adopted IFRS. These analyses provide us with 4,598 firm-year observations (727 firms).

We then remove 1,156 firm-year observations (108) firms that have missing accounting and capital market data. At this stage we identified the IFRS adoption year for the remaining firms and then deleted 1,918 firm-year observations (365 firms) outside of the six-year window.[10] We then remove 198 firm-year observations (33 firms) that had a mixed R&D policy in either (or both) of the regimes; that is, these firms had firm-year observations where they would capitalize in some years, and expense in other years within the same regime. Next, we remove 1 firm (6 firm-year observations) that changed from capitalizing to expensing under IFRS and 2 firms (12 firm-year observations) that adopted IFRS earlier than 2005.

The next step in our sample construction is to identify our two primary sub-groups of firms: (1) those firms that always expensed under UK GAAP and then began to always capitalize under IFRS (voluntary expensers), and (2) those firms that always expensed under UK GAAP and continued to always expense under IFRS (mandatory expensers). In total, there are 86 voluntary expenser firms (516 firm-year observations). There are 104 mandatory expenser firms (624 firm-year observations).

In addition to these two sub-groups, we also have a sub-group of firms that always capitalized under UK GAAP and IFRS ('capitalizers'). In total there are 26 capitalizer firms (156 firm-year observations). We report results for these firms in some of our tests, but they are not the focus of our analysis.

[10] For example, for a firm that adopted IFRS in 2005, we deleted the 208-2010 firm-year observations. Similarly, for a firm that adopted IFRS in 2008, we deleted the 2002-2004 firm-year observations.

An important assumption underlying our tests is that capitalization of eligible development expenditures became mandatory under IFRS. There is much evidence to support this assumption. First, the fact that so many voluntary expensers switched is *prima facie* evidence that enforcement was effective, and mandatory expensers did not simply choose to avoid capitalization. Second, the timing of their switches was when IFRS went into effect, consistent with the mandate. Third, as pointed out above, in the first IFRS year, voluntary expensers were required to disclose pro-forma (as-if IFRS) capitalized amounts pertaining to the *previous* (last UK GAAP) year. This shows that they could have capitalized under UK GAAP (i.e., they had development expenditures that met the capitalization conditions), but that they chose to expense, and only capitalized when they were mandated to. Fourth, Oswald et al (2022) analyzed the R&D footnotes for every firm that expensed under both UK GAAP and IFRS. They found that industry membership was an important determinant of whether a firm remained an expenser. For example, firms in particular industries, such as Healthcare, explicitly mentioned that their development expenditures did not meet the capitalization conditions, due to the uncertainty of future benefits. Thus, firms that continued to expense either had only research expenditures, or their development expenditures never met the conditions for capitalization. Fifth, the U.K. bundled IFRS adoption with substantive enforcement changes to ensure compliance with IFRS, so it is reasonable to assume that capitalization of eligible development expenditures became mandatory (Christensen, Hail, and Leuz, 2013). In summary, there is strong evidence that the switch was mandatory, and enforcement was effective.

Table 1, Panel B reports the industry membership of voluntary and mandatory expensers. The number of firms in each specific industry is small, so again, investors might have had a difficult time separating firms that had capitalizable expenditures from those that did not. Only in

a few industries, such as Personal Products, Pharmaceuticals, and Specialty Chemicals, is there a heavy concentration of one type or the other.

Table 2, Panels A and B presents descriptive statistics for mandatory and voluntary expensers during the UK GAAP and IFRS periods, respectively. Consistent with Oswald et al (2022), we find that the R&D intensity of voluntary expensers increased relative to mandatory expensers in the regime change. For example, under UK GAAP, the mean R&D intensities of the two groups are .084 and .075, respectively, and not statistically different. In the switch to IFRS, voluntary expensers' mean intensity increased slightly to .087, while mandatory expensers' declined to .064, and the difference is statistically significant. Voluntary expensers' leverage increased by .016 (.039 to .055) from UK GAAP to IFRS, while mandatory expensers' only increased by .01 (.059 to .060). For half of the fundamentals, we cannot reject equality between the two groups during the UK GAAP period (Column 7, Diff. p-value). This suggests that investors might not have been able to distinguish firms in the two groups, which we formally test, below.

Table 2, Panel C, shows correlations among income, returns, and R&D expenditures, for each of the two groups under each regime. We focus on the main variables for brevity. For voluntary expensers under IFRS, we additionally document correlations of the expensed R&D and capitalized R&D with the other main variables. The level and change of NIRD are positively correlated with each other and with returns, as expected. For voluntary expensers under IFRS, capitalized R&D expenditures are more highly correlated with returns than expensed R&D expenditures, consistent with the underlying premise of this paper.

4. Hypotheses and Tests

Our research is motivated by the difference between R&D expenditures that are eligible for capitalization vs those that are not, and whether the market could detect the difference when all R&D expenditures are expensed. As Johnstone and Penman (2024) discuss, the information value of R&D is whether it revises our priors about the probability of payoffs to R&D projects. As discussed above, capitalized expenditures have crossed the threshold to meet the IFRS definition of an asset. They are both closer to fruition and less risky (to produce future benefits) than expensed expenditures. Thus, the present value of the expected payoffs of capitalized expenditures should be greater than the present value of expensed expenditures, and our first hypothesis is (in null form):

H1: The value relevance of capitalized and expensed expenditures is equal.

Our alternative hypothesis is that capitalized expenditures have greater value relevance. We test H1 via equation (1):

$$R_{it} = a + b_1*NIRD_{it} + b_2*EXP_{it} + b_3*CAP_{it} + e_{it} \qquad (1)$$

R_{it} is the cumulative stock return over the period from 9 months before fiscal year end to 3 months after fiscal year end; $NIRD_{it}$ is the firm's earnings before R&D expense; EXP_{it} and CAP_{it} are the expensed and capitalized components of R&D expenditures, respectively. NIRD is included as control for performance. All variables are for firm i in year t. All continuous explanatory variables are on a per share basis and are deflated by P_{it-1}, the firm's share price at the beginning of the year.

Equation 1 (and equation 2, below) are based on Ohlson and Penman (1992), where the accounting variable is a measure of value-added (the change in market value), so the coefficients represent the change in share price per £ of the independent variable. We estimate (1) on our

sample of voluntary expensers under IFRS, when they are mandated to capitalize eligible development expenditures. Under the null (alternative) hypothesis, $b_2 = b_3$ ($b_2 < b_3$). While the greater value relevance of capitalized than expensed R&D expenditures has been demonstrated for software firms in the U.S. (Aboody and Lev, 1998, Table 3), we estimate (1) to confirm that this property holds for our broader sample.

If capitalized R&D is more value relevant than expensed R&D, then the R&D of firms whose R&D expenditures have met the capitalization conditions should be more value relevant than the R&D of firms whose R&D expenditures have not met the capitalization conditions (i.e., who must expense all of their R&D). The former were voluntary expensers under UK GAAP and then were mandated to switch to capitalization under IFRS. The latter were mandatory expensers under UK GAAP and continued to expense under IFRS. Our primary research question is whether the stock market could distinguish between these firms when both fully expensed under UK GAAP; i.e., whether the value relevance of both groups' R&D is equal. Thus, our second hypothesis is (in null form):

H2: The value relevance of voluntary expensers' and mandatory expensers' R&D expenditures is equal.

We test H2 via equation (2):

$$R_{it} = a + b_1 * NIRD_{it} + b_2 * R\&D_{it} + e_{it} \qquad (2)$$

$R\&D_{it}$ is the firm's total R&D expenditure (both expensed and capitalized components, if the firm capitalized under IFRS), and all other variables are as above. We estimate (2) on both voluntary and mandatory expensers, in the last three years under UK GAAP and the first three years under IFRS. Under the null hypothesis, b_2 for voluntary expensers equals b_2 for mandatory expensers. Under the alternative hypothesis, b_2 for voluntary expensers is greater than b_2 for

mandatory expensers. Since voluntary expensers became capitalizers under IFRS, their "type" became observable, and we expect to reject the null under IFRS. If the market could distinguish the two groups under UK GAAP, we'll reject the null hypothesis under this regime also. But, if the market could not distinguish between the two groups under UK GAAP, we won't reject the null hypothesis. In this case, mandated capitalization brought new information to the market that was unknown beforehand. Hypothesis 2 is a classic example of a pooling vs separating equilibrium (Spence, 1978).

If we reject (don't reject) the null hypothesis H2 under IFRS (UK GAAP), then the new information provided by mandatory capitalization may have enabled the stock returns of voluntary expensers to reflect more future earnings information than the returns of mandatory expensers. Thus, our third hypothesis is (in null form):

H3: The amount of future earnings information reflected in stock returns did not decrease for mandatory expensers relative to voluntary expensers in the switch from UK GAAP to IFRS.

We test H3 via the diff-in-diff equation (3):

$$\begin{aligned} R_{it} = a + b_1*IFRS + \quad & b_2*VOL + \quad b_3*IFRS*VOL + \\ & b_4*X_t + b_5*IFRS*X_t + b_6*VOL*X_t + b_7*IFRS*VOL*X_t + \\ & b_8*X_{t+T} + b_9*IFRS*X_{t+T} + b_{10}*VOL*X_{t+T} + b_{11}*IFRS*VOL*X_{t+T} + \\ & b_{12}*X_{t-1} + b_{13}*IFRS*X_{t-1} + b_{14}*VOL*X_{t-1} + b_{15}*IFRS*VOL*X_{t-1} + \\ & b_{16}*R_{t+T} + b_{17}*IFRS*R_{t+T} + b_{18}*VOL*R_{t+T} + b_{19}*IFRS*VOL*R_{t+T} + e_{it} \end{aligned} \quad (3)$$

X_t, X_{t-1},X_{t+T} are current (NI), lagged (LAG_NI) and future earnings (FUTURE_NI), respectively, VOL is an indicator for voluntary expenser, and R_t and R_{t+T} are current and future stock returns; we use both two-years and three-years of future data. b_4 and b_4+b_5 are the contemporaneous Earnings Response Coefficients (ERCs) for voluntary expensers under UK GAAP and IFRS,

respectively; b_4+b_6 and $b_4+b_6+b_7$ are the ERCs for mandatory expensers under UK GAAP and IFRS, respectively; b_8 and b_8+b_9 are the FERCs for voluntary expensers under UK GAAP and IFRS, respectively; b_8+b_{10} and $b_8+b_{10}+b_{11}$ are the FERCs for mandatory expensers under UK GAAP and IFRS, respectively. To provide an "apples to apples" comparison across firms and over time, earnings of capitalizers (voluntary expensers) under IFRS are adjusted to an as-if expense basis (Oswald and Zarowin, 2007). Our primary coefficient of interest is b_{11}, the incremental FERC for voluntary expensers under IFRS. Under the null (alternative) hypothesis, b_{11} is zero (positive).

5. Results

5.1 Primary results

Table 3, column 1, shows the results of equation (1) for voluntary expensers in the first three years of IFRS (i.e., when they have become capitalizers). The response coefficient on capitalized expenditures is a highly significant 6.438, while the coefficient on expensed expenditures is 1.004 (insignificantly different from both zero and one), and the difference between the two coefficients is statistically significant (p-value = 0.05). As pointed out above, the coefficients in (1) and (2) represent the change in share price per £ of each explanatory variable. Thus, our results indicate that £1 of capitalized R&D expenditure translates into about £6 of share value, while £1 of expensed R&D expenditure translates into about £1 of share value. This is consistent with the market understanding that capitalized expenditures have positive NPV, while expensed expenditures are less certain to produce future benefits, consistent with Johnstone and Penman (2024). The difference between the market's valuation of the two types of expenditures, and the higher valuation of capitalized expenditures, is also consistent with the

results of Aboody and Lev (1998, Table 3) who find that for software firms in the U.S., capitalized costs have a higher coefficient explaining returns than expensed costs, and with the analysis of Barker et al (2022), who emphasize the importance of uncertainty in accounting for intangibles. By definition, expensed investments are more uncertain than capitalized investments, because the latter have passed a feasibility threshold and are closer to fruition. As expected and consistent with prior research, the coefficient on NIRD is significantly positive.[11]

Table 3, columns 2-5, show our most important results, reporting the estimation of equation (2) separately for voluntary and mandatory expensers, under the last 3 years of UK GAAP and the first 3 years of IFRS. Under UK GAAP, the R&D response coefficients of the two groups are almost the same, 2.77 and 2.94 for mandatory and voluntary expensers, respectively, and they are statistically indistinguishable ($t = -0.22$, $p = 0.83$).[12] The almost identical coefficients show that their lack of statistical difference is not due to low power, but to the market's inability to distinguish the two groups. Indeed, the standard error of the difference would have to be an order of magnitude lower for the coefficients to be statistically different, but even then, they would not be *economically* different. Under IFRS, the difference between the R&D response coefficients increases to 1.92; the coefficient for voluntary expensers is 2.13 ($t = 3.81$) while the coefficient for the mandatory expensers is 0.21 ($t = 0.39$), and the difference is statistically significant ($t = -3.11$, $p < 0.01$). Table 3, columns 2-5, shows that the market could not distinguish the relative valuation of the two groups' R&D expenditures until the groups revealed their types under IFRS.

[11] We also estimated equation (1) for capitalizers (firms that capitalized eligible development expenditures under both UK GAAP and IFRS), under both UK GAAP and IFRS. Results (untabulated due to brevity) are that capitalized R&D expenditures are more valuable than expensed R&D expenditures, consistent with the results for voluntary expensers in Table 3.

[12] The t-statistic for the difference is calculated from a stacked regression with group dummy variables.

The results in Table 3 highlight the difference between our paper and Aboody and Lev (1998). Like our results in Table 3, column 1, Aboody and Lev (1998, Table 3) find that capitalized expenditures are more value relevant (have a higher response coefficient) than expensed expenditures. However, Aboody and Lev (1998) have no result comparable to our most important result, Table 3, columns 2-5, comparing the firms with vs without capitalization-eligible expenditures across two different regimes. Thus, they cannot address the primary research question of our paper: whether the market can distinguish firms that have capitalizable R&D costs vs those that don't, when firms expense all of their R&D expenditures. Thus, our paper is fundamentally different from theirs.

The results in Table 3, columns 2-5, suggest that under UK GAAP, the capital market assumes that both voluntary expensers and mandatory expensers have developed R&D projects. In particular, the coefficients of 2.77 and 2.94 for mandatory and voluntary expensers in columns 2 and 3, respectively, imply that £1 of R&D investment is expected to return between £2½ and £3; the similarity of the coefficients and their values greater than 1.0 imply that under UK GAAP, the market assumed that both voluntary and mandatory expensers had capitalizable R&D costs. Only after IFRS adoption could the market tell that firms that continue to expense do not have "mature" R&D investments. Thus, the key change in the market's valuation of firms' R&D expenditures across regimes is the *decline* for mandatory expensers, which makes it unlikely that the separation is due to the market's overvaluing capitalized expenditures. In other words, the new information that the market learns under IFRS' mandatory capitalization is that only firms that capitalize have R&D projects with a high probability of success (capitalization-eligible); firms that continue to expense don't. Comparing the coefficient of .21 on expensed R&D for mandatory expensers (Table 3, column 4) with the coefficient of 1.00 on expensed R&D for

voluntary expensers (Table 3, column 1) supports this interpretation. These coefficients suggest that until firms begin to capitalize R&D (i.e., until feasibility is demonstrated by capitalization), the market heavily discounts firms' R&D expenditures.

In summary, there was a pooling equilibrium under UK GAAP, when the market assumed that both voluntary and mandatory expensers have capitalization-eligible R&D expenditures. The two groups were not separated until mandatory capitalization under IFRS revealed that only firms that capitalize have advanced R&D projects with a high likelihood of success, information that the market did not know beforehand.

As another test of whether mandatory capitalization reveals new information, equation (3) tests how each group's Future Earnings Response Coefficient changed from UK GAAP to IFRS. If capitalization reveals new information (about future earnings), FERC of voluntary expensers' should increase relative to FERC of mandatory expensers, in the switch from UK GAAP to IFRS. Table 4 shows the results of equation (3). Consistent with (alternative) Hypothesis 3, coefficient b_{11} on IFRS*VOL*X_{t+T} is significantly positive for both the two-year and the three-year horizons (.246 and .188, respectively), so FERC increased for voluntary expensers relative to mandatory expensers in the switch from UK GAAP to IFRS. This indicates that capitalization enabled returns to incorporate more information about future earnings. Note that the three coefficients on future NI (.009 for Mandatory expensers under UK GAAP; .029 incremental coefficient for Voluntary expensers under UK GAAP; and .001 incremental coefficient for Mandatory expensers under IFRS) are all small and insignificantly different from zero. Only the incremental coefficient for Voluntary expensers under IFRS is significantly different from zero (.246, t = 2.86 in column 1). Since the first three cases are all full expensing, and only the Voluntary expensers under IFRS is capitalization, this shows that it was

capitalization that produced the additional information. Moreover, the coefficient of .246 is similar, but slightly smaller than the raw coefficient on NI, further increasing our confidence that the incremental effect is due to capitalization. Together, the results in Tables 3 and 4 indicate that the market could not separate voluntary vs mandatory expensers under UK GAAP, and IFRS' requirement for firms to capitalize eligible development expenditures revealed new information to the market.

5.2 Alternative Explanation – Real Change in R&D Expenditures

A crucial assumption of our tests is that the identity of firms as voluntary expensers revealed under IFRS also held during UK GAAP; i.e., the voluntary expensers had capitalizable R&D expenditures before IFRS, and the valuation changes that we documented were due to a change in financial reporting that revealed new information to the market, and not to real changes in voluntary expensers' R&D expenditures.

A strong piece of evidence against this "real change" explanation is that it would imply a big change in voluntary expensers' business models (from basic research to development), in just one year, which seems unlikely. Nevertheless, to verify that market learning due to the change in financial reporting, and not a change in the composition of R&D expenditures, is the reason behind the valuation change, we conduct the following additional tests.

73% of voluntary expensers (63 firms) disclose non-zero pro-forma R&D capitalization, while 27% disclose zero. For these 63 firms, the average pro-forma ratio of capitalized R&D expenditures to total R&D expenditures is .313, and the average in the first 3 IFRS years is .396. This shows that their capitalization behavior did not change much between regimes. Since the 27% might have been mandatory expensers under UK GAAP, we repeat Tables 3 - 4 on the 63 non-zero pro-forma firms. Results are shown in Tables 3A and 4A.

Table 3A, column 1, like Table 3, column 1, shows that capitalized expenditures have a higher response coefficient than expensed expenditures. Table 3A, columns 2-5, like Table 3, columns 2-5, shows that under UK GAAP there was a small and insignificant difference in the R&D response coefficients between mandatory and voluntary expensers (2.77 vs 2.72); but, under IFRS there was a large and statistically significant difference (0.21 vs 2.75, $p < 0.01$).[13] Finally, Table 4A, like Table 4, shows that the FERC for voluntary expensers increased relative to the FERC for mandatory expensers in the switch from UK GAAP to IFRS. Together, these results show that it is highly unlikely that a shift in the composition of R&D expenditures is responsible for the increase in voluntary expensers' R&D response coefficient that is shown in Table 3 and their increase in FERC in Table 4.

In summary, the collective results of our tests are consistent and indicate that the change in financial reporting under IFRS is the likely cause of the relative increase in voluntary expensers' R&D response coefficients, and of the separating equilibrium that the increase represents.

5.3 Robustness Tests

We perform a number of robustness tests. First, to be confident that the switch to IFRS capitalization is driving our results, we conduct a placebo test by re-estimating equation (2) using SG&A expenditures, rather than R&D expenditures, since SG&A continued to be expensed under IFRS. Thus, we expect no difference in the relative SG&A response coefficients between mandatory and voluntary expensers in either period. Results are shown in Table 5, and this is exactly what we find. SG&A response coefficients are .479 and .665 during the UK GAAP period,

[13] Note that in Table 3A, columns 2 and 4 for mandatory expensers are identical to columns 2 and 4 in Table 3. We repeat them in 3A for ease of visual comparison with columns 3 and 5.

and .370 and .521 during the IFRS period, and we cannot reject the null hypothesis that voluntary expensers' and mandatory expensers' SG&A response coefficients are equal in each period.

Second, Oswald et al (2022) find that Switchers increased their R&D expenditures around the time of the switch to IFRS. To be sure that the increase in R&D expenditures is not driving our results, we estimated equations (1), (2) and (3) after deleting voluntary expensers that had large changes in their R&D expenditures, which we defined as ≥ 100% (20% of voluntary expensers), in the switch from UK GAAP to IFRS. Analogous to Tables 3A and 4A, results are shown in Tables 3B and 4B.[14] Table 3B like Tables 3 and 3A shows that capitalized expenditures are more valuable than expensed expenditures (column 1) and that R&D response coefficients were identical for voluntary and mandatory expensers under UK GAAP (columns 2-3), but voluntary expensers' R&D response coefficient was significantly greater under IFRS (columns 4-5). Table 4B like Tables 4 and 4A, shows that voluntary expensers' FERC increased relative to mandatory expensers' FERC, in the switch to IFRS. Thus, all of our primary results are supported.

Finally, we repeat Table 3 (i.e., our main equations (1) and (2)), including the change in NIRD, as well as its level. Results are shown in Table 6, and our conclusions are supported. Capitalized expenditures are more valuable than expensed expenditures (column 1), and the R&D response coefficients for voluntary and mandatory expensers are (statistically and economically) indistinguishable under UK GAAP (columns 2-3), but voluntary expensers' is higher under IFRS (columns 4-5).[15] Together, all of our results are consistent, and show that the market could not distinguish the relative value of firms' R&D expenditures when all firms expensed all of their

[14] In Table 3B, like Table 3A, columns 2 and 4 for mandatory expensers are identical to columns 2 and 4 in Table 3. We repeat them in 3B for ease of visual comparison with columns 3 and 5.

[15] We also estimated the models in Tables 3 with a LOSS dummy (NI < 0); the results (untabulated due to brevity) were very similar to those reported in Table 3.

R&D. Only the new information revealed by mandatory capitalization enabled the stock market to distinguish firms with vs without capitalizable R&D expenditures.

5.4 Is there Excessive Capitalization?

One reason for full expensing of R&D in the U.S. is the fear that firms would abuse capitalization and put "soft" assets on the balance sheet (i.e., expenditures that should not be capitalized). While we can't know when R&D expenditures have passed IFRS' capitalization threshold, an important piece of evidence of excess capitalization would be write-offs of R&D assets. To examine this, Table 7, Panel A reports statistics on write-offs of R&D assets, for the (former) voluntary expensers during our three year IFRS sample period, relative to both beginning of year market value and to beginning of year R&D asset + current year capitalized R&D expenditure. During this time, there were 17 write-offs, 6.6% of the 258 firm-year observations. The average write-off was about 1% of market value and 12% of R&D asset value (medians are slightly smaller, 0.7% and 8.3%, respectively), and even the third quartiles are only 1.4% and 14.2%.[16]

To put these R&D write-off statistics in perspective, Table 7, Panel B reports statistics on PPE write-offs for our sample of voluntary expensers over the same three year IFRS period. Panel B shows that there were 28 PPE write-offs, 11 more than the R&D write-offs, and the average PPE write-off is greater than the average R&D write-off (although the median R&D write-off is greater). The relative magnitude and frequency of R&D vs PPE write-offs should mitigate U.S. regulators' concerns that R&D capitalization puts "soft" assets on the balance

[16]We also investigated write-offs of R&D assets thru year 4, since R&D capitalized in year 3 might not be written off until the following year (although this could overstate the write-off propensity, if the year 4 write-off includes R&D capitalized after year 3). Cumulatively thru year 4, there were 28 write-offs (8.1% of firm-year observations). The average write-off was 0.9% of market value and 9.6% of R&D asset value (medians are 0.7% and 5.9%, respectively). Thus, our results are not sensitive to the 3 year window.

sheet; PPE capitalization, of course, is taken for granted, and our write-off evidence suggests that U.S. regulators should rethink their reservations about R&D capitalization.

The low incidence and small size of R&D impairments, especially in comparison to PPE write-offs, indicates a stringent R&D capitalization criterion. This implies a high capitalization threshold, consistent with the IFRS mandate, whereby specific conditions must be satisfied for R&D capitalization to occur, reducing the likelihood of subsequent failures. Johnstone and Penman (2024) warn about excessive capitalization, but our empirical evidence suggests that this is not a concern. The low probability of R&D impairment indicates that IFRS R&D capitalization is actually conservative (although not as conservative as US GAAP's full expensing), which has not been appreciated before.

6. Why Can't the Stock Market Capitalize R&D Expenditures Without Mandatory Capitalization?

In order to understand the mechanism behind why, without mandatory capitalization, the market can't infer which firms have advanced R&D projects, Table 8, Panel A shows the percentage of capitalized R&D expenditures relative to total R&D expenditures (CAP%), for (former) Voluntary Expensers in the first three IFRS years and the pro-forma CAP% for the last UK GAAP year. As discussed above, 27% of Voluntary Expensers reported zero pro-forma CAP%, so we present both the full sample and the 73% non-zeros to facilitate intertemporal comparisons. Three important results emerge. First, for all firms, far less than 100% of expenditures are capitalized. Second, there is considerable cross-sectional variation in the capitalization percentage; for example, Q1 is about 10% and Q3 is 50% - 60%. Third, there is

considerable intertemporal variation for a given firm, as the average and median ranges (high – low CAP%) are 15.5% and 9.4%, respectively.[17]

Since capitalization rates vary across industries, Table 8, Panels B, C, and D, report CAP% for the three largest industries in our sample (see Table 1), Software, Industrial Machinery, and Electrical Equipment, respectively. These panels show that the same variation observed for the whole sample is mirrored within each industry as well. This shows that the full sample results in Panel A are not simply a reflection of cross-industry variation, but are due to intrinsic variation across firms and for a given firm over time; moreover, using industry or even industry-year capitalization rates, as in Lev and Sougiannis (1996) and Iqbal, et al (2024), respectively, does not substitute for knowing firms' actual capitalization rates.

Collectively, the results in Table 8, Panels A thru D show that previous research's use of a uniform capitalization rate is both incorrect and misses important information. As Penman (2024) points out, R&D capitalization adds to investors' information set only if it indicates the probability of the investment's success. By construction, uniform capitalization cannot do this. Without the proprietary information revealed by mandatory capitalization, it is likely impossible for the market to know what percentage of a firm's R&D expenditures pass the capitalization threshold. This likely explains why the market can't distinguish firms with vs firms without capitalizable R&D expenditures, when firms expense all of their R&D expenditures.

7. Conclusion

We examine whether the stock market can distinguish firms with more valuable (capitalization-eligible) vs less valuable (not capitalization-eligible) R&D expenditures, when all

[17] We also find that Capitalizers have a lot of both cross-sectional and intertemporal variation in their CAP% (untabulated), so our conclusions are not limited to (former) voluntary expensers.

firms expense R&D. Our investigation is particularly applicable to markets like the U.S, where expensing R&D is mandated, and no additional disclosures are required.

Our setting is the UK around the time of its switch from UK GAAP to IFRS in 2005. Under both regimes, research expenditures and development expenditures that did not meet capitalization conditions must be expensed. Under UK GAAP, firms had the option to expense or capitalize capitalization-eligible R&D expenditures. Thus, there were mandatory expensers (who did not have capitalization-eligible R&D expenditures), and voluntary expensers (who had capitalization-eligible R&D expenditures, but chose to expense them). Under IFRS, such eligible expenditures must be capitalized, so voluntary expensers were required to reveal their type.

We find that under UK GAAP, the UK stock market valued the R&D expenditures of both mandatory and voluntary expensers equally; i.e., the market could not separate the two groups of firms, and there was a pooling equilibrium. R&D of voluntary expensers was valued more highly only under IFRS. Consistent with the revelation of the value relevant information in the switch from UK GAAP to IFRS, the FERC of voluntary expensers increased relative to the FERC of mandatory expensers.

To understand the mechanism behind our results, we show that the percentage of R&D expenditures that is capitalized varies substantially, both across firms and for a given firm over time. Since capitalization represents projects close to fruition, this shows that without the proprietary information revealed by mandatory capitalization, it is likely impossible for the market to know what percentage of a firm's R&D expenditures pass the capitalization threshold, which explains why the market can't distinguish firms with vs firms without capitalizable R&D expenditures, when firms expense all of their R&D expenditures. In addition, it shows that

previous research's use of a uniform capitalization rate is both incorrect and misses important information about the status of firms' R&D projects.

Finally, in addition to our primary results, we make an important contribution by showing that write-offs of capitalized R&D are rare and small (likely due to IFRS's stringent capitalization criteria), even when compared to write-offs of PPE. Since capitalization of PPE is taken for granted, our write-off evidence shows that U.S. regulators' fear of recognizing "soft" intangible R&D assets is likely overblown.

In the U.S., where almost all R&D costs are expensed, there is much debate about whether (at least some) R&D costs should be capitalized. Although they do not explicitly advocate for an IFRS-like separation, our results are consistent with Barker et al (2022), who emphasize the importance of investment uncertainty, since expensed R&D investments are more uncertain than capitalized R&D investments. In terms of its lessons for U.S. regulators, our results can serve as an example of evidence-based policy making (Leuz, 2018). In this regard, some may question whether results from the UK can be extrapolated to the U.S.? As Leuz points out, we would not apply results from a study of plant emissions in India, where auditors are paid less than $1,000 per audit, to the U.S. Clearly, learning from the U.K. what U.S. results might look like, does not suffer from this problem of large cross-country differences, as it is widely agreed that the U.K.'s capital market is the most comparable to the U.S'. Indeed, the dearth of capitalization information among U.S. R&D firms is like U.K. expensers before IFRS, attesting to the similarity of the two settings. Thus, our results can offer valuable lessons for U.S. regulators.

More generally, our evidence points to the importance of disclosure regulation (Leuz and Wysocki, 2016). We offer strong and consistent evidence that voluntary disclosure was not

enough. Without mandatory capitalization revealing firms' types, the market was not able to properly value firms' R&D expenditures, and voluntary expensers' stock returns incorporated less future earnings information, than with the new information.

An important question for future research is why voluntary expensers didn't reveal their valuable R&D investments to the market before IFRS. Two possible reasons are proprietary costs, and/or not wanting to incur the costs to track and identify projects that passed the capitalization threshold (Nixon, 1997). But, regardless of the reason, it doesn't affect our main conclusion: the stock market cannot capitalize R&D expenditures when firms aren't mandated to.

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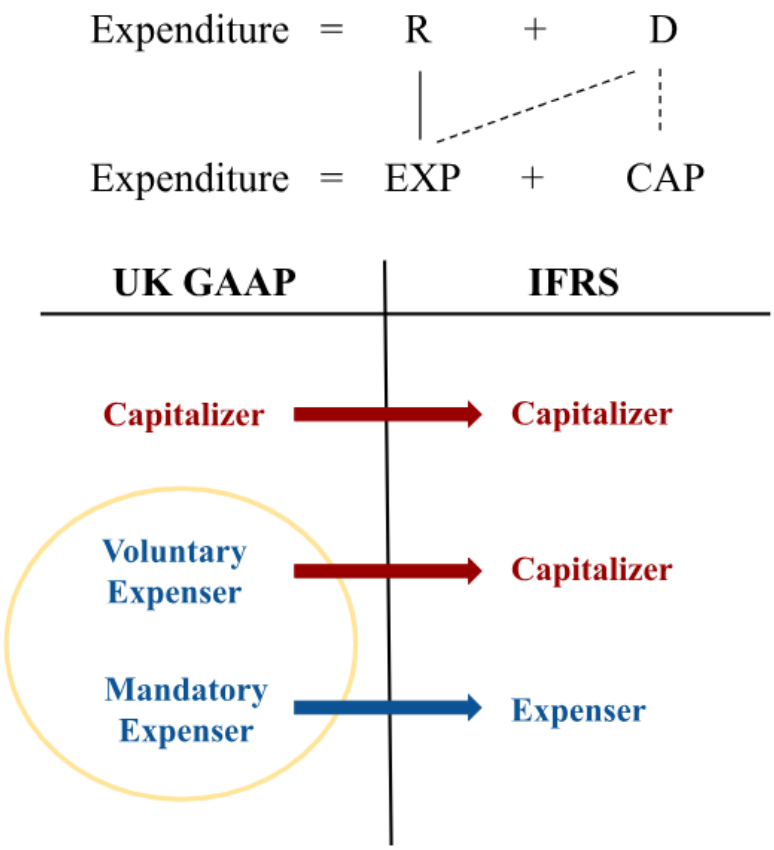
Appendix. Variable descriptions

Variable	Definition
R&D	The amount of total R&D expenditure in year t scaled by market cap in year t-1
EXP	The amount of R&D expenditure expensed in year t scaled by market cap in year t-1
CAP	The amount of R&D expenditure capitalized in year t scaled by market cap in year t-1
WOFF	The amount of R&D impairment in year t scaled by market cap in year t-1
MAN	1 if firm is a mandatory expenser under UK GAAP and 0 otherwise
RET	Cumulative stock return over the period from 9 months before fiscal year end to 3 months after fiscal year end
IFRS	1 if firm follows IFRS standard in year *t*, and 0 otherwise.
NIRD	Net income before after-tax R&D expense (net income plus R&D expense * (1 – 0.3))
CHG_NIRD	Changes in NIRD from year t-1 to year t
NI	As-if net income in year t scaled by market cap in year t-1
LAG_NI	As-if net income in year t-1 scaled by market cap in year t-2
FUTURE_NI	Sum of as-if net income scaled by lagged market cap over the two or three years.
FUTURE_RET	Cumulative stock return over the period from 3 months to 27 or 39 months after fiscal year end
SIZE	Log (market value of equity), measured 3 months after fiscal year end
BTM	As-if Book value of equity / Market value of equity
LEVERAGE	Total debt/total assets
ROE	Net income / Common Equity
ROA	Net income / Total asset
VROA	Variance of ROA over prior four years
SG&A	The amount of SG&A expenditure in year t scaled by market cap in year t-1
WOFF_PPE	The amount of PP&E impairment in year t scaled by market capitalization in year t-1

Figure 1: Accounting for R&D Expenditures Under UK GAAP and IFRS



Capitalizer = Voluntarily chose to capitalize eligible development expenditures under UK GAAP; continued to do so under IFRS

Voluntary Expenser = Voluntarily chose to expense eligible development expenditures under UK GAAP; mandated to capitalize them under IFRS

Mandatory Expenser = Do not have eligible development expenditures

Table 1. Sample Selection and Industry Distribution

Panel A. Sample Selection

	Firm-Year Obs	Firms
IFRS Adopted Firms (2002~2010)	4,598	727
Remove:		
Missing Control Variables	(1,156)	(108)
Outside Six-Year Window	(1,918)	(365)
Mixed R&D Policy	(198)	(33)
Reverse Switcher or Early Switcher	(18)	(3)
Final Sample	1,296	216
• Type		
Voluntary Expenser	516	86
Mandatory Expenser	624	104
Capitalizer	156	26

Panel A of Table 1 shows the sample selection procedure. The sample consists of up to six firm-year observations per firm of U.K. firms that disclosed either an R&D asset or R&D expense during the period 2002_2010. To obtain our final sample, we remove inappropriate observations and require accounting and financial data. Voluntary Expensers are firms that switched from expensing R&D under U.K. GAAP to capitalizing R&D under IFRS. Mandatory Expensers are firms that always expensed R&D under U.K. GAAP and IFRS. Capitalizers are firms that always capitalized R&D under U.K. GAAP and IFRS.

Table 1. Sample Selection and Industry Distribution (Continued)

Panel B: Industry Membership

Industry	Voluntary Expensers	Mandatory Expensers	Industry	Voluntary Expensers	Mandatory Expensers
Aerospace	1	1	Home Construction	1	0
Alternative Fuels	2	0	Industrial Machinery	6	9
Auto Parts	3	0	Industrial Suppliers	1	1
Biotechnology	7	2	Integrated Oil & Gas	1	0
Brewers	1	0	Internet	2	0
Building Mat.& Fix.	2	2	Media Agencies	0	1
Bus.Train & Employmnt	1	0	Medical Equipment	2	4
Business Support Svs.	3	5	Medical Supplies	1	3
Clothing & Accessory	1	0	Mobile Telecom.	2	0
Computer Hardware	1	1	Multiutilities	2	0
Comm. Vehicles,Trucks	0	1	Nondur.Household Prod	1	0
Computer Services	3	6	Oil Equip. & Services	1	0
Con. Electricity	0	1	Paper	1	0
Containers & Package	2	2	Personal Products	4	0
Defense	0	2	Pharmaceuticals	7	1
Distillers & Vintners	1	0	Restaurants & Bars	0	1
Divers. Industrials	0	1	Semiconductors	1	4
Dur. Household Prod.	1	0	Software	11	18
Electrical Equipment	8	5	Specialty Chemicals	6	1
Electronic Equipment	2	5	Telecom. Equipment	2	4
Fixed Line Telecom.	1	0	Toys	1	2
Food Products	3	2	Transport Services	1	0
Food Retail, Wholesale	1	0	Water, Disposal Svs.	1	0
Heavy Construction	1	0	Water	2	1

	Total	104	86

Panel B of Table 1 shows the Datastream level-6 industry distribution of Voluntary Expensers and Mandatory Expensers. See the Appendix for variable definitions.

Table 2: Descriptive Statistics

Panel A: Under U.K. GAAP - Voluntary Expensers vs. Mandatory Expensers								
	Voluntary Expensers			Mandatory Expensers			Difference (p-value)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Mean	Median	Std.	Mean	Median	Std.	T-test	Wilcoxon
R&D	0.084	0.045	0.116	0.075	0.037	0.121	0.366	0.002
RET	0.206	0.212	0.524	0.157	0.147	0.534	0.268	0.108
NIRD	0.037	0.069	0.201	-0.007	0.051	0.243	**0.020**	0.021
SIZE	11.369	11.029	1.865	11.660	11.458	2.578	0.131	0.376
BTM	0.418	0.342	0.532	0.538	0.435	0.751	**0.031**	0.011
LEVERAGE	0.039	0.012	0.070	0.059	0.020	0.101	**0.007**	0.121
ROA	-0.039	0.028	0.259	-0.105	0.017	0.320	**0.008**	0.004
ROE	-0.081	0.091	0.890	-0.061	0.063	0.788	0.775	0.190
VROA	0.080	0.004	0.410	0.191	0.003	0.750	**0.034**	0.803
Panel B: Under IFRS - Voluntary Expensers vs. Mandatory Expensers								
	Voluntary Expensers			Mandatory Expensers			Difference (p-value)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Mean	Median	Std.	Mean	Median	Std.	T-test	Wilcoxon
R&D	0.087	0.043	0.128	0.064	0.028	0.114	**0.025**	<0.001
RET	0.087	0.093	0.474	0.090	0.128	0.468	0.942	0.564
NIRD	0.089	0.080	0.154	0.044	0.069	0.188	**0.002**	0.002
SIZE	11.585	11.161	2.094	11.828	11.733	2.849	0.255	0.518
BTM	0.518	0.389	0.613	0.499	0.394	0.693	0.734	0.583
LEVERAGE	0.051	0.019	0.089	0.060	0.020	0.100	0.277	0.879
ROA	0.054	0.066	0.136	-0.075	0.046	0.356	**0.000**	<0.001
ROE	0.091	0.127	0.531	-0.006	0.120	0.714	**0.071**	0.170
VROA	0.029	0.002	0.089	0.099	0.002	0.477	**0.021**	0.948

Table 2 shows the descriptive statistics of our sample. Panels A and B presents descriptive statistics for mandatory and voluntary expensers during the UK GAAP and IFRS periods, respectively. Each panel also reports the p-values indicating the statistical significance of differences in mean and median between voluntary and mandatory expensers. Panel C reports the correlations among our main variables (NIRD, CHG_NIRD, RET, and R&D), separately for voluntary and mandatory expensers, as well as across different regimes. Bolded figures denote significance at the 10% level or lower. See the Appendix for variable definitions.

Panel C: Correlation Table

i. Voluntary Expensers – Under UK GAAP

Variables	(1) NIRD	(2) CHG_NIRD	(3) RET
(1) NIRD	1.000		
(2) CHG_NIRD	**0.222**	1.000	
(3) RET	**0.140**	**0.103**	1.000
(4) R&D	0.082	**0.194**	0.076

ii. Voluntary Expensers – Under IFRS

Variables	(1) NIRD	(2) CHG_NIRD	(3) RET	(4) R&D	(5) EXP
(1) NIRD	1.000				
(2) CHG_NIRD	**0.538**	1.000			
(3) RET	**0.220**	**0.264**	1.000		
(4) R&D	**0.193**	**0.117**	0.090	1.000	
(5) EXP	**0.407**	**0.192**	0.044	**0.828**	1.000
(6) CAP	0.038	0.100	0.099	**0.750**	**0.394**

iii. Mandatory Expensers – Under UK GAAP

Variables	(1) NIRD	(2) CHG_NIRD	(3) RET
(1) NIRD	1.000		
(2) CHG_NIRD	**0.402**	1.000	
(3) RET	**0.164**	**0.200**	1.000
(4) R&D	-0.063	-0.025	**0.185**

iv. Mandatory Expensers – Under IFRS

Variables	(1) NIRD	(2) CHG_NIRD	(3) RET
(1) NIRD	1.000		
(2) CHG_NIRD	**0.637**	1.000	
(3) RET	**0.163**	**0.161**	1.000
(4) R&D	-0.045	0.035	-0.026

Table 2 shows the descriptive statistics of our sample. Panels A and B presents descriptive statistics for mandatory and voluntary expensers during the UK GAAP and IFRS periods, respectively. Each panel also reports the p-values indicating the statistical significance of differences in mean and median between voluntary and mandatory expensers. Panel C reports the correlations among our main variables (NIRD, CHG_NIRD, RET, and R&D), separately for voluntary and mandatory expensers, as well as across different regimes. Correlations of EXP and CAP with the other variables are reported for voluntary expensers under IFRS. Bolded figures denote significance at the 10% level or lower. See the Appendix for variable definitions.

Table 3. Value Relevance of R&D Expenditure

	IFRS	U.K. GAAP		IFRS	
	(1)	(2)	(3)	(4)	(5)
VARIABLES	Voluntary Expenser	Mandatory Expenser	Voluntary Expenser	Mandatory Expenser	Voluntary Expenser
NIRD	**0.776*** **	0.311	0.136	0.351	**0.829*** **
	(2.955)	(1.075)	(0.398)	(1.010)	**(3.336)**
EXP	1.004				
	(1.123)				
CAP	**6.438*** **				
	(2.711)				
R&D		**2.777*** **	**2.942*** **	0.214	**2.125*** **
		(4.512)	**(4.236)**	(0.389)	**(3.811)**
Constant	-0.218***	-0.049	-0.045	0.061	-0.172***
	(-2.936)	(-1.049)	(-0.750)	(1.411)	(-2.968)
	EXP = CAP:	*R&D* (2) = (3):		*R&D* (4) = (5):	
	p-value:0.05	p-value:0.83		p-value<0.01	
Observations	258	312	258	312	258
Adjusted R-squared	0.288	0.335	0.237	0.335	0.237
Fixed Effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Clustered SE	Firm	Firm	Firm	Firm	Firm

Table 3, Column (1) presents the regression results of Equation (1): $R_{it} = a + b_1*NIRD_{it} + b_2*EXP_{it} + b_3*CAP_{it} + e_{it.}$ for voluntary expensers under IFRS adoption. The p-values for differences between the coefficients on *EXP* and *CAP* are reported at the bottom of Column (1). Table 3, Columns (2) – (4) presents the regression results of Equation (2): $R_{it} = a + b_1*NIRD_{it} + b_2*R\&D_{it} + e_{it}$. Columns (2) and (3) show the results for mandatory expenser and volunatry expenser under U.K. GAAP, while Columns (4) and (5) present the results for mandatory expenser and voluntary expenser under IFRS. The p-values for differences in the coefficient on *R&D* between Columns (2) and (3) and between Columns (4) and (5) are reported at the bottom Table 3. We use firm and year fixed effects and cluster standard errors by firm. Robust t-statistics are presented in parentheses, and significance levels are denoted by ***, **, and *, indicating significance at the 1%, 5%, and 10% levels (two-sided), respectively. All variables are defined in the Appendix.

Table 4. Future Earnings Response Coefficient

VARIABLES	(1) TWO-YEAR FUTURE EPS	(2) THREE-YEAR FUTURE EPS
NI	**0.319***	**0.314***
	(1.844)	**(1.810)**
NI*IFRS	0.067	0.092
	(0.186)	(0.245)
NI*VOL	0.106	0.114
	(0.357)	(0.384)
NI*VOL*IFRS	-0.019	0.026
	(-0.033)	(0.045)
FUTURE_NI	0.009	0.007
	(0.270)	(0.334)
FUTURE_NI*IFRS	0.001	0.008
	(0.016)	(0.376)
FUTURE_NI*VOL	0.029	-0.015
	(0.430)	(-0.245)
FUTURE_NI*VOL*IFRS	**0.246*****	**0.188***
	(2.862)	**(1.909)**
LAG_NI	-0.193	-0.179
	(-1.273)	(-1.253)
LAG_NI*IFRS	0.045	0.015
	(0.157)	(0.055)
LAG_NI*VOL	-0.010	-0.031
	(-0.048)	(-0.146)
LAG_NI*VOL*IFRS	-0.451	-0.399
	(-0.989)	(-0.935)
FUTURE_RET	-0.055	-0.071
	(-0.837)	(-1.532)
FUTURE_RET*IFRS	-0.077	-0.048
	(-0.848)	(-0.815)
FUTURE_RET*VOL	-0.011	0.034
	(-0.129)	(0.604)
FUTURE_RET*VOL*IFRS	0.017	-0.066
	(0.142)	(-0.728)
IFRS	-0.013	-0.031
	(-0.218)	(-0.522)
VOL	0.040	0.023
	(0.735)	(0.466)
VOL*IFRS	-0.093	-0.070
	(-1.100)	(-0.827)
Constant	0.163***	0.191***
	(4.000)	(5.047)
Observations	1,140	1,140
Adjusted R-squared	0.183	0.186
Fixed Effects	Industry & Year	Industry & Year
Clustered SE	Firm	Firm

Table 4 presents the regression results of Equation (3): $R_{it} = a + b_1*IFRS + b_2*VOL + b_3*IFRS*VOL + b_4*X_t + b_5*IFRS*X_t + b_6*VOL*X_t + b_7*IFRS*VOL*X_t + b_8*X_{t+T} + b_9*IFRS*X_{t+T} + b_{10}*VOL*X_{t+T} + b_{11}*IFRS*VOL*X_{t+T} + b_{12}*X_{t-1} + b_{13}*IFRS*X_{t-1} + b_{14}*VOL*X_{t-1} + b_{15}*IFRS*VOL*X_{t-1} + b_{16}*R_{t+T} + b_{17}*IFRS*R_{t+T} + b_{18}*VOL*R_{t+T} + b_{19}*IFRS*VOL*R_{t+T} + e_{it}$. X_t, X_{t-1},X_{t+T} are current (*NI*), lagged (*LAG_NI*) and future earnings *(FUTURE_NI)*, respectively. Column (1) uses two-year future EPS to calculate *FUTURE_NI*, and Column (2) uses three-year future EPS to calculate *FUTURE_NI*. Earnings of capitalizers (voluntary expensers) under IFRS are adjusted to an as-if expense basis. We use Industry and year fixed effects and cluster standard errors by firm. Robust t-statistics are presented in parentheses, and significance levels are denoted by ***, **, and *, indicating significance at the 1%, 5%, and 10% levels (two-sided), respectively. All variables are defined in the Appendix.

Table 5. Robustness Analysis: Value Relevance of SG&A Expenditure

	U.K. GAAP		IFRS	
	(1)	(2)	(3)	(4)
	Mandatory	Voluntary	Mandatory	Voluntary
VARIABLES	Expenser	Expenser	Expenser	Expenser
NIRD	0.380	0.261	0.816	**0.842*** **
	(1.185)	(1.242)	(1.590)	**(2.856)**
SG&A	**0.479*** **	**0.665*** **	**0.370** **	**0.521*** **
	(3.188)	**(5.027)**	**(2.170)**	**(3.132)**
Constant	-0.089	-0.159**	-0.102	-0.222***
	(-1.118)	(-2.267)	(-1.284)	(-3.111)
	SG&A (1) = (2): p-value:0.38		*SG&A* (3) = (4) : p-value:0.39	
Observations	251	204	238	205
Adjusted R-squared	0.262	0.317	0.139	0.276
Fixed Effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Clustered SE	Firm	Firm	Firm	Firm

Table 5 presents the regression results of Equation (2) using SG&A instead of R&D: $R_{it} = a + b_1*NIRD_{it} + b_2*SG\&A_{it} + e_{it}$. Columns (2) and (3) show the results for mandatory expenser and volunatry expenser under U.K. GAAP, while Columns (4) and (5) present the results for mandatory expenser and voluntary expenser under IFRS. The p-values for differences in the coefficient on *SG&A* between Columns (2) and (3) and between Columns (4) and (5) are reported at the bottom Table 5. We use firm and year fixed effects and cluster standard errors by firm. Robust t-statistics are presented in parentheses, and significance levels are denoted by ***, **, and *, indicating significance at the 1%, 5%, and 10% levels (two-sided), respectively. All variables are defined in the Appendix.

Table 6. Robustness Analysis: Including both NIRD and CHG_NIRD

	IFRS	U.K. GAAP		IFRS	
	(1)	(2)	(3)	(4)	(5)
VARIABLES	Voluntary Expenser	Mandatory Expenser	Voluntary Expenser	Mandatory Expenser	Voluntary Expenser
NIRD	0.728	-0.319	-0.060	-0.273	0.684
	(1.420)	(-0.774)	(-0.143)	(-0.587)	(1.465)
CHG_NIRD	0.046	**0.445*** **	0.199	**0.510** **	0.127
	(0.121)	**(2.652)**	(0.784)	**(1.993)**	(0.400)
EXP	0.927				
	(0.792)				
CAP	**6.353*** **				
	(2.939)				
R&D		**2.612*** **	**2.794*** **	0.032	**1.981*** **
		(4.487)	**(3.962)**	(0.057)	**(3.388)**
Constant	-0.208**	-0.047	-0.032	0.098**	-0.148*
	(-2.171)	(-1.118)	(-0.525)	(2.134)	(-1.945)
	EXP = CAP:	*R&D* (2) = (3):		*R&D* (4) = (5):	
	p-value:0.05	p-value:0.83		p-value<0.01	
Observations	258	312	258	312	258
Adjusted R-squared	0.283	0.374	0.236	0.150	0.267
Fixed Effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Clustered SE	Firm	Firm	Firm	Firm	Firm

Table 6 replicates Table 3 adding changes in earnings (CHG_NIRD) to Equations (1) and (2). We use firm and year fixed effects and cluster standard errors by firm. Robust t-statistics are presented in parentheses, and significance levels are denoted by ***, **, and *, indicating significance at the 1%, 5%, and 10% levels (two-sided), respectively. All variables are defined in the Appendix.

Table 7: R&D Impairment

Panel A: R&D Impairment – Voluntary Expenser with Positive Write-Off						
	N	Mean	Median	Std.	Q1	Q3
WOFF	17	0.011	0.007	0.010	0.001	0.014
WOFF/R&D ASSET	17	0.123	0.083	0.166	0.038	0.142
Panel B: PP&E Impairment – Voluntary Expenser with Positive Write-Off						
	N	Mean	Median	Std.	Q1	Q3
WOFF_PPE	28	0.013	0.004	0.022	0.002	0.015
WOFF_PPE/PPE	28	0.137	0.025	0.377	0.006	0.040

Table 7 presents the statistics for Impairment for voluntary expensers with non-zero write-off. Panel A shows the R&D impairment, and Panel B shows the PP&E impairment. *WOFF* indicates the amount of R&D impairment in year t scaled by market capitalization in year t-1. *WOFF/R&D ASSET* shows the R&D impairment divided by the sum of beginning R&D asset and the capitalized R&D expenditure in year t. *WOFF_PPE* indicates the amount of PP&E impairment in year t scaled by market capitalization in year t-1. *WOFF_PPE/PPE* shows the PP&E impairment divided by the sum of the beginning PP&E in year t. All variables are defined in the Appendix.

Table 8: Capitalization Ratio

Panel A: CAP% Over the First 3 Years Under IFRS – Voluntary Expenser						
	N	Mean	Median	Std.	Q1	Q3
CAP% - Pro-Forma	86	0.230	0.100	0.304	0.000	0.338
CAP% - Pro-Forma (nonzero)	63	0.313	0.185	0.316	0.073	0.492
CAP% - Year 0	86	0.361	0.243	0.336	0.107	0.556
CAP% - Year 1	86	0.378	0.259	0.345	0.123	0.547
CAP% - Year 2	86	0.381	0.273	0.350	0.104	0.658
CAP% - Within Diff	86	0.156	0.094	0.191	0.036	0.183
Panel B: CAP% Over the First 3 Years Under IFRS – Voluntary Expenser (Software Industry)						
	N	Mean	Median	Std.	Q1	Q3
CAP% - Pro-Forma	18	0.203	0.070	0.298	0.000	0.208
CAP% - Pro-Forma (nonzero)	13	0.281	0.129	0.320	0.044	0.500
CAP% - Year 0	18	0.356	0.227	0.359	0.060	0.469
CAP% - Year 1	18	0.388	0.316	0.358	0.125	0.547
CAP% - Year 2	18	0.369	0.340	0.326	0.140	0.422
CAP% - Within Diff	18	0.111	0.059	0.139	0.030	0.159
Panel C: CAP% Over the First 3 Years Under IFRS – Voluntary Expenser (Industrial Machinery Industry)						
	N	Mean	Median	Std.	Q1	Q3
CAP% - Pro-Forma	9	0.215	0.106	0.276	0.042	0.214
CAP% - Pro-Forma (nonzero)	9	0.215	0.106	0.276	0.042	0.214
CAP% - Year 0	9	0.300	0.177	0.302	0.098	0.326
CAP% - Year 1	9	0.312	0.129	0.371	0.107	0.409
CAP% - Year 2	9	0.378	0.254	0.365	0.104	0.658
CAP% - Within Diff	9	0.154	0.091	0.108	0.088	0.177
Panel D: CAP% Over the First 3 Years Under IFRS – Voluntary Expenser (Electrical Equipment)						
	N	Mean	Median	Std.	Q1	Q3
CAP% - Pro-Forma	5	0.440	0.311	0.443	0.073	0.809
CAP% - Pro-Forma (nonzero)	5	0.440	0.311	0.443	0.073	0.809
CAP% - Year 0	5	0.529	0.423	0.453	0.193	1.000
CAP% - Year 1	5	0.523	0.322	0.442	0.176	1.000
CAP% - Year 2	5	0.334	0.312	0.403	0.017	0.333
CAP% - Within Diff	5	0.215	0.102	0.242	0.101	0.182

Table 8 shows the capitalization ratio of our sample. Panel A shows the percentage of capitalized R&D expenditure relative to total R&D expenditure (CAP%) for voluntary expensers during the first three IFRS years. *CAP% - Year t* represents the CAP% for each year relative to the IFRS adoption year. *CAP% - Pro-Forma* shows the CAP% for the last year under U.K. GAAP, based on disclosed pro-forma data. *CAP% - Within Diff* indicates the difference between highest and lowest CAP% for each firm. Panels B, C, and D show the capitalization ratio for Software, Industrial Machinery, and Electrical Equipment industry respectively. All variables are defined in the Appendix.

Table 3A. Value Relevance of R&D expenditure Excluding Voluntary Expensers with Zero Pro-Forma CAP%

	IFRS	U.K. GAAP		IFRS	
	(1)	(2)	(3)	(4)	(5)
VARIABLES	Non-Zero Voluntary Expenser	Mandatory Expenser	Non-Zero Voluntary Expenser	Mandatory Expenser	Non-Zero Voluntary Expenser
NIRD	**1.181*** **	0.311	0.097	0.351	**1.119*** **
	(4.665)	(1.075)	(0.373)	(1.010)	**(3.497)**
EXP	0.703				
	(0.667)				
CAP	**9.030*** **				
	(4.756)				
R&D		**2.777*** **	**2.724*** **	0.214	**2.754*** **
		(4.512)	**(4.236)**	(0.389)	**(3.811)**
Constant	-0.218***	-0.049	-0.048	0.061	-0.266***
	(-2.936)	(-1.049)	(-0.802)	(1.411)	(-3.446)
	EXP = *CAP*: p-value<0.01	*R&D* (2) = (3): p-value:0.99		*R&D* (4) = (5): p-value:<0.01	
Observations	189	312	189	312	189
Adjusted R-squared	0.423	0.335	0.331	0.134	0.348
Fixed Effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Clustered SE	Firm	Firm	Firm	Firm	Firm

Table 3A, Column (1), presents the regression results of Equation (1): $R_{it} = a + b_1*NIRD_{it} + b_2*EXP_{it} + b_3*CAP_{it} + e_{it.}$ for voluntary expensers with non-zero pro-forma CAP% under IFRS adoption. The p-values for differences between the coefficients on *EXP* and *CAP* are reported at the bottom of Column (1). Table 3A, Columns (2)-(5), presents the regression results of Equation (2): $R_{it} = a + b_1*NIRD_{it} + b_2*R\&D_{it} + e_{it}$. Columns (2) and (3) show the results for mandatory expenser and voluntary expenser with non-zero pro-forma CAP% under U.K. GAAP, while Columns (4) and (5) present the results for mandatory expenser and voluntary expenser with non-zero pro-forma CAP% under IFRS. The p-values for differences in the coefficient on *R&D* between Columns (2) and (3) and between Columns (4) and (5) are reported at the bottom Table 3A. We use firm and year fixed effects and cluster standard errors by firm. Robust t-statistics are presented in parentheses, and significance levels are denoted by ***, **, and *, indicating significance at the 1%, 5%, and 10% levels (two-sided), respectively. All variables are defined in the Appendix.

Table 4A. Future Earnings Response Coefficient Excluding Voluntary Expensers with Zero Pro-Forma CAP%

VARIABLES	(1) TWO-YEAR FUTURE EPS	(2) THREE-YEAR FUTURE EPS
NI	**0.301***	**0.300***
	(1.676)	**(1.673)**
NI*IFRS	0.053	0.076
	(0.145)	(0.202)
NI*VOL	0.202	0.178
	(0.576)	(0.500)
NI* VOL*IFRS	0.714	0.736
	(1.200)	(1.212)
FUTURE_NI	0.006	0.005
	(0.167)	(0.252)
FUTURE_NI*IFRS	0.005	0.010
	(0.139)	(0.459)
FUTURE_NI* VOL	-0.008	**-0.062***
	(-0.192)	**(-1.858)**
FUTURE_NI* VOL*IFRS	**0.328****	**0.246***
	(2.110)	**(1.914)**
LAG_NI	-0.190	-0.176
	(-1.249)	(-1.231)
LAG_NI*IFRS	0.015	-0.013
	(0.052)	(-0.048)
LAG_NI*VOL	-0.008	-0.054
	(-0.030)	(-0.209)
LAG_NI* VOL*IFRS	-0.439	-0.391
	(-0.934)	(-0.837)
FUTURE_RET	-0.057	-0.072
	(-0.852)	(-1.501)
FUTURE_RET*IFRS	-0.074	-0.042
	(-0.805)	(-0.681)
FUTURE_RET* VOL	-0.077	0.004
	(-0.844)	(0.060)
FUTURE_RET* VOL*IFRS	0.089	0.003
	(0.779)	(0.031)
IFRS	-0.004	-0.026
	(-0.058)	(-0.441)
VOL	0.067	0.045
	(1.135)	(0.806)
VOL*IFRS	**-0.186****	**-0.161****
	(-2.413)	**(-2.057)**
Constant	0.156***	0.185***
	(3.857)	(4.900)
Observations	1,002	1,002

Adjusted R-squared	0.203	0.205
Fixed Effects	Industry & Year	Industry & Year
Clustered SE	Firm	Firm

Table 4A presents the regression results of Equation (3): $R_{it} = a + b_1*IFRS + b_2*VOL + b_3*IFRS*VOL + b_4*X_t + b_5*IFRS*X_t + b_6*VOL*X_t + b_7*IFRS*VOL*X_t + b_8*X_{t+T} + b_9*IFRS*X_{t+T} + b_{10}*VOL*X_{t+T} + b_{11}*IFRS*VOL*X_{t+T} + b_{12}*X_{t-1} + b_{13}*IFRS*X_{t-1} + b_{14}*VOL*X_{t-1} + b_{15}*IFRS*VOL*X_{t-1} + b_{16}*R_{t+T} + b_{17}*IFRS*R_{t+T} + b_{18}*VOL*R_{t+T} + b_{19}*IFRS*VOL*R_{t+T} + e_{it}$. X_t, X_{t-1},X_{t+T} are current (*NI*), lagged (*LAG_NI*) and future earnings *(FUTURE_NI)*, respectively. We use mandatory expensers and voluntary expensers with non-zero pro-forma CAP% as a sample. Column (1) uses two-year future EPS to calculate *FUTURE_NI*, and Column (2) uses three-year future EPS to calculate *FUTURE_NI*. Earnings of capitalizers (voluntary expensers) under IFRS are adjusted to an as-if expense basis. We use Industry and year fixed effects and cluster standard errors by firm. Robust t-statistics are presented in parentheses, and significance levels are denoted by ***, **, and *, indicating significance at the 1%, 5%, and 10% levels (two-sided), respectively. All variables are defined in the Appendix.

Table 3B. Value Relevance of R&D expenditure Excluding Voluntary Expensers with large R&D growth

	IFRS	U.K. GAAP		IFRS	
	(1)	(2)	(3)	(4)	(5)
VARIABLES	Non-large R&D growth Voluntary Expenser	Mandatory Expenser	Non-large R&D growth Voluntary Expenser	Mandatory Expenser	Non-large R&D grwoth Voluntary Expenser
NIRD	0.693	0.311	0.289	0.351	0.816**
	(1.641)	(1.075)	(1.099)	(1.010)	(2.190)
EXP	1.080				
	(0.780)				
CAP	**9.798*** **				
	(6.441)				
R&D		**2.777*** **	**2.895*** **	0.214	**2.563*** **
		(4.512)	**(3.923)**	(0.389)	**(3.895)**
Constant	-0.325***	-0.049	-0.099	0.061	-0.242***
	(-4.119)	(-1.049)	(-1.372)	(1.411)	(-3.103)
	EXP = *CAP*:	*R&D* (2) = (3):		*R&D* (4) = (5):	
	p-value<0.01	p-value:0.90		p-value:<0.01	
Observations	207	312	207	312	207
Adjusted R-squared	0.308	0.335	0.287	0.134	0.254
Fixed Effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Clustered SE	Firm	Firm	Firm	Firm	Firm

Table 3B, Column (1), presents the regression results of Equation (1): $R_{it} = a + b_1*NIRD_{it} + b_2*EXP_{it} + b_3*CAP_{it} + e_{it.}$ for voluntary expensers with less than 100% increase in R&D expenditure under IFRS. The p-values for differences between the coefficients on *EXP* and *CAP* are reported at the bottom of Column (1). Table 3B, Columns (2)-(5), presents the regression results of Equation (2): $R_{it} = a + b_1*NIRD_{it} + b_2*R\&D_{it} + e_{it}$. Columns (2) and (3) show the results for mandatory expenser and voluntary expenser with non-zero pro-forma CAP% under U.K. GAAP, while Columns (4) and (5) present the results for mandatory expenser and voluntary expenser with less than 100% increase in R&D expenditure under IFRS. The p-values for differences in the coefficient on *R&D* between Columns (2) and (3) and between Columns (4) and (5) are reported at the bottom Table 3B. We use firm and year fixed effects and cluster standard errors by firm. Robust t-statistics are presented in parentheses, and significance levels are denoted by ***, **, and *, indicating significance at the 1%, 5%, and 10% levels (two-sided), respectively. All variables are defined in the Appendix.

Table 4B. Future Earnings Response Coefficient Excluding Voluntary Expensers with large R&D growth

VARIABLES	(1) TWO-YEAR FUTURE EPS	(2) THREE-YEAR FUTURE EPS
NI	**0.315***	**0.313***
	(1.799)	**(1.781)**
NI*IFRS	0.051	0.074
	(0.141)	(0.196)
NI*VOL	0.232	0.210
	(0.734)	(0.646)
NI* VOL*IFRS	-0.170	-0.125
	(-0.253)	(-0.186)
FUTURE_NI	0.008	0.006
	(0.223)	(0.293)
FUTURE_NI*IFRS	0.002	0.009
	(0.050)	(0.411)
FUTURE_NI* VOL	-0.005	-0.050
	(-0.113)	(-1.181)
FUTURE_NI* VOL*IFRS	**0.283*****	**0.268*****
	(2.774)	**(3.006)**
LAG_NI	-0.188	-0.178
	(-1.239)	(-1.248)
LAG_NI*IFRS	0.027	0.002
	(0.094)	(0.008)
LAG_NI*VOL	-0.112	-0.146
	(-0.470)	(-0.637)
LAG_NI* VOL*IFRS	-0.665	-0.611
	(-1.473)	(-1.371)
FUTURE_RET	-0.059	-0.077
	(-0.895)	(-1.648)
FUTURE_RET*IFRS	-0.073	-0.042
	(-0.795)	(-0.697)
FUTURE_RET* VOL	-0.052	-0.021
	(-0.589)	(-0.376)
FUTURE_RET* VOL*IFRS	0.094	0.018
	(0.756)	(0.198)
IFRS	-0.005	-0.020
	(-0.090)	(-0.358)
VOL	0.032	0.023
	(0.577)	(0.458)
VOL*IFRS	-0.111	-0.109
	(-1.301)	(-1.279)
Constant	0.157***	0.184***
	(3.974)	(5.041)
Observations	1,038	1,038

Adjusted R-squared	0.177	0.185
Fixed Effects	Industry & Year	Industry & Year
Clustered SE	Firm	Firm

Table 4B presents the regression results of Equation (3): $R_{it} = a + b_1*IFRS + b_2*VOL + b_3*IFRS*VOL + b_4*X_t + b_5*IFRS*X_t + b_6*VOL*X_t + b_7*IFRS*VOL*X_t + b_8*X_{t+T} + b_9*IFRS*X_{t+T} + b_{10}*VOL*X_{t+T} + b_{11}*IFRS*VOL*X_{t+T} + b_{12}*X_{t-1} + b_{13}*IFRS*X_{t-1} + b_{14}*VOL*X_{t-1} + b_{15}*IFRS*VOL*X_{t-1} + b_{16}*R_{t+T} + b_{17}*IFRS*R_{t+T} + b_{18}*VOL*R_{t+T} + b_{19}*IFRS*VOL*R_{t+T} + e_{it}$. X_t, X_{t-1},X_{t+T} are current (*NI*), lagged (*LAG_NI*) and future earnings *(FUTURE_NI)*, respectively. We use mandatory expensers and voluntary expensers with less than 100% increase in R&D expenditure under IFRS as a sample. Column (1) uses two-year future EPS to calculate *FUTURE_NI*, and Column (2) uses three-year future EPS to calculate *FUTURE_NI*. Earnings of capitalizers (voluntary expensers) under IFRS are adjusted to an as-if expense basis. We use Industry and year fixed effects and cluster standard errors by firm. Robust t-statistics are presented in parentheses, and significance levels are denoted by ***, **, and *, indicating significance at the 1%, 5%, and 10% levels (two-sided), respectively. All variables are defined in the Appendix.