Does Capitalization vs. Expensing of R&D Matter? Evidence from corporate financing decisions and investor valuation

Jiyoung Park
School of Business
Yonsei University

Jiyoon Lee
School of Business
Yonsei University

William R. Baber
McDonough School of Business
Georgetown University

Sok-Hyon Kang
School of Business
The George Washington University

Jiyoung Park is at Yonsei University; School of Business; Building 212; 50 Yonsei-ro; Seodaemun-gu; Seoul 03722; South Korea; Email: jypark820@yonsei.ac.kr; Phone: +82-2-2123-6861. Jiyoon Lee is at Yonsei University; School of Business; Building 212; 50 Yonsei-ro; Seodaemun-gu; Seoul 03722; South Korea; Email: jiyoonlee@yonsei.ac.kr; Phone: +82-2-2123-5486. William R. Baber is at Georgetown University; McDonough School of Business; Rafik B. Hariri Building; 3700 O Street NW; Washington DC 20057; United States; Email: William.Baber@georgetown.edu; Phone: +1-703-473-8094. Sok-Hyon Kang is at The George Washington University; School of Business; Funger Hall; 2201 G Street NW; Suite 603; Washington DC 20052; United States; Email: sokkang@gwu.edu; Phone: +1-202-994-6058. We thank seminar participants at the 2016 Korea Finance Association Joint Conference, the 2017 Asian Finance Association Annual Meeting, the 2017 Financial Management Association Annual Meetings, the 2019 American Accounting Association Annual Meeting for helpful comments. This work was supported by the 'BK21 FOUR (Fostering Outstanding Universities for Research)' in 2023.

Does Capitalization vs. Expensing of R&D Matter?
Evidence from corporate financing decisions and investor valuation

ABSTRACT

Under U.S. GAAP, R&D expenditures except for software development costs must be expensed, whereas under IFRS, R&D expenditures must be capitalized subject to specified criteria. We analyze firms in Korea, a country that follows IFRS, to explore whether expensed and capitalized components of R&D explain corporate financing decisions and convey different value-relevant information to investors. We find that expensed R&D, but not capitalized R&D, components are positively associated with cash holdings and negatively associated with leverage. Moreover, positive R&D investment sensitivity to internally generated cash flow documented in previous studies is attributable to expensed rather than capitalized R&D expenditures, and the marginal value of cash is positively associated only with expensed R&D. Such findings suggest that accounting distinctions between expensing and capitalizing R&D indicate the relative certainty of research and development outcomes. We also find that, consistent with the differential information content of R&D components, seasoned equity offering announcement returns are positively associated with capitalized, but not expensed, R&D components. This evidence supports the notion that accounting standards that require insiders to distinguish expensed from capitalized R&D are informative, value-relevant, and promote outsider understanding of corporate financing decisions.

Keywords: R&D capitalization; Information asymmetry; Cash holdings; Investment–cash flow sensitivity; Capital structure; Marginal value of cash

JEL Classification: G32, M41

Data Availability: Data are available from the public sources cited in the text.

I. INTRODUCTION

Most R&D projects progress through stages. As projects move through the process, the commercial viability of the project becomes more certain. U.S. GAAP accounting does not distinguish this uncertainty inherent to the R&D process. In particular, except for certain software development expenditures,[1] research and development (R&D) expenditures are treated as operating expenses in the period when they are incurred. Some argue that the practice of immediately expensing all R&D costs exacerbates information asymmetry between managers and outsiders because R&D projects of varying degrees of success are uniformly treated as unsuccessful (e.g., Aboody and Lev 2000; Boone and Raman 2001; Mohd 2005). As a result, outside investors are uninformed about the outcome risk of aggregate R&D spending. Such information asymmetry creates adverse selection and contracting frictions between managers and investors that increase financing costs.

In contrast with U.S. GAAP treatment of R&D costs, IFRS (IAS 38) requires capitalization of R&D that satisfies specific conditions and current-period expensing of R&D that does not. The IFRS approach allows managers to communicate the R&D progress to investors, potentially reducing information asymmetry between management and outside stakeholders.

In this study, we investigate associations between capitalized and expensed components of R&D and financing characteristics which manifest as cash holdings, capital structure, propensity to issue equity versus debt, investment–cash flow sensitivity, the marginal value of cash, and seasoned equity offering (SEO) underpricing. The objective is to consider whether the distinction between R&D capitalization and expensing explains corporate financing policies and informs outsiders about R&D outcome risk. We use publicly

[1] Capitalization of certain software development costs is permitted under Statement of Financial Accounting Standards (SFAS) No. 86.

traded Korean firms to execute the analyses, as Korea follows IAS 38 and mandates IFRS reporting for R&D, disclosing both expensed and capitalized components of current period R&D costs. South Korea offers a rich setting for examining the informativeness of R&D because it is one of the most R&D-intensive of the G20 member countries. More specifically, Korea is the second most R&D-intensive country in the world, with 4.64% of GDP spent on R&D, and its gross total R&D spending of $102 billion ranks fifth in the world.[2] Not surprisingly, more than 50% of Korean firms report some form of R&D expenditures in a typical year.

A few prior studies examine whether capitalized R&D components are value relevant, typically focusing on the software industry or simulating capitalized R&D using various algorithms (e.g., Lev and Sougiannis 1996; Aboody and Lev 1998; Chan, Lakonishock, and Sougiannis 2001; Healy, Myers, and Howe 2002). The two unique features of this study are first, we investigate whether and how the expensed versus capitalized distinction matters from a *financing* perspective and investors' evaluations of financing choices, rather than how it affects earnings-price or book-to-market associations. Second, we employ a large cross-section of firms which are required to distinguish and disclose both capitalized and expensed R&D expenditures, in contrast with prior studies that were restricted to a small sample of firms that disclose capitalized R&D.

Whether or not R&D expenditures deserve to be capitalized is an important accounting issue (Penman 2009, Skinner 2011). Our study focuses on whether the capitalized and expensed components of R&D, once they are determined, convey differential information about firms' financial policies and investor valuation.

Extant research posits that information asymmetry between firms and capital

---

[2] From National Science Board, *Research and Development: U.S. Tends and International Comparisons*. https://ncses.nsf.gov/pubs/nsb20225/cross-national-comparisons-of-r-d-performance. In comparison, the U.S. spends 3.13% of GDP on R&D and $668 billion in aggregate total R&D.

providers creates contracting frictions that influence financing decisions. These frictions cause firms to hoard cash in deference to precautionary motives and to guard against future cash flow shocks (Kim, Mauer, and Sherman 1998; Opler, Pinkowitz, Stulz, and Williamson 1999). The literature further links R&D costs to financial leverage, noting that R&D expenditures are inherently difficult to finance externally due to uncertain outcomes and the lack of attachable collateral value (Hall 2002, Hall and Lerner 2010).[3] Previous research also recognizes that financing frictions influence real investment decisions, causing both tangible and intangible R&D investments to be sensitive to internally generated cash flows (Fazzari, Hubbard, and Petersen 1988; Almeida and Campallo 2007). The high risk of failure and adverse selection problems lead to a funding gap for innovation and R&D underinvestment (Hall and Lerner 2010; Kerr and Nanda 2015, Takor and Lo 2017),

Following prior studies (e.g., Bhagat and Welch 1995; Opler, Pinkowitz, Stulz, Williamson 1999; Brown Fazzari, and Petersen, 2009; Brown and Petersen 2009), we begin by replicating in the context of Korean firms three established empirical results about aggregate R&D expenditures: 1) positive association between R&D spending and cash holdings, 2) negative association between R&D spending and leverage, and 3) positive R&D investment–cash flow sensitivity. Undocumented by prior research is whether these associations differ for capitalized versus expensed R&D components. Focusing on this distinction, we find that the documented contemporaneous associations of R&D expenditures with cash holdings and leverage are primarily attributable to the expensed and not to the capitalized components of current-period R&D costs. We also find that preference for equity over debt financing, measured by the proportion of net equity to all external capital raised (Butler, Cornaggia, Grullon, and Weston 2011), is higher for R&D-intensive firms, but the association exists for expensed and not for capitalized R&D. As a whole, these results

[3] As a result, firms typically finance R&D ventures either internally or by issuing equity rather than debt.

indicate that the high risk and information asymmetry that induce firms to hold excess cash and avoid debt stem from expensed R&D characterized by uncertain outcomes, not from capitalized R&D where commercial viability is established. The implication for accounting is straightforward: IFRS which requires delineating capitalized versus expensed R&D reduces information asymmetry by better informing investors about R&D outcomes. We also postulate that financial constraints on R&D investments are more binding for expensed than capitalized R&D, owing to uncertainty and information asymmetry associated with expensed R&D investments. Consistent with this prediction, we find that internal finance constraints are binding for R&D investments that are expensed but not for capitalized R&D investments.

Next, we extend the analysis to consider the marginal value investors place on cash holdings. R&D-intensive firms face more substantial external financial constraints and higher financing costs than firms with less significant R&D costs (Faulkender and Wang 2006; Brown, Fazzari, and Petersen 2009). We therefore expect that investors, recognizing more significant financing constraints associated with risky R&D investment, assign a higher value to cash holdings to firms with high levels of *expensed* R&D. Consistent with this prediction, we find a significant positive association between the marginal value of cash and expensed R&D. The association does not exist for the marginal value of cash conditioned on capitalized R&D.

To understand whether R&D capitalization reduces adverse selection in the context of equity financing, we investigate the stock market's response to seasoned equity offering (SEO) announcements. We find that capitalized R&D, but not expensed R&D, varies positively with SEO announcement returns. A one-standard-deviation increase in the extent that R&D is capitalized corresponds with an increase in two-day cumulative abnormal returns of 39 basis points, which is a 7.5 percent increase in the value of the proceeds from the stock issue.[4] In contrast, correlations between SEO announcement returns and expensed R&D are neither economically nor statistically significant. These results suggest that investors value the certainty of R&D outcomes communicated through the IFRS accounting treatment of R&D spending. This evidence further supports that distinguishing between capitalized and expensed R&D conveys value-relevant information to investors.

From a methodological standpoint, our study is an extension of, and thus builds on, past studies that document a link between R&D and financing characteristics (Opler et al. 1999; Faulkender and Petersen 2006; Brown et al. 2009; Lee and Masulis 2009; Butler et al. 2011). To facilitate comparisons, we replicate the empirical methods employed in the corresponding existing studies to the extent possible. Given this approach, we also follow the existing GMM estimation approach (Brown, Fazzari, and Petersen 2009) to the specifications where endogeneity is a concern.

Our study contributes to accounting literature in two ways. First, this study informs the policy debate regarding the accounting treatment of R&D expenditures. Analyses in the contexts of both corporate financing decisions and investor valuation consistently support the proposition that distinguishing between capitalized and expensed components of R&D reduces information asymmetry about R&D outcomes. In contrast, many prior studies examine the information benefits of R&D capitalization by focusing on alternative R&D treatment in the context of operational performance (return–earnings associations or correlations between capitalized R&D and market values). While these approaches remain insightful, our study directs attention to an alternative way to consider information provided through R&D capitalization: whether and how R&D capitalization and expensing correlate with financing policies and investor assessments of such policies.

Second, the study extends and deepens the understanding of previous studies on the

[4] We use Mummolo and Peterson's (2018) method to calculate economic magnitudes throughout the paper.

relationship between R&D investment and financing characteristics. We show, in particular, that delineating aggregate R&D spending according to relative outcome certainty supports and sharpens interpretations advanced in prior studies that link corporate investing with corporate financing policies.

The remainder of the paper is as follows. In Section 2, we review the relevant literature on the informational role of R&D capitalization and its link to corporate financing of R&D. We develop hypotheses in Section 3. In Section 4, we describe the data and summary statistics. Empirical results are in Section 5, and concluding remarks are in Section 6.

II. LITERATURE REVIEW

Information benefits of R&D capitalization

U.S. GAAP proscribes capitalization of R&D costs (SFAS 2) except for certain software development costs (SFAS 86). Academic studies that investigate the potential consequences of R&D capitalization are scarce owing to the lack of quality data that enables researchers to distinguish between capitalized and expensed R&D components. Most existing studies, therefore, either simulate the R&D capitalization process or focus on the software industry to examine the valuation implications and stock market consequences (e.g., Lev and Sougiannis 1996; Aboody and Lev 1998; Chan, Lakonishock, and Sougiannis 2001; Healy, Myers, and Howe 2002). Healy et al. (2002), who simulate the economic and accounting effects of capitalization for 500 pharmaceutical firms, conclude that a simple capitalization rule for R&D expenditures creates a stronger relationship between accounting information and economic value than fully expensing R&D. Aboody and Lev (1998), who analyze capitalization of software development costs for 163 firms during 1987-1995, report that capitalized development costs vary directly with stock returns and earnings subsequently reported, and that capitalized software assets reported on balance sheets vary directly with stock prices. Notably, they argue that the judgment involved in software capitalization decreases the quality of reported earnings.[5] In general, however, studies of alternative R&D accounting treatments using U.S. companies are challenged by sporadic and insufficient R&D disclosures under the U.S. GAAP

Oswald and Zarowin (2007) exploit U.K. accounting practices that permit, but do not require, firms to capitalize some R&D expenditures. Investigating earnings-response coefficients, the authors find that stock returns of R&D capitalizers in the U.K. reflect current and future earnings information better than the stock returns of R&D expensers. The authors interpret the finding as evidence that incremental information provided through capitalization is useful for forecasting future earnings. Most studies, including Oswald and Zarowin (2007), examine the pre-IFRS (before 2005) sample period when R&D capitalization in non-U.S. economies was a matter of choice. Because pre-IFRS capitalization is rare (Tsoligkas and Tsalavoutas 2011) and some firms self-select to capitalize certain R&D costs while others do not, sparse data and self-selection present design challenges.[6] However, subsequent studies consider EU's 2005 mandated IFRS (IAS 38) adoption[7] as a milestone that restricts discretion regarding the treatment of R&D costs, and therefore, treat it as an exogenous event (Tsoligkas and Tsalavoutas 2011; Oswald, Simpson, and Zarowin 2022).[8] For example, using post-IAS 38 data from U.K. firms, Tsoligkas and Tsalavoutas (2011) find that capitalized R&D components vary directly with market values, suggesting that the market perceives the capitalized components as evidence of successful projects that promise future

[5] Aboody and Lev's (1998) earnings quality tests are based on the explanatory power of the earnings-returns regressions between the reported (capitalized) and fully expensed earnings, the latter obtained by adjusting for ("backing out") the capitalized components.

[6] Oswald and Zarowin (2007) use a Heckman approach to control for self-selection.

[7] All publicly traded European Union companies were required to follow IFRS for fiscal years beginning on or after January 1, 2005.

[8] All accounting revenues and expenses are subject to some managerial discretion. Thus, one cannot rule out a degree of discretion, although estimating the extent of such discretion is not feasible.

economic benefits. More recently, Oswald et al. (2022), who treat IAS 38 as an exogenous event, report that firms subject to the IFRS mandatory capitalization rule increased R&D investments subsequently, implying that the rule affects investment decisions. Chen, Garvious, and Lev (2017) postulate that IFRS capitalization requirements involve substantial value-relevant information, some of which was disclosed voluntarily to investors. Their results are consistent with expectations that capitalizers disclose more information than non-capitalizers, and such disclosures are value-relevant, evidenced by price-to-book and returns-to-earnings associations.

While these existing studies focus on how R&D capitalization affects security returns and internal investment decisions, no study has approached the question from financing perspective, to connect corporate financing with outcome risk reflected in the capitalized versus expensed R&D. Our study fills this gap by examining whether accounting delineation of capitalized versus expensed R&D reveals insights about corporate cash holdings, leverage, the marginal value of cash, investment-internal cash sensitivity, and SEO underpricing. We focus on whether such financing outcomes differ between capitalized and expensed components.

III. HYPOTHESES DEVELOPMENT

R&D projects usually have low probabilities of success but extremely high potential payoffs. R&D investments also are carried out over extended horizons, often with relatively little external transparency owing to proprietary concerns and the lack of authoritative disclosure rules. Thus, high uncertainty and information asymmetry are typical. Furthermore, R&D investments have little or no collateral value, unlike capital expenditures. The uncertainty, information asymmetry, and lack of collateral value can create financing frictions.

The International Accounting Standards Board (IASB) sets the R&D capitalization criteria that accommodate this inherent technical uncertainty of research projects. IAS 38 requires capitalization, and subsequent amortization, of development costs for projects where specifically identifiable benefits are probable. When R&D expenditures are capitalized, investors infer that technical uncertainty is largely resolved, and the investment is likely to generate future cash flows. Thus, we posit that the IAS 38 requirement to capitalize R&D credibly communicates insider expectations about the resolution of uncertainty than does U.S. GAAP which proscribes R&D capitalization. This reasoning underlies the following expectations.

Cash holdings and financial leverage

Information asymmetry between firms and capital providers in the context of high operating risk exacerbates financing frictions, which creates incentives to hold cash (Kim, Mauer, and Sherman 1998) and reinforces precautionary motives associated with cash holdings (Opler, Pikowitz, Stulz, and Williamson 1999). Consistent with this characterization, prior studies document positive associations between cash holdings and aggregate R&D expenditures (Opler, Pinkowitz, Stulz, and Williamson 1999; Dittmar, Mahrt-Smith, and Servaes 2003; Bates, Kahle, and Stulz 2009; Brown and Petersen 2011; He and Wintoki 2016). In the context of IAS 38, expensed R&D components indicate unresolved technical uncertainty, whereas capitalized components indicate that a degree of uncertainty is resolved. Thus, we expect expensed R&D to be more substantially associated with financing frictions than capitalized components. Stated in the null form,

H1: The positive association between cash holdings and R&D is more substantial for expensed than for capitalized R&D components.

The literature also reasons that risky R&D investments are intrinsically difficult to finance using external funds, especially long-term debt, due to uncertain outcomes and lack of attachable collateral (Hart and Moore 1994; Hall 2002; Thakor and Lo 2018). Ex-post moral hazard problems detrimental to debtholders are also severe for R&D intensive firms because it is easy to enter riskier R&D ventures (Brown et. al 2009). If so, then the use of debt financing varies inversely with risky R&D investment. Accordingly, prior studies document negative associations of R&D spending with leverage and the propensity to use debt rather than equity to raise capital (Bhagat and Welch 1995; Faulkender and Petersen 2006; Baxamusa, Mohanty, and Rao 2015). From the viewpoint that expensed R&D carries greater information asymmetry than capitalized R&D, we expect that expensed R&D components are more negatively associated with debt usage. Stated formally,

H2: The negative association between R&D and leverage is more substantial for expensed than for capitalized R&D components.

A straightforward corollary to H2 is that the ratio of equity-to-all external financing correlates more substantially with expensed than with capitalized R&D.

R&D–cash flow sensitivity

An extensive literature investigates whether financing constraints cause investment to be sensitive to internal cash flows (e.g., Fazzari, Hubbard, and Petersen 1988; Whited 1992; Kaplan and Zingales 1997; Lamont, Polk, and Saaá-Requejo 2001; Almedia and Campello 2007). Consistent with R&D investment being contingent on financing constraints, Brown and Petersen (2009) document relatively stable and robust R&D–to-internal cash flow sensitivity between 1970-2006. Financing frictions are greater for expensed R&D components because of the lack of collateral value and uncertain outcomes. Consequently, we expect that expensed R&D is more substantially affected by financing constraints than capitalized R&D. Stated formally,

H3: R&D–cash flow sensitivity is more substantial for expensed than for capitalized R&D.

Marginal value of cash

Prior studies predict and find that the marginal value of cash is greater for firms that have difficulty accessing external capital than for firms that can more easily access external capital (Faulkender and Wang 2006). Researchers argue that information asymmetry regarding uncertain outcomes from R&D investment adversely affects the ability to raise new capital (e.g., Arrow 1962; Brown et al. 2009; He and Wintoki 2016). The IAS 38 requirement to distinguish capitalized from expensed R&D components conveys information to prospective outside investors about the degree of uncertainty and the likelihood of success of each R&D component. Consequently, we expect the marginal value of cash holdings to vary more substantially with the expensed R&D components than with the capitalized component. Stated formally,

H4: The marginal value of cash varies more substantially with expensed R&D components than with capitalized R&D components.

SEO underpricing

Underpricing of seasoned equity offerings (SEO) is often attributed to information asymmetry between managers and outside investors. Treating accounting as a mechanism to resolve information asymmetry, Lee and Masulis (2009) demonstrate that accounting accrual estimation error (Dechow and Dichev 2002), a proxy for information asymmetry, varies inversely with SEO announcement returns. If the R&D accounting treatment conveys incremental information about the relative certainty and insider information of investment outcomes, market responses to SEO announcements differ conditional on the expensed and capitalized components. If expensed R&D components carry greater information asymmetry, we predict that expensed components are more positively associated with SEO underpricing (that is, are negatively related to equity value) than capitalized components.

A counter-argument is that intangible assets created through R&D capitalization proxy for growth opportunities (Lee and Masulis 2009). Therefore, pursuing additional external financing may be interpreted favorably regarding expensed R&D consequences. Thus, the association between SEO announcement returns and expensed components of R&D is an empirical issue. The following hypothesis applies.

H5: SEO announcement returns are positively and more substantially associated with capitalized components of R&D than expensed components of R&D.

To summarize, the capitalizing-versus-expensing distinction suggests five predictions about corporate financing characteristics: 1) the level of corporate cash holdings varies more positively with expensed R&D than with capitalized R&D; 2) financial leverage correlates more negatively with expensed R&D than with capitalized R&D, and related, expensed R&D, but not capitalized R&D, explains the propensity to incrementally finance using equity than debt; 3) investors assign higher values to cash holdings of firms with high levels of expensed R&D but not high levels of capitalized R&D; 4) the extent of SEO underpricing is lower for capitalized R&D than for expensed R&D; 5) the sensitivity of R&D investment to internal cash flow is higher for expensed than for capitalized R&D—that is, financing constraints are more substantially binding when R&D investments are expensed.

IV. INSITITUTIONAL SETTING AND DATA

Accounting for R&D in Korea

Korean accounting standards have long required firms to report expensed and capitalized components of R&D separately, although criteria for capitalization have nominally changed over time. Before the 1997 Asian financial crisis, R&D costs incurred in the ordinary course of business were expensed, and R&D costs outside the ordinary course of business were capitalized. Following the Asian financial crisis of 1997, Korea began to harmonize domestic accounting standards with IFRS, and in 2011, Korea fully adopted IFRS, designating the codified principles K-IFRS. Before 2011, R&D asset recognition followed *Statements of Korean Accounting Standards* No. 3 (SKAS 3), whose recognition criteria were identical to those of the IAS 38 (Kang and Kim, 2015).[9] Therefore, the 2011 event did not materially change R&D accounting. K-IFRS requires all *research* expenditures to be recognized as expenses when incurred, but *development* expenditures must be capitalized if they satisfy six criteria: (a) the technical feasibility of completing the intangible asset so that it can be available for use or sale; (b) the intention to complete and use or sell the intangible asset; (c) the ability to use or sell the intangible asset; (d) the existence of a market for the output created from the intangible asset or the intangible asset itself or, if it is to be used internally, the usefulness of the intangible asset; (e) the availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset; (f) the ability to reliably measure the expenditure attributable to the intangible asset during its development (IAS 38). Although K-IFRS adoption did not significantly alter the accounting rules of R&D in Korea, enforcement of the accounting treatment can be affected. Thus, we investigate whether the empirical predictions apply more or less strongly after 2011, by estimating difference-in-differences (DID) specifications centered on the 2011 event.

Korean firms' R&D expense and capitalization amounts are typically available from footnote disclosures. Exhibit I illustrates how R&D expenditures are reported using the 2016 annual report of Hyundai Motor Company. In Panel A, the company reports both expensed and capitalized components of R&D in its intangibles footnote. The aggregate total R&D

[9] The preceding criteria under *Interpretation 44-20* (1999) also were comparable to SKAS No. 3.

spending in FY 2016 was 2,352,229 million Korean won (about USD 2 billion), among which 1,224,743 (52%) was capitalized and 1,127,486 (48%) was expensed. Panel B shows the intangible R&D asset has an ending balance of 3,015,782 after adding the current-period capitalization of 1,224,743 and amortizing 1,022,841.

<u>Exhibit I About Here</u>

Testing Strategy and Data

The empirical objective is to ascertain whether and how the capitalization versus expensing R&D distinction manifests in the context of prior studies which document cross-sectional associations between total R&D spending and various financing characteristics. These prior studies are executed using data from economies where accounting standards proscribe R&D capitalization. We first verify that previous findings, typically obtained using samples of U.S. firms, also hold for the Korean sample. We then execute tests that distinguish between expensed and capitalized R&D expenditures. In all specifications, we control for firm fixed effects and (industry × year) fixed effects and cluster standard errors at the firm level. Firm fixed effects control for time-invariant firm-specific omitted variables. As a robustness check, we also estimate difference-in-differences specifications focused on the event year 2011 when Korea formally adopted IFRS.

The sample is 1,624 Korean public firms with annual data between 2000 and 2017. The KisValue database provided by National Information & Credit Evaluation (NICE) is the primary source of accounting data. Stock price information and capitalized portions of R&D are from the DataGuide database provided by FnGuide. Following standard procedures, we exclude financial institutions and utilities from the sample. The final sample comprises 21,178 firm-years.

The independent variables are *EXP*, *CAP,* and *R&D* except for Hypothesis 3, where

EXP and *CAP* are the dependent variables (R&D investment). *EXP* (*CAP*) are the expensed (capitalized) components of current period R&D costs scaled by lagged total assets. The quantity designated as *R&D* is the sum of *EXP* and *CAP*. *Cash* is the ratio of cash and cash equivalents to total assets. Following previous research (Fazzari et al. 1988; Opler et al. 1999; Almeida and Campello 2007), *OCF* is operating cash flow scaled by lagged total assets. *Capex* is capital expenditure scaled by lagged total assets. Current net operating assets, designated *CNOA*, is current assets minus cash and cash equivalents minus current liabilities plus current debt, scaled by total assets. Net working capital (*NWC*) is current assets minus current liabilities scaled by total assets. *Size* is the natural logarithm of a firm's total assets. *Tobin'sQ* is total assets minus the book value of equity plus the market value of equity divided by total assets ((Total assets − book value of equity + market value of equity)/total assets). *Leverage* is long-term debt scaled by total assets. *EqIssuanceRatio* is net equity issuance divided by net capital raised. *Tangibility* is property, plant, and equipment scaled by total assets. *ExcessReturn* is the annual stock return minus benchmark portfolio return. *CAR(0,1)* is cumulative abnormal returns over a two-day trading period starting from an SEO announcement day. *AmountRatio* for an equity offering is net proceeds scaled by the market value of equity. *Kospi* is an indicator variable set equal to one when a firm is a component of the Korea Composite Stock Price Index (KOSPI) market. All variables are defined in the Appendix and winsorized at 1 percent in both distribution tails.

Summary statistics

Table 1 reports summary statistics for the sample firms. Sixty-eight percent, sixty-one percent, and twenty-four percent of sample firms report nonzero (positive) R&D expenditures, expensed R&D, and capitalized R&D, respectively. These figures indicate that a majority of Korean firms invest in R&D, which is not surprising as Korea is among the top ten countries based on the number of firms included in the top 1,000 R&D spenders.[10]

On average, the sample firms spend 1.7 percent of total assets on R&D. Of this expenditure, about 71 percent is expensed (29 percent is capitalized). Firms hold, on average, 6.5 percent of total assets as cash or cash equivalents. *OCF*, on average, is 5.8 percent of assets. Mean *Tobin's Q* is 1.21; mean *Leverage* is 0.64; and mean *Capex* is 0.05. Equity accounts for approximately 20 percent of total security issues.

Panel B displays the means of financing variables after classifying firms using median *R&D*, *EXP*, and *CAP*. Columns (1) and (2) show the mean *Cash*, *Leverage*, and *EqIssuanceRatio* for firms classified according to median *R&D*. Column (3) indicates differences between the two groups. Firms with R&D greater than the median hold significantly greater cash than firms less than the median *R&D*. The difference, 0.014, suggests that above-median *R&D* firms hold 24 percent more cash than below-median *R&D* firms. Results for *EqIssuanceRatio* suggest that above-median *R&D* firms issue more equity than below-median *R&D* firms. These comparisons are consistent with evidence reported in previous studies.

Columns (4) and (5) show the mean *Cash*, *Leverage*, *EqIssuanceRatio* for sample delineations set according to whether *EXP* is above and below the median. Above-median *EXP* firms hold significantly more cash than below-median *EXP* firms (Column 6). Comparisons of means of *Leverage* and *EqIssuanceRatio* indicate that above-median *EXP* firms issue significantly less debt than below-median *EXP* firms. Columns (7) and (8) indicate mean financing measures delineated by median *CAP*. These comparisons indicate no statistically significant difference in cash holdings between above-median *CAP* firms and

[10] Among those included in the worldwide top 100 R&D firms are Samsung, LG, SK Hynix, and Hyundai Motor Company, reflecting Korea's status as a major manufacturer of electronics, semiconductors, and automobiles.

below-median *CAP* firms. On the other hand, comparisons of mean *Leverage* and *EqIssuanceRatio* indicate that above-median *CAP* firms also issue significantly less debt than below-median *CAP* firms.

Panel C shows the correlation matrix. Spearman (Pearson) correlations are displayed to the right (left) of the diagonal. Both Spearman and Pearson correlations between *R&D* and *Cash*, *OCF, Leverage*, and *EqIssuanceRatio* are consistent with prior findings that R&D varies directly with cash holdings and with the use of equity. Spearman and Pearson correlations of *EXP* and *CAP* with *Cash* indicate a stronger association between cash holdings and *EXP* than between cash holdings and *CAP*. The correlation between *EXP* (*CAP*) and *Leverage* indicates that leverage is more negatively associated with *EXP* than *CAP*. Lastly, the correlations between *EXP* (*CAP*) and *EqIssuanceRatio* are consistent with the proposition that *EXP*-intensive firms rely more heavily on equity than *CAP*-intensive firms.

Table 1 About Here

V. RESULTS

Cash holdings (Hypothesis 1)

Table 2 displays specifications designed to address H1, where the dependent variable is *Cash*. Even-numbered columns include control variables identified in prior studies to influence cash holdings; odd-numbered columns show results without controls. Columns (1) and (2) replicate the results for *aggregate* R&D spending (*R&D*). The parameter estimate on *R&D* is positive and statistically significant in both columns, confirming the well-established positive association between cash holdings and *R&D*.

Estimates in Columns (3) and (4) include both R&D components, *EXP* and *CAP,* as independent variables. Estimates in Column (4) (with control variables) are the primary focus. The estimate on *EXP* is positive and statistically significant (0.219, t=5.22, Column 4), whereas the coefficient on *CAP* is not statistically significant. Regarding economic significance, the estimate on *EXP* in Column (4) indicates that a one-standard-deviation increase in *EXP* is associated with an increase in cash holdings of approximately 0.5 percent of firm assets. For the average firm, this represents an 8.0 percent increase in cash holdings.

The variables of interest for Columns (5)-(6) and (7)-(8) are respectively *EXP* and *CAP* considered separately. In both columns, parameter estimates of interest are similar to those in Columns (3)-(4). Consistent with H1, these results indicate that the positive association between cash holdings and R&D stems from expensed components. As such, distinguishing expensed R&D expenditures from capitalized ones offers an additional insight regarding firms' cash holding policy: expensed R&D, but not capitalized R&D, which portends more certain economic benefit, increases incentives to hold cash.

Turning to the control variables, *Size* and *CNOA* are negatively associated with cash holdings, while *OCF* is positively associated with cash holdings. These findings are consistent with those reported in Opler et al. (1999). The negative association between *Size* and cash holdings comports with the intuition that large firms are financially less constrained than small firms and thus need not hoard cash.

Table 2 About Here

Capital structure (Hypothesis 2)

Table 3 considers associations between R&D investment and *Leverage*. In Columns (1) and (2), the estimate on aggregate *R&D* is negative, although statistically significant only in Column (2). That is, R&D-intensive firms are less likely to employ debt financing. The estimate on *R&D* (-0.090; *t*=-2.45) in Column (2) indicates that one-standard-deviation greater aggregate *R&D* corresponds with approximately 0.3 percent lower leverage. Such results conform with evidence in prior studies (e.g., Bhagat and Welch 1995; Baxamusa, Mohanty, and Rao 2015; Faulkender and Petersen 2006). When aggregate R&D is partitioned as *EXP* and *CAP* (Column (4)), the estimate on *EXP* is negative (-0.115) and statistically significant at the 5% level (*t*=-2.51). In terms of economic significance, one standard deviation greater *EXP* corresponds to about 0.3 percent lower financial leverage, roughly equivalent to the result for aggregate *R&D*. In contrast, the estimate on *CAP* is not statistically significant at conventional reliability levels.

Table 3 About Here

To corroborate the *Leverage* result, we consider the reliance on equity versus debt financing. In particular, Table 4 shows specifications of the equity issuance ratio (*EqIssuanceRatio*) computed for each firm year as net equity issuance deflated by net capital raised (Butler, Cornaggia, Grullon, and Weston 2011, p. 668). In Column (2), the estimate on *R&D* is positive and statistically significant (0.876, *t*=2.63). Thus, net equity issuance comprises a higher proportion of net new financing in firms with greater R&D. Separating *EXP* and *CAP* in Column (4), *EXP* is statistically and economically significant (1.167, *t*=2.78), whereas *CAP* is not statistically significant (0.452, *t*=0.69). The estimate on *EXP* (1.167) indicates that one-standard-deviation greater *EXP* is associated with 0.028 greater *EqIssuanceRatio*. For the average sample firm, this accounts for approximately 14.1 percent greater *EqIssuanceRatio*. Columns (5)-(6) and (7)-(8) show results for *EXP* and *CAP*, considered separately. The estimates' economic magnitude and statistical significance are similar to those in Columns (3) and (4).

The preceding analyses regarding cash holdings and financial leverage confirm the well-documented empirical regularity that R&D-intensive firms hold greater cash and rely more substantially on equity than on debt as a source of external financing (e.g., Brown et al. 2009; Hovakimian et al. 2001). Unique to this study is that the association is attributable primarily to R&D investment with less certain benefit – that is, to R&D that is expensed rather than capitalized. Such evidence supports the proposition that financial accounting rules that require firms to distinguish capitalized from expensed R&D better explain capital structure decisions.

Table 4 About Here

R&D–cash flow sensitivity (Hypothesis 3)

This section investigates R&D–cash flow sensitivity following frameworks provided by Fazzari, Hubbard, and Petersen (1988) and Almeida and Campello (2007). Again, we begin by considering associations for aggregate R&D expenditures, and then we consider investment–cash flow sensitivity for *EXP* and *CAP* separately. These analyses are restricted to sample firms that report positive R&D expenditure and positive cash flows.

Columns (1) and (2) of Table 5 show investment–cash flow sensitivity using aggregate R&D. Note that the dependent variable is *R&D,* and the estimate on *OCF* is the focus. Consistent with prior studies, the *OCF* estimate is positive and statistically significant in both columns, indicating that aggregate R&D expenditures vary directly with cash flow. The 0.014 estimate in Column (2) indicates that each additional cash flow unit yields 1.4 cents of R&D. Such results are in line with results reported in prior studies using U.S. firms.

Columns (3)-(4) and (5)-(6), respectively, show investment–cash flow sensitivities for *EXP* and *CAP* considered separately. Focusing on Column (4), the 0.012 estimate on *OCF* is positive and statistically significant. The result is also significant economically, indicating that one standard deviation higher *OCF* is associated with an increased *EXP* of approximately 5.4 percent of its standard deviation, or that each unit of internally generated cash flow yields about 1.2 cents on expensed R&D. In contrast, the *OCF* estimate is not statistically significant in Column (6) when *CAP* is the dependent variable, and the economic substance implied by the estimate is substantially less than what is implied for *EXP*. These results support Hypothesis 3, that positive *R&D*–cash flow sensitivity is attributable primarily to expensed R&D components.[11]

A potential criticism of the Table 5 investment-cash flow specifications is that internally generated cash flow can reflect new growth opportunities not properly considered using Tobin's Q as a control (e.g., Erickson and Whited 2000, 2012). Thus, we estimate specifications for two sub-samples partitioned according to whether the firm is financially constrained.[12] If the positive association between *EXP* and cash flows is driven by new investment opportunities beyond what is captured by Tobin's Q, both financially constrained and unconstrained firms should display a similar association between *EXP* and cash flows. However, if the positive association between *EXP* and cash flows is attributable to financial constraints, results should be more substantial for the financially constrained group. Results (not tabulated) indicate that *EXP*–cash flow sensitivity is significantly higher for the financially constrained group in all specifications.

<u>Table 5 About Here</u>

Marginal value of cash (Hypothesis 4)

Table 6 summarizes analyses that consider whether and how R&D intensity and the *EXP*-vs.-*CAP* distinction are associated with the marginal value of cash. The dependent variable is annual excess stock returns. Following Faulkender and Wang (2006), the independent variables are levels and changes in firm characteristics deflated by the lagged market value of equity. We modify the Faulkender and Wang (2006) approach to consider

[11] To address reverse causality, omitted variables, and measurement errors, Brown, Fazzari, and Petersen (2009) use a first-difference GMM procedure for dynamic panel models to estimate the investment equation. Following Brown, et al. (2009), we re-estimate the investment and other specifications using GMM. Results are reported later in Table 8.

[12] We use five commonly used financial constraint proxies to create the sub-samples: 1) dividend payout, 2) size; 3) bond rating; 4) Whited-Wu (2006) index; and 5) an indicator variable for Korean conglomerates.

the marginal value of cash regarding both R&D and capital expenditures.

The specification in Column (1) replicates the Faulkender and Wang (2006) result that the coefficient on the interaction of the level of cash with the change in cash holdings (*Cash_mv* × Δ*Cash_mv*) is negative (-0.454, *t*=-3.00). Similarly, the estimate of the interaction of changes in cash with leverage (*Lev_mv*× Δ*Cash_mv*) is negative and statistically significant (-0.054, *t*=-2.57). These results support the notion that the value of an additional unit of cash decreases as firms increase their cash holdings or their financial leverage. Estimates on the remaining variables are generally consistent with those reported in Faulkender and Wang (2006). Thus, the marginal value of cash for Korean companies comports with findings for U.S. firms.[13]

Estimates in Columns (2) and (3) address H4, which predicts that the marginal value of cash balance for high-R&D firms is greater than for low-R&D firms owing to more substantial external financing constraints created by R&D investment. Focusing on Column (3) where we interact both *EXP* and *CAP* with changes in cash, the estimate on the interaction (*EXP_mv* × Δ*Cash_mv*) is positive and statistically significant at the five percent level (6.024, *t*=2.09), whereas the estimate on (*CAP_mv* × Δ*Cash_mv*) is not reliably different from zero. Considering *EXP_mv* and (*EXP_mv* × Δ*Cash_mv*) in Column (4) and *CAP_mv* and (*CAP_mv* × Δ*Cash_mv*) in Column (5) yields results comparable to those in Column (3).[14]

Comparing associations for capitalized R&D with those for tangible capital expenditures (*Capex*) is useful as information asymmetry is lower with tangible investments. Capital expenditures can also relax financial constraints because they provide collateral value.

[13] The estimate on Δ*Cash_mv* is 0.633, which is the estimated marginal value of one unit of cash for a firm with zero cash and no leverage, is less than the $1.47 in Faulkender and Wang (2006). The difference is likely attributable to weaker corporate governance in Korea than in the U.S. In a weak-governance environment, firms are less likely to use cash to create shareholder value; therefore, each unit of cash is valued lower than in a strong governance environment (Dittmar and Mahrt-Smith 2007). Shin and Lee (2016) (exposition in Korean) report an estimate on Δ*Cash_mv* of approximately 0.6 for Korean firms.

[14] Statistical comparison of the hypothesis that the Column (4) estimate on *EXP* equals the Column (5) estimate on *CAP* indicates a statistically significant difference at conventional reliability levels.

Consistent with this expectation, estimates on (*Capex_mv* × Δ*Cash_mv*) are consistently negative. In contrast, the interactions for capitalized R&D (*CAP_mv* × Δ*Cash_mv*) are consistently positive, albeit statistically insignificant.

To summarize, evidence in Table 6 indicates that equity investors value cash holdings of R&D conditional on whether the R&D costs are capitalized or expensed. The evidence is consistent with a characterization that investors are better served by an accounting treatment that makes this distinction.

Table 6 About Here

SEO announcement returns (Hypothesis 5)

Hypothesis 5 posits that SEO pricing reflects lower uncertainty and information asymmetry implied by capitalized R&D. Following Lee and Masulis (2009), we use two-day abnormal returns as the dependent variable. Independent variables are computed using the most recent annual financial statements prior to the SEO announcement. SEO size, designated *AmountRatio,* is computed as the net SEO proceeds scaled by the market value of equity.[15] The analysis employs a measure of accounting quality, designated *MDD* (Modified Dechow-Dichev), computed as in Dechow and Dichev (2002) and modified by McNichols (2002).

Table 7 shows the results. The parameter estimate on aggregate *R&D* is positive and statistically significant at the 10 percent level in Column (2). Partitioning total *R&D* into *EXP* and *CAP* in Column (4) reveals that the estimate on *CAP* is positive and statistically significant (0.392, t=2.20), but the estimate on *EXP* is not reliably different from zero.[16] Regarding economic significance, the estimate on *CAP* (0.392) suggests that one standard

[15] As in the U.S., average SEO announcement stock returns are negative in Korea (Yoon 2016, exposition in Korean).

[16] The difference between the estimate on *EXP* and the estimate on *CAP* in Column (4) is statistically significant.

deviation greater *CAP* corresponds with 1.0 percent greater *CAR (0,1)*. Given that the median value of net proceeds is 13.3 percent of the pre-issue market value of equity, the result indicates 7.5 percent greater proceeds. This result supports the proposition that equity investors favorably interpret capitalized, but not expensed, R&D.

Turning to the control variables, *AmountRatio* is negatively associated with the announcement returns, while *Tangibility* is positively associated with *CAR(0,1)*, consistent with the evidence in Lee and Masulis (2009). Results inconsistent with Lee and Masulis (2009) are the negative coefficient estimates for *Tobin's Q* and *Size*. However, these associations are consistent with Yoon (2016), who studies SEO announcements by Korean firms. The parameter estimate on accounting report quality *MDD* is positive but only moderately significant statistically (*t*=1.67, Column 6), This result is in line with Kim, Lee, and Chung (2015), who report a positive effect of accounting quality for Korean firms' SEO announcement returns. In sum, Table 7 evidence supports Hypothesis 5 and implies that the R&D capitalization requirement conveys value-relevant information to outside equity investors.

<u>Table 7 About Here</u>

Additional Analyses

The GMM procedure

Brown et al. (2009) and Brown and Petersen (2009) address endogeneity and reverse causality concerns regarding the investment-cash flow equation using first-difference GMM procedure for dynamic panel models. We adopt a similar approach to re-estimate all parameters reported in Tables 2 through 7. In particular, lagged dependent variables dated t-3 and t-4 are used as instruments. Using lags reduced the sample sizes by 20-30%, depending on the specification.

Table 8 reports the estimates from the GMM procedure. These specifications include all control variables (fixed effects and covariates) used in Table 2 through Table 7 analyses. As is typical for GMM estimation using lagged variables, the *m*1 statistic indicates robust first-order autocorrelation in the errors with *p*-values close to zero. High *p*-values (all greater than 0.10) for the *m*2 statistics imply no second-order autocorrelation. The Sargan test suggests that all instruments are valid except for Columns (5) and (6).[17]

The results shown in this table support the results of OLS regressions, although significance levels are somewhat weaker (likely reflecting the reduced sample sizes). In particular, estimates on *EXP* in Columns (1) – (3) are qualitatively the same as those in OLS regressions of cash holdings, leverage, and equity issuance and significant at the five percent level (one-tailed), and estimates on *CAP* in Columns (1) – (3) are insignificant. The estimate on the interaction between the level of expensed R&D and the change in cash holdings (*EXP_mv* × Δ*Cash_mv*) in Column (4) is positive and significant, as in Table 5. In addition, the estimate on *OCF* is positive and significant, both statistically and economically, for expensed R&D (Column 5) but not for capitalized R&D (Column 6).

Table 8 About Here

Difference-in-differences estimation of the 2011 K-IFRS adoption effects

Although K-IFRS did not meaningfully alter the accounting treatment for R&D spending by Korean firms, enforcement of the accounting treatment can intensify to the extent that K-IFRS elevates regulator and manager attention to financial reporting issues. If more intense oversight does occur, then information conveyed through R&D accounting becomes more credible, and we expect more robust support for our hypotheses following 2011. To consider this possibility empirically, we augment primary specifications to include

[17] We note that capitalized R&D does not provide financial constraints as indicated in Columns (5) and (6).

the main effect of *POST* and the interactions (*EXP* × *POST)*, and (*CAP* × *POST)*, where *POST* = 1 for 2011 through 2017 observations (*POST* = 0, otherwise).

Table 9 shows the results of these tests. Note that the specifications include all control variables (both fixed effects and covariates) used in Table 2 through Table 7 analyses. (For brevity, estimates for control variables are not displayed.) Focusing on cash holdings (Column (1)), notice that the post-2011 incremental effect of *CAP* (*CAP* × *POST*) is negative and marginally significant (t=-1.82). This result implies that cash holdings more substantially *vary inversely* with *CAP* following 2011 than before. Estimates in Column (3) suggest that the impact of R&D on equity issuance declined for both *EXP* and *CAP*. The estimates also show an increased *R&D*–cash flow sensitivity for the expensed, but not for the capitalized, R&D components (Column 6) in the post-2011 period.

Otherwise, the evidence does not support the notion that formal K-IFRS influenced associations tabulated and discussed in the primary analysis. We detect no statistically significant pre-versus-post-K-IFRS differences for specifications of leverage (Column 2 in the table), SEO announcement returns (Column 4), the marginal value of cash (Column 5), and investment-cash flow sensitivities regarding capitalized R&D (Column 7). Overall, considering formal IAS 38 adoption does not significantly alter interpretations of the primary analyses displayed in Tables 2 to 7.

<u>Table 9 About Here</u>

VI. CONCLUDING REMARKS

Research and development investments are inherently risky with uncertain outcomes. Throughout the R&D process, projects are either pursued or abandoned as profitable outcomes become more or less certain. Informed by reasoning and evidence advanced in existing studies, we posit that the varying degree of information asymmetry between insider managers and outsider investors in the R&D context manifests in the empirical relationship between financing and the separation between expensed and capitalized R&D components.

Analyzing firms in Korea, which mandates capitalization of development costs, we provide empirical evidence suggesting that 1) distinguishing expensed and capitalized components conveys incremental information that explains corporate financing policies, and 2) investors utilize this accounting information to evaluate financing decisions. In particular, the positive association between R&D and cash holdings and the negative association between R&D and leverage are attributable to expensed, but not to capitalized, components of R&D expenditures. We also show that the R&D–cash flow sensitivity documented in previous studies is primarily attributable to the expensed components. Furthermore, we find that the marginal value of cash holdings varies directly with the magnitude of expensed components of R&D, implying that the market understands the consequence of the financing constraints associated with unproven R&D. In addition, expensed components of R&D carry greater uncertainty and information asymmetry, and therefore, the market responds more favorably to SEO announcements of firms that have more capitalized R&D than expensed R&D. A set of six tests point to the same conclusion consistent with the predictions grounded on information asymmetry and uncertainty inherent to R&D ventures. This study provides extensive and consistent evidence that the expensed and capitalized portions of R&D convey differential and value-relevant information. Investors, in turn, utilize such information for equity pricing and valuation of cash holdings.

To summarize the implications for financial reporting, evidence documented in this manuscript using publicly traded firms in Korea supports an accounting treatment that mitigates information asymmetry associated with R&D investment. In particular, the accounting approach that requires managers to capitalize R&D when the process satisfies generally accepted criteria more credibly communicates the future profitability of R&D

activities than an approach that requires expensing all R&D spending. These results support interpretations of evidence advanced in prior studies of R&D investment. The results also are pertinent to ongoing deliberations about the relevance versus objectivity of R&D accounting standards.

To illustrate, until recently, U.S. companies were permitted to expense R&D for income tax purposes when incurred. Under the 2017 Tax Cuts and Jobs Act (TCJA), however, R&D expenditures must be amortized over 5 to 15 years for tax purposes beginning January 1, 2022. Our study illustrates that such an all-or-none approach (either expense all or capitalize all) may be dysfunctional because only the R&D portions with proven results are comparable to productive (thus depreciable) long-term physical assets.[18]

[18] If we were to use an all-or-none approach, R&D capitalization is more informative. Under the all-capitalization approach, investors can easily "undo" the effects of capitalization and restate the pretax income statement using the all-expensing approach. The reverse does not hold, however.

REFERENCES

Aboody, D., and B. Lev. 1998. The Value Relevance of Intangibles: The Case of Software Capitalization. *Journal of Accounting Research* 36: 61-191.

Aboody, D., and B. Lev. 2000. Information Asymmetry, R&D, and Insider Gains. *The Journal of Finance* 55(6): 2747-2766.

Almeida, H., and M. Campello. 2007. Financial Constraints, Asset Tangibility, and Corporate Investment. *Review of Financial Studies* 5: 1429–1460.

Arrow, K. J. 1962. *Economic Welfare and the Allocation of Resources for Invention.* Macmillan Education UK. 609−626.

Bates, T., K. Kahle, and R. Stulz. 2009. Why Do U.S. Firms Hold So Much More Cash than They Used To?. *The Journal of Finance* 64(5): 1985-2021.

Baxamusa, M., S.Mohanty, and R.P.Rao. 2015. Information Asymmetry about Investment Risk and Financing Choice. *Journal of Business Finance & Accounting* 42(7-8): 947-964.

Bhagat, S., and I. Welch. 1995. Corporate Research & Development Investments International Comparisons. *Journal of Accounting and Economics* 19: 443-470.

Boone, J., and K. K. Raman. 2001. Off-balance Sheet R&D Assets and Market Liquidity. *Journal of Accounting and Public Policy* 20(2): 97-128.

Brown, J. R., S. M. Fazzari, and B. C. Petersen. 2009. Financing Innovation and Growth: Cash Flow, External Equity, and the 1990s R&D Boom. *The Journal of Finance* 64(1): 151-185.

Brown, J. R., and B. C. Petersen. 2009. Why has the Investment–cash flow Sensitivity Declined so Sharply? Rising R&D and Equity Market Developments. *Journal of Banking & Finance* 33: 971-984.

Brown, J. R., and B. C. Petersen. 2011. Cash Holdings and R&D Smoothing, *Journal of Corporate Finance* 17: 694-709.

Butler, A., J. Cornaggia, G. Grullon, and J. P. Weston. 2011. Corporate Financing Decisions, Managerial Market Timing, and Real Investment. *Journal of Financial Economics* 101(3):

666-683.

Chan, L. K. C., J. Lakonishok, and T. Sougiannis. 2001. The Stock Market Valuation of Research and Development Expenditures. *The Journal of Finance* 56(6): 2431-2456.

Chen, E., I. Gavious, and B. Lev. 2017. The positive externalities of IFRS R&D Capitalization: Enhanced voluntary disclosure. *Review of Accounting Studies* 22: 677–714.

Dechow, P. and I. Dichev. 2002. The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors. *The Accounting Review* 77: 35-59.

Dittmar, A., and J. Mahrt-Smith. 2007. Corporate Governance and The Value of Cash Holdings. *Journal of Financial Economics* 83: 599-634.

Dittmar, A., J. Mahrt-Smith, and H. Servaes. 2003. International Corporate Governance and Corporate Cash Holdings. *The Journal of Financial and Quantitative Analysis* 38(1): 111-133.

Erickson, T., and T. M. Whited. 2000. Measurement Error and the Relationship between Investment and *q*. *Journal of Political Economy* 108: 1027-1057.

Erickson, T., and T. M. Whited. 2012. Treating Measurement Error in Tobin's *q*. *The Review of Financial Studies* 25(4): 1286-1329.

Faulkender, M., and M. A. Petersen. 2006. Does the Source of Capital Affect Capital Structure?. *The Review of Financial Studies* 19(1): 45-79.

Faulkender, M., and R. Wang. 2006. Corporate Financial Policy and the Value of Cash. *The Journal of Finance* 61(4): 1957-1990.

Fazzari, S. M., R. G. Hubbard, and B. C. Petersen. 1988. Financing Constraints and Corporate Investment. *Brookings Papers on Economic Activity* 1988: 141-206.

Hall, B. H. 2002. The Financing of Research and Development. *Oxford Review of Economic Policy* 18(1): 35-51.

Hall, B. H., and J. 2010. Lerner. The Financing of R&D and Innovation. Handbook

of the Economics of Innovation 1: 609-639.

Hart, O., and J. Moore. 1994. A Theory of Debt Based on the Inalienability of Human Capital, *Quarterly Journal of Economics* 109: 841-879.

He, Z., and M. B. Wintoki. 2016. The Cost of Innovation: R&D and High Cash Holdings in U.S. Firms. *Journal of Corporate Finance* 41: 280-303.

Healy, P. M., S.C.Myers, and C.D.Howe. 2002. R&D Accounting and the Tradeoff Between Relevance and Objectivity. *Journal of Accounting Research* 40(3): 677-710.

Hovakimian, A., T. Opler, and S. Titman. 2001. The Debt-Equity Choice. *Journal of Financial and Quantitative Analysis* 36(1): 1-24.

Kang, P.K., and Y.C. Kim, 2015. Capitalizing R&D Expenditures or Expensing Them All? Evidence from the accounting environment of South Korea. *International Journal of Disclosure and Governance*. Vol 13-2. 117-134.

Kaplan, S. N., and L. Zingales. 1997. Do Investment–Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?. *The Quarterly Journal of Economics* 112(1): 169-215.

Kerr,W. R., and R. Nanda. 2015. "Financing innovation." *Annual Review of*

Financial Economics 7: 445-462.

Kim, K. S., J. H. Lee, and C. Y. Chung. 2015. Accrual Quality and Opportunistic Seasoned Equity Offering in the Korean Stock Market. *Emerging Markets Finance and Trade* 51: 140-157.

Kim, C., D. C. Mauer, and A. E. Sherman. 1998. The Determinants of Corporate Liquidity: Theory and Evidence. *The Journal of Financial and Quantitative Analysis* 33(3): 335-359.

Lamont, O., C. Polk, and J. Saaá-Requejo. 2001. Financial Constraints and Stock Returns. *Review of Financial Studies* 14 (2): 529-554.

Lee, G., and R. W. Masulis. 2009. Seasoned Equity Offerings: Quality of Accounting Information and Expected Flotation Costs. *Journal of Financial Economics* 92: 443-469.

Lev, B., and T. Sougiannis. 1996. The Capitalization, Amortization, and Value-relevance of

R&D. *Journal of Accounting and Economics* 21(1): 107-138.

McNichols, M. F. 2002. Discussion of the Quality of Accruals and Earnings: The Role of Accrual Estimation Errors. *The Accounting Review* 77: 61-69.

Mohd, E. 2005. Accounting for Software Development Costs and Information Asymmetry. *The Accounting Review* 80(4): 1211-1231.

Mummolo, J., and E. Peterson. 2018. Improving the Interpretation of Fixed Effects Regression Results. *The European Political Science Association* 6(4): 1-7.

Opler, T., L.Pinkowitz, R.Stulz, and R.Williamson. 1999. The Determinants and Implications of Corporate Cash Holdings. *Journal of Financial Economics* 52: 3-46.

Oswald, D. R., and P. Zarowin. 2007. Capitalization of R&D and the Informativeness of Stock Prices. *European Accounting Review* 16(4): 730-726.

Oswald, D. R., A. Simpson, and P. Zarowin. 2022. Capitalization vs Expensing and the Behavior of R&D Expenditures. *Review of Accounting Studies* 27: 1199-1232.

Penman, S. H. 2009. Accounting for Intangible Assets: There is Also an Income Statement. *Abacus* Vol. 45, No. 3

Roychowdhury, S, N. Shroff, and R. Verdi, 2019, "The Effects of Financial Reporting and Disclosure on Corporate Investment: A Review", *Journal of Accounting and Economics* 68 1-27.

Shin, M., and J. Lee. 2016. Effects of Labor Union on the Marginal Value of Cash. *Journal of Business Research* 31(1): 55-80.

Skinner, D.J., 2008 Accounting for intangibles – a critical review of policy recommendations, *Accounting and Business Research*, 38:3, 191-204.

Thakor, R. T., and A. W. Lo. 2018. Optimal Financing for R&D-intensive Firms. Working Paper.

Tsoligkas, F., and I. Tsalavoutas. 2011. Value Relevance of R&D in the UK After IFRS Mandatory Implementation. *Applied Financial Economics* 21(13): 957-967.

Whited, T. M. 1992. Debt, Liquidity Constraints, and Corporate Investment: Evidence from

Panel Data. *Journal of Finance* 47 (4): 1425-1460.

Whited, T. M., and G. Wu. 2006. Financial Constraints Risk. *The Review of Financial Studies* 19(2): 531-559.

Yoon, P. S. 2016. The Announcement Effect of Seasoned Equity Offerings: A Re-examination. *Korean Journal of Financial Studies* 45(2): 379-415.

Exhibit I

Financial Statement Excerpts for Hyundai Motor Company

The panels below illustrate how R&D expenditures are typically reported in financial statements in Korea, using Hyundai Motor Company's fiscal 2016 footnote disclosures on income statements (Panel A) and balance sheets (Panel B) regarding intangibles. Hyundai breaks out expensed from capitalized components of R&D expenditures. In Panel A, the total R&D spending in FY 2016 was 2,352,229 million Korean won (₩), of which ₩1,224,743 was capitalized and 1,127,486 was expensed. Panel B shows the intangible R&D asset has an ending balance of ₩3,015,782 in FY 2016, after adding ₩1,224,743 and amortizing ₩1,022,841.

Panel A: Income Statement

(3) Research and development expenditures for the years ended December 31, 2016 and 2015 are as follows:

(In millions of Korean Won)

Description	2016	2015
Development costs (intangible assets)	₩ 1,224,743	₩ 1,098,176
Research and development (manufacturing cost and administrative expenses)	1,127,486	1,074,230
Total (*)	₩ 2,352,229	₩ 2,172,406

(*) Amortization of development costs is not included.

Panel B: Balance Sheet

(2) The changes in intangible assets for the year ended December 31, 2016 are as follows:

(In millions of Korean Won)

Description	Beginning of the year	Internal developments and separate acquisitions	Transfers within intangible assets	Disposals	Amortization	Impairment gain (loss)	Others (*)	End of the year
Goodwill	₩ 292,078	₩ -	₩ -	₩ -	₩ -	₩ -	₩ (1,785)	₩ 290,293
Development costs	3,015,782	1,224,743	99,265	(34)	(1,022,841)	4,446	9,629	3,330,990
Industrial property rights	97,212	1,545	25,430	(43)	(15,602)	-	621	109,163
Software	330,531	24,152	38,056	(234)	(129,929)	(205)	95,910	358,281
Others	292,203	18,028	5,956	(13,003)	(25,819)	15	16,035	293,415
Construction in progress	270,282	105,695	(168,707)	(49)	-	(2,461)	(730)	204,030
	₩ 4,298,088	₩ 1,374,163	₩ -	₩ (13,363)	₩ (1,194,191)	₩ 1,795	₩ 119,680	₩ 4,586,172

Appendix: Variable Definitions

Financial Variables	
EXP_t	Amount of R&D $expense_t$/total $assets_{t-1}$.
CAP_t	Amount of R&D $capitalized_t$/total $assets_{t-1}$.
$R\&D_t$	$EXP_t + CAP_t$.
$Size_t$	Natural logarithm of total $assets_t$.
$Tobin'sQ_t$	(Total $assets_t$ - book value of $equity_t$ + market value of $equity_t$)/total $assets_t$.
OCF_t	(Operating cash $flow_t$)/total $assets_{t-1}$.
$Cash_t$	Cash and cash $equivalents_t$/total $assets_t$.
$CNOA_t$	Current net operating assets, ((Current $asset_t$ - cash and cash $equivalents_t$) - (current $liabilities_t$ - current long-term $debt_t$)/total $assets_t$.
NWC_t	(Current $asset_t$ - current $liabilities_t$)/total $assets_t$.
$Capex_t$	Capital $expenditure_t$/total $assets_{t-1}$.
$Tangibility_t$	PPE_t/total $assets_t$.
$Leverage_t$	Long-term $debt_t$/total $assets_t$
$EqIssuanceRatio_t$	Equity $issuance_t$/(|Equity $issuance_t$ + Debt $issuance_t$|), where Equity issuance is total equity issuance minus equity repurchases, and Debt issuance is total debt issuance minus debt redemption.
$Cash\_mv_t$	Cash and cash $equivalents_t$/market value of $equity_t$.
EXP_mv_t	Amount of R&D $expense_t$/market value of $equity_{t-1}$.
CAP_mv_t	Amount of R&D $capitalized_t$/market value of $equity_{t-1}$.
$R\&D\_mv_t$	R&D $expenditure_t$/market value of $equity_{t-1}$.
$Capex\_mv_t$	Capital $expenditure_t$/market value of $equity_{t-1}$.
Lev_mv_t	Long-term $debt_t$/market value of $equity_t$
$\Delta Cash\_mv_t$	(Cash and cash $equivalents_t$ - cash and cash $equivalents_{t-1}$)/market value of $equity_{t-1}$.
$\Delta EBIT\_mv_t$	($EBIT_t$ - $EBIT_{t-1}$)/market value of $equity_{t-1}$.
ΔNA_mv_t	((Total $assets_t$ - cash $holdings_t$) - (total $assets_{t-1}$ - cash $holdings_{t-1}$)) /market value of $equity_{t-1}$.
$\Delta Interest\_mv_t$	($Interest_t$ - $Interest_{t-1}$)/market value of $equity_{t-1}$.
ΔDiv_mv_t	($Dividend_t$ - $Dividend_{t-1}$)/market value of $equity_{t-1}$.
$\Delta R\&D\_mv_t$	(R&D $expenditure_t$ - R&D $expenditure_{t-1}$)/market value of $equity_{t-1}$.
NF_mv_t	Net $financing_t$/market value of $equity_{t-1}$, where Net financing is

	Equity $issuance_t$ plus Debt $issuance_t$.
$ExcessReturn_t$	$r_{i,t}$-$R_{i,t}^B$ where $r_{i,t}$ is the annual stock return of firm *i* at time *t* and $R_{i,t}^B$ is stock *i*'s benchmark portfolio return at time *t*.
CAR(0,1)	Cumulative abnormal returns over a two-day trading period starting from the SEO announcement day.
$AmountRatio_t$	An offer's net proceeds/market value of equity.
$Kospi_t$	An indicator variable that is equal to one if a firm is listed on KOSPI market.
MDD	Modified DD model following McNichols (2002).
	The standard deviation of firm's residuals over the years t-4 through t, $CA_{i,t} = a_0 + a_1 CFO_{i,t-1} + a_2 CFO_{i,t} + a_3 CFO_{i,t+1} + a_4 \Delta Sales_{i,t} + a_5 PPE_{i,t} + e_{j,t}$, where *CA* = (Δcurrent assets – Δcurrent liabilities – Δcash + Δdebt in current liabilities)/average value of total assets, CFO = cash flow from operation / average value of total assets.

Table 1
Summary Statistics

This table displays summary statistics on the sample firms. The sample comprises non-financial public firms operating in Korea from 2000 through 2017. Panel A reports summary statistics on all sample firms. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution. Panel B reports the averages of the main financing variables—*Cash*, *Leverage*, and *EqIssuanceRatio*—after splitting firms based on the median value of *R&D*, *EXP*, and *CAP*. Columns (3), (6), and (9) display the magnitude and statistical significance of differences in the variables between the two groups. ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Panel C reports the correlation matrix for variables used in the paper. The upper (lower) right triangle displays the Spearman (Pearson) correlations. Currency values are expressed in billions of Korean Won.

Panel A: Summary Statistics

	Count	Mean	SD	p25	p50	p75
R&D	21178	0.017	0.031	0.000	0.003	0.020
EXP	21178	0.012	0.024	0.000	0.001	0.014
CAP	21178	0.005	0.016	0.000	0.000	0.000
Cash	21178	0.065	0.072	0.016	0.042	0.087
OCF	21178	0.058	0.108	0.002	0.053	0.110
Size	21178	25.759	1.422	24.79	25.484	26.433
Leverage	21178	0.064	0.087	0.000	0.025	0.102
Asset	21178	695.43	2298.24	58.46	117.58	302.40
Tobin's Q	21178	1.211	0.742	0.777	0.979	1.356
Capex	21178	0.054	0.084	0.008	0.028	0.069
NWC	21178	0.186	0.235	0.017	0.175	0.350
CNOA	21178	0.378	0.192	0.247	0.376	0.507
Tangibility	21178	0.296	0.187	0.153	0.281	0.42
R&D_mv	17477	0.022	0.038	0.000	0.004	0.027
EXP_mv	17477	0.012	0.015	0.000	0.002	0.021
CAP_mv	17477	0.004	0.014	0.000	0.000	0.000
Capex_mv	17477	0.093	0.166	0.008	0.041	0.116
Δ*Cash_mv*	17477	0.012	0.115	-0.034	0.003	0.048
Δ*EBIT_mv*	17477	0.013	0.236	-0.042	0.003	0.05
Δ*NA_mv*	17477	0.141	0.898	-0.039	0.076	0.271
ExcessReturn	17477	-0.027	0.566	-0.333	-0.112	0.157
NF_mv	17477	0.119	0.462	-0.009	0.021	0.170
Δ*Interest_mv*	17477	-0.003	0.059	-0.003	0.000	0.004
Δ*Div_mv*	17477	0.000	0.018	0.000	0.000	0.002
Δ*R&D_mv*	17477	0.002	0.021	-0.001	0.000	0.003
EqIssuanceRatio	20868	0.199	0.638	0.000	0.000	0.154
CAR(0,1)	1371	-0.012	0.104	-0.085	-0.019	0.034
AmountRatio	1371	0.195	0.255	0.063	0.133	0.240
Kospi	1371	0.285	0.452	0.000	0.000	1.000
MDD	1371	0.081	0.070	0.032	0.061	0.108

Panel B: Above and below the median *R&D*, *EXP*, *CAP* firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	R&D>50%	*R&D*<50%	Diff	*EXP* >50%	*EXP* <50%	Diff	*CAP* >50%	*CAP* <50%	Diff
Cash	0.072	0.058	0.014***	0.071	0.059	0.011***	0.065	0.065	0.000
Leverage	0.065	0.064	0.001	0.062	0.073	-0.011***	0.070	0.082	-0.012***
EqIssuanceRatio	0.262	0.130	0.132***	0.243	0.149	0.094***	0.266	0.172	0.094***

Panel C: Correlation Matrix (Spearman top and Pearson bottom)

	R&D	*EXP*	*CAP*	*Cash*	*Size*	*Leverage*	*OCF*	*Capex*	*Tobin'sQ*	*PPE*	*NWC*	*EqIssuance Ratio*
R&D		0.899	0.546	0.159	-0.121	0.030	0.051	0.220	0.258	-0.094	0.158	0.157
EXP	0.853		0.256	0.161	-0.045	0.027	0.060	0.145	0.220	-0.053	0.145	0.126
CAP	0.670	0.196		0.029	-0.124	0.081	-0.003	0.226	0.156	-0.083	0.038	0.099
Cash	0.142	0.148	0.053		-0.150	-0.214	0.205	-0.034	0.201	-0.270	0.464	0.132
Size	-0.170	-0.098	-0.185	-0.156		0.237	0.083	-0.088	-0.131	0.183	-0.331	-0.121
Leverage	-0.025	-0.045	0.019	-0.157	0.242		-0.109	0.140	-0.011	0.339	-0.380	-0.129
OCF	0.053	0.066	0.006	0.173	0.084	-0.113		0.259	0.110	0.099	0.119	0.027
Capex	0.198	0.103	0.231	-0.034	-0.096	0.172	0.222		0.228	0.257	-0.003	0.072
Tobin'sQ	0.271	0.236	0.171	0.224	-0.112	-0.029	0.100	0.165		-0.171	0.082	0.175
PPE	-0.175	-0.133	-0.142	-0.284	0.175	0.298	0.076	0.222	-0.183		-0.470	-0.142
NWC	0.223	0.216	0.115	0.431	-0.315	-0.275	0.106	-0.034	0.158	-0.491		0.187
EqIssuanceRatio	0.128	0.103	0.096	0.103	-0.095	-0.101	0.040	0.041	0.123	-0.116	0.168	

Table 2
Cash Holdings

This table presents the results of a cash holdings analysis. The dependent variable is *Cash*. Entries are parameter estimates with t-statistics shown parenthetically. We control for variables previously known to be associated with cash holdings in even-numbered columns. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution. Standard errors are clustered at the firm level, and firm fixed effects and industry-year fixed effects are included in all regressions.

Dep. variable	Predicted sign	*Cash*							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R&D	+	0.119	0.107						
		(3.31)	(3.33)						
EXP	+			0.212	0.219	0.211	0.218		
				(4.44)	(5.22)	(4.43)	(5.21)		
CAP	+			-0.034	-0.074			-0.027	-0.069
				(-0.61)	(-1.47)			(-0.47)	(-1.35)
Capex	-		-0.025		-0.021		-0.023		-0.019
			(-3.90)		(-3.29)		(-3.60)		(-2.98)
Size	-		-0.005		-0.005		-0.005		-0.005
			(-2.80)		(-2.86)		(-2.84)		(-2.83)
Leverage	-		0.004		0.004		0.004		0.004
			(0.51)		(0.50)		(0.52)		(0.43)
OCF	+		0.106		0.105		0.105		0.106
			(17.58)		(17.48)		(17.50)		(17.60)
Tobin'sQ	+		0.008		0.008		0.008		0.008
			(5.70)		(5.65)		(5.64)		(5.77)
CNOA	-		-0.101		-0.102		-0.102		-0.100
			(-13.88)		(-14.00)		(-14.01)		(-13.68)
Tangibility	-		-0.133		-0.135		-0.134		-0.135
			(-16.54)		(-16.71)		(-16.70)		(-16.56)
Firm FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		21178	21178	21178	21178	21178	21178	21178	21178
R^2		0.540	0.599	0.541	0.600	0.541	0.600	0.540	0.599

Table 3
Leverage

This table presents the analysis of the association between leverage and *EXP* and *CAP*. The dependent variable is *Leverage* in all columns. Entries are parameter estimates with t-statistics shown parenthetically. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution. Standard errors are clustered at the firm level, and firm fixed effects and industry-year fixed effects are included in all regressions.

Dep. variable		*Leverage*							
	Predicted sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R&D	-	-0.054	-0.090						
		(-1.38)	(-2.45)						
EXP	-			-0.085	-0.115	-0.085	-0.116		
				(-1.82)	(-2.51)	(-1.83)	(-2.54)		
CAP	-			-0.016	-0.063			-0.018	-0.066
				(-0.23)	(-1.00)			(-0.27)	(-1.05)
Capex	+		0.112		0.111		0.110		0.110
			(10.99)		(10.87)		(10.77)		(10.78)
OCF	-		-0.093		-0.093		-0.093		-0.093
			(-12.66)		(-12.67)		(-12.67)		(-12.70)
Tobin'sQ	-		-0.001		-0.001		-0.001		-0.001
			(-0.90)		(-0.89)		(-0.88)		(-0.96)
Cash	-		-0.024		-0.024		-0.024		-0.025
			(-1.79)		(-1.78)		(-1.76)		(-1.83)
Size	+		0.031		0.031		0.031		0.031
			(11.81)		(11.81)		(11.82)		(11.79)
Tangibility	+		0.112		0.113		0.113		0.112
			(9.13)		(9.15)		(9.19)		(9.14)
NWC	+		0.063		0.063		0.063		0.062
			(8.47)		(8.50)		(8.50)		(8.37)
Firm FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		21178	21178	21178	21178	21178	21178	21178	21178
R^2		0.507	0.552	0.507	0.552	0.507	0.552	0.507	0.552

Table 4
Equity Issuance

This table presents the analysis of the association between equity issuance and *EXP* and *CAP*. The dependent variable is *EqIssuanceRatio*. Entries are parameter estimates with t-statistics shown parenthetically. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution. Standard errors are clustered at the firm level and firm fixed effects, and industry-year fixed effects are included in all regressions.

Dep. variable	*EqIssuanceRatio*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R&D	1.409	0.876						
	(4.18)	(2.63)						
EXP			1.583	1.167	1.600	1.171		
			(3.69)	(2.78)	(3.75)	(2.80)		
CAP			1.184	0.452			1.220	0.466
			(1.81)	(0.69)			(1.88)	(0.72)
Capex		0.603		0.613		0.625		0.622
		(8.23)		(8.23)		(8.52)		(8.31)
OCF		-0.189		-0.190		-0.190		-0.187
		(-2.77)		(-2.79)		(-2.79)		(-2.75)
Tobin'sQ		0.034		0.034		0.034		0.035
		(2.14)		(2.13)		(2.13)		(2.19)
Cash		0.372		0.370		0.368		0.379
		(2.71)		(2.69)		(2.68)		(2.76)
Size		0.053		0.053		0.053		0.053
		(3.25)		(3.24)		(3.23)		(3.25)
Tangibility		-0.266		-0.271		-0.275		-0.269
		(-4.00)		(-4.04)		(-4.13)		(-4.01)
NWC		0.228		0.226		0.226		0.235
		(3.96)		(3.92)		(3.92)		(4.10)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	20868	20868	20868	20868	20868	20868	20868	20868
R^2	0.053	0.06	0.053	0.06	0.052	0.06	0.052	0.06

Table 5
Investment–Cash Flow Sensitivity of R&D

This table presents the analysis of the investment–cash flow sensitivity of *EXP* and *CAP*. We use the sample of firms that report positive R&D expenditure and positive cash flow. The dependent variables are *R&D*, *EXP*, and *CAP*, with the corresponding results reported in Columns (1)–(2), (3)–(4), and (5)–(6), respectively. Entries are parameter estimates with t-statistics shown parenthetically. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution. Standard errors are clustered at the firm level and firm fixed effects, and industry-year fixed effects are included in all regressions.

Dep. variable		*R&D*		*EXP*		*CAP*	
	Predicted sign	(1)	(2)	(3)	(4)	(5)	(6)
OCF	+	0.017	0.014	0.015	0.012	0.003	0.003
		(5.14)	(4.13)	(5.94)	(4.60)	(1.27)	(1.32)
Tobin's Q	+		0.003		0.002		0.001
			(4.34)		(3.99)		(1.73)
Leverage	-		-0.006		-0.007		0.001
			(-1.45)		(-2.34)		(0.51)
Cash	+		-0.001		0.007		-0.007
			(-0.10)		(1.54)		(-1.98)
Size	-		-0.003		0.000		-0.002
			(-2.37)		(-0.53)		(-2.81)
Firm FE		Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FE		Yes	Yes	Yes	Yes	Yes	Yes
N		12512	12512	12512	12512	12512	12512
R^2		0.763	0.766	0.771	0.773	0.620	0.622

Table 6
Marginal Value of Cash

This table presents the analysis of the marginal value of cash holdings. The dependent variable is annual excess stock returns. Following Faulkender and Wang (2006), the independent variables are changes in firm characteristics deflated by the lagged market value of equity except for leverage. Entries are parameter estimates with t-statistics shown parenthetically. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution. Standard errors are clustered at the firm level and firm fixed effects, and industry-year fixed effects are included in all regressions.

Dep. variable		*ExcessReturn*				
	Predicted sign	(1)	(2)	(3)	(4)	(5)
Cash_mv × Δ*Cash_mv*	-	-0.454	-0.444	-0.469	-0.479	-0.473
		(-3.00)	(-2.91)	(-3.06)	(-3.11)	(-3.09)
Lev_mv × Δ*Cash_mv*	-	-0.054	-0.052	-0.052	-0.052	-0.052
		(-2.57)	(-2.45)	(-2.44)	(-2.46)	(-2.46)
R&D_mv × Δ*Cash_mv*	+		2.431			
			(2.05)			
EXP_mv ×Δ*Cash_mv*	+			6.024	6.233	
				(2.09)	(2.18)	
CAP_mv × Δ*Cash_mv*	+			1.529		1.789
				(0.86)		(1.03)
Capex_mv × Δ*Cash_mv*	-		-0.283	-0.280	-0.276	-0.281
			(-1.95)	(-1.89)	(-1.85)	(-1.92)
R&D_mv	+	1.704	1.631			
		(6.72)	(6.51)			
EXP_mv	+			2.771	2.710	
				(5.08)	(5.00)	
CAP_mv	+			0.381		0.298
				(1.34)		(1.06)
Capex_mv	+		0.046	0.05	0.051	0.052
			(1.20)	(1.29)	(1.31)	(1.34)
Δ*Cash_mv*	+	0.633	0.592	0.578	0.586	0.665
		(8.01)	(7.13)	(6.75)	(6.81)	(8.23)
Δ*EBIT_mv*	+	0.285	0.282	0.284	0.285	0.284
		(4.64)	(4.65)	(4.63)	(4.64)	(4.63)
Δ*NA_mv*	+	0.059	0.057	0.056	0.056	0.055
		(5.10)	(4.86)	(4.80)	(4.82)	(4.67)
Δ*Interest_mv*	-	-0.15	-0.164	-0.151	-0.145	-0.137
		(-0.56)	(-0.58)	(-0.54)	(-0.53)	(-0.49)
Δ*Div_mv*	+	1.796	1.770	1.762	1.751	1.729
		(5.42)	(5.33)	(5.31)	(5.28)	(5.21)

Cash_mv	+	0.033	0.025	0.024	0.025	0.023
		(1.73)	(1.24)	(1.19)	(1.21)	(1.12)
NF_mv	+	0.165	0.162	0.159	0.159	0.169
		(5.27)	(5.13)	(5.00)	(4.98)	(5.32)
Lev_mv	-	0.032	0.032	0.036	0.036	0.040
		(5.60)	(5.35)	(5.98)	(6.02)	(6.78)
ΔR&D_mv		0.451	0.471	0.869	1.045	1.096
		(1.56)	(1.64)	(2.96)	(3.85)	(3.78)
Firm FE		Yes	Yes	Yes	Yes	Yes
Industry-year FE		Yes	Yes	Yes	Yes	Yes
N		17477	17477	17477	17477	17477
R^2		0.245	0.246	0.244	0.244	0.242

Table 7
SEO Announcement Returns

This table presents the analysis of the association between SEO announcement returns and *EXP* and *CAP*. Following Lee and Masulis (2009), the dependent variable is two-day abnormal returns. The independent variables are taken from the most recent financial statements prior to SEO announcements. Entries are parameter estimates with t-statistics shown parenthetically. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution. Standard errors are clustered at the firm level, and industry-year fixed effects are included in all regressions.

Dep. variable		*CAR(0,1)*							
	Predicted sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R&D		0.163	0.206						
		(1.43)	(1.78)						
EXP	-			0.075	0.084	0.083	0.077		
				(0.51)	(0.58)	(0.56)	(0.52)		
CAP	+			0.307	0.392			0.309	0.390
				(1.68)	(2.20)			(1.69)	(2.19)
AmountRatio	-		-0.032		-0.032		-0.031		-0.032
			(-1.80)		(-1.82)		(-1.76)		(-1.81)
Capex	.		-0.127		-0.138		-0.097		-0.133
			(-2.02)		(-2.20)		(-1.56)		(-2.13)
Tobin'sQ	+		-0.005		-0.004		-0.004		-0.004
			(-1.02)		(-0.96)		(-0.84)		(-0.89)
Leverage	.		-0.038		-0.042		-0.042		-0.045
			(-0.99)		(-1.10)		(-1.12)		(-1.17)
Size	+		-0.006		-0.006		-0.006		-0.006
			(-1.79)		(-1.70)		(-1.79)		(-1.67)
Tangibility	+		0.043		0.047		0.036		0.047
			(1.70)		(1.88)		(1.45)		(1.87)
OCF	.		0.066		0.064		0.067		0.065
			(1.93)		(1.87)		(1.99)		(1.89)
Cash	.		0.048		0.053		0.044		0.055
			(0.90)		(1.00)		(0.82)		(1.03)
Kospi	.		-0.005		-0.006		-0.005		-0.006
			(-0.45)		(-0.56)		(-0.45)		(-0.60)
MDD	.		0.084		0.082		0.091		0.082
			(1.53)		(1.50)		(1.67)		(1.51)
Industry-year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		1371	1371	1371	1371	1371	1371	1371	1371
R^2		0.288	0.306	0.289	0.308	0.286	0.303	0.289	0.308

Table 8
GMM Estimates

Estimates are from first-difference GMM procedures (Brown, Fazzari, and Petersen 2009) for dynamic panel models with lagged dependent variables, where lagged values dated t-3 and t-4 are used as instruments. We report *m*1 statistics (*p*-values) for first-order autocorrelation, *m*2 for second-order autocorrelation, and Sargan statistics (*p*-values) for the validity of the overidentifying restrictions. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	Cash Holdings	Leverage	Equity Issuance	Marginal Value of Cash	Investment-Cashflow (*EXP*)	Investment-Cashflow (*CAP*)
EXP	0.720	-2.200	14.939			
	(1.67)	(-2.56)	(1.67)			
CAP	-0.201	1.235	-12.545			
	(-0.38)	(1.15)	(-1.09)			
$EXP\_mv \times \Delta Cash\_mv$				5.643		
				(2.06)		
$CAP\_mv \times \Delta Cash\_mv$				1.469		
				(1.08)		
OCF	0.120	-0.063	-0.213		0.037	0.001
	(10.83)	(-6.42)	(-1.74)		(3.84)	(0.19)
Control Variables	Included	Included	Included	Included	Included	Included
*m*1 (*p*-value)	0.000	0.000	0.006	0.047	0.000	0.000
*m*2 (*p*-value)	0.288	0.713	0.435	0.128	0.145	0.305
Sargan (*p*-value)	1.000	0.183	0.213	0.948	0.000	0.000
N	17399	17399	17163	12708	10069	10069

Table 9
Difference-in-Differences Specifications

This table presents the results of a difference-in-differences estimation of the seven specifications, focusing on the coefficients of *EXP* and *CAP* before and after the formal imposition of IAS 38. *POST* is an indicator variable that equals one on or after 2011. All control variables are included, but the coefficient estimates are not shown for brevity. All variables are defined in the Appendix and winsorized at 1 percent in both tails of the distribution. Standard errors are clustered at the firm level and firm fixed effects, and industry-year fixed effects are included in all regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. variable	Cash Holdings	Leverage	Equity Issuance	SEO Announcement	Marginal Value of Cash	Investment -Cashflow (EXP)	Investment -Cashflow (CAP)
EXP	0.212	-0.171	1.839	0.008			
	(4.15)	(-2.81)	(3.49)	(0.05)			
EXP × *POST*	0.015	0.091	-1.080	0.229			
	(0.28)	(1.31)	(-1.71)	(0.69)			
CAP	-0.031	-0.114	1.266	0.348			
	(-0.57)	(-1.55)	(1.96)	(1.65)			
CAP × *POST*	-0.145	0.191	-2.991	0.175			
	(-1.82)	(1.80)	(-2.46)	(0.48)			
POST	-0.034	-0.026	-0.495	-0.115	-1.459	-0.009	0.002
	(-4.74)	(-2.78)	(-6.72)	(-7.24)	(-36.05)	(-2.93)	(0.69)
$EXP \times \Delta Cash$					7.720		
					(1.91)		
$EXP \times \Delta Cash \times POST$					-4.794		
					(-0.87)		
$CAP \times \Delta Cash$					2.053		
					(0.97)		
$CAP \times \Delta Cash \times POST$					-1.175		
					(-0.33)		
OCF	0.105	-0.093	-0.192		0.065	0.008	0.004
	(17.50)	(-12.67)	(-2.81)		(1.91)	(2.71)	(1.30)
OCF × *POST*						0.011	-0.002
						(2.24)	(-0.70)
Control Variables	Included	Included	Included	Included	Included	Included	Included
Firm FE	Yes	Yes	Yes	No	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	21178	21178	20868	1371	17477	12512	12512
R^2	0.545	0.490	0.142	0.309	0.117	0.722	0.536