Development costs capitalization and debt financing

Andreas Kreß[1]*

Brigitte Eierle[2]

Ioannis Tsalavoutas[3]

Acknowledgements

We gratefully acknowledge helpful comments received from Andrew Stark (Editor), an anonymous reviewer, Paul Andrè, Diogenis Baboukardos, Anne Jeny, Khadija Almaghrabi, Fanis Tsoligkas, Alan Goodacre, Kostas Pappas, Antonios Siganos and Pauline Weetman. Additionally, we thank seminar participants at the University of Limerick (October, 2018), University of Essex (November, 2017), the University of Stirling (September 2017) and the University of Glasgow (September 2017) as well as delegates and participants of the 41st Annual EAA conference (Milan, May 2018), the 13th EUFIN workshop (Florence, August 2017) and the 21st Financial Reporting and Business Communication (FRBC) conference (Durham, July 2017).

*Corresponding author.

[1]Andreas Kreß is at the University of Bamberg (Room 03.38, Feldkirchenstraße 21, 96047 Bamberg. E-mail: andreas.kress@uni-bamberg.de).
[2]Brigitte Eierle is at the University of Bamberg (Room 03.36, Feldkirchenstraße 21, 96047 Bamberg. E-mail: brigitte.eierle@uni-bamberg.de).
[3]Ioannis Tsalavoutas is at the University of Glasgow (Adam Smith Business School, West Quadrangle, Main Building, Room G683, University Avenue, Glasgow, G12 8QQ, Scotland, UK. E-mail: ioannis.tsalavoutas@glasgow.ac.uk).

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Abstract

This study investigates debt market effects of research and development (R&D) costs capitalization, using a global sample of public bonds and private syndicated loans issued by public non-financial firms. Firstly, we show that firms capitalize larger amounts of R&D in a year when they exhibit a propensity for issuing bonds, rather than borrowing funds privately from the syndicated loan market, in the subsequent year. Secondly, we provide evidence that capitalized R&D investments reduce the cost of debt. We infer that debt market participants are able to identify firms' motives for R&D capitalization, as we find a reduction in the cost of debt only for those firms that do not show indications of employing R&D capitalization for earnings management reasons. Indeed, only for this sub-sample of firms, the amount of capitalized R&D contributes positively to future earnings. We confirm that R&D capitalization is positively associated with audit fees and thus can be deemed to be a signaling device. Lastly, we find that it is the amount of R&D a firm is expected to capitalize and not the discretionary counterparts, which facilitates a firm's access to public debt markets, reduces bond and syndicated loan prices, and contributes to future benefits.

Keywords: Research and development, R&D, R&D capitalization, debt markets, debt financing, cost of debt.

JEL Classifications: G12, G15, M40, M41

1. Introduction

International Accounting Standard (IAS) 38 Intangible Assets, within International Financial Reporting Standards (IFRS), separates development expenditures from research costs and requires different treatment for each component. Research outlays must be expensed as incurred, but development costs must be capitalized when certain conditions are met. This contrasts with the requirements of United States Generally Accepted Accounting Principles (US GAAP) where both research costs and development expenditures must be expensed. Development costs capitalized under IAS 38 relate to R&D projects which are closer to being used or sold and hence bear less uncertainty regarding their future outcome. However, as fulfillment of the restrictive recognition criteria under IAS 38 requires managers to use proprietary information and exercise subjective judgement, R&D capitalization under IFRS is open to managerial discretion.

We first investigate whether or not managers use this discretion as a means of facilitating borrowing from public debt markets, rather than entering private debt markets (i.e. the syndicated loan market). Thus, we examine if the amount of R&D a firm capitalizes in a given year is associated with a firm's choice of the source of debt financing for the subsequent year. We then analyze the value relevance of R&D capitalization for debt markets by investigating the effect of capitalized development costs in a given year on the cost of public debt and private debt for the subsequent year. To the best of our knowledge, evidence on these two issues is absent. Prior studies examining the debt market consequences of R&D investments focus exclusively on US firms (Shi, 2003; Eberhart et al., 2008; Ciftci & Darrough, 2016) and thus rely on a setting for which discretionary R&D capitalization cannot be observed.

We first hypothesize that firms capitalize larger amounts of R&D in a year when they show a higher propensity subsequently to raise funds from the public debt market rather than the syndicated loan market (H1). The public debt market and syndicated loan market are regarded as mutual substitutes (e.g. Altunbaş et al., 2010), because in both markets firms can raise considerable amounts of funds with comparable maturity terms. However, the markets differ strongly in information asymmetry (Bharath et al., 2008; Altunbaş et al., 2010). Firms accessing the syndicated loan market are able to communicate the future success of their R&D projects via private channels, while bondholders in the public debt market do not have access to such channels (Bharath et al., 2008; Florou & Kosi, 2015). Thus, information in publicly available financial statements can be more important for bondholders in this context (Gorton & Winton, 2003; Bharath et al., 2008; Marshall et al., 2016). Consequently, for our chosen context, firms that plan to access public debt markets have greater incentives to signal the future success of their R&D investments and are willing to incur the necessary costs – including higher audit fees – to capitalize the corresponding development expenditures.

Further, we hypothesize a negative association between capitalized R&D and the cost of public (H2) and private debt (H3). These hypotheses are motivated by the asymmetric payoff structure of debtholders. They bear the full extent of the downside risk, while their return is restricted to a fixed interest rate. Thus, debtholders are more concerned about bad news, which may affect their downside risk (Easton et al., 2009; Ball et al., 2008). As innovation projects show a high degree of technical and commercial uncertainty as well as a low success rate (Lev, 2001), the risk component and thus the trade-off between future benefits and risk of R&D investments is more prevalent for debt markets (Shi, 2003; Ciftci & Darrough, 2016). Capitalized development costs should, therefore, be of particular importance to debt market participants. Arguably, the high reporting costs and audit effort involved in recording capitalized development costs (De George et al., 2013; Cheng et al., 2016; Kuo & Lee, 2017) could further assist debtholders to perceive capitalized development costs as a signal of genuine future economic benefits resulting from less risky R&D projects. Hence, capitalized R&D investments should be priced positively, resulting in reduced debt costs.

We test these hypotheses by using a global sample of bonds and private syndicated loans issued by public, non-financial firms in countries which mandated IFRS or fully converged their local GAAP with IFRS from 2005 onwards.

Consistent with our first hypothesis, the propensity to borrow in the public debt market rather than the private syndicated loan market in a given year is positively associated with higher amounts of R&D having been capitalized during the previous year. Regarding the cost of public debt, we find that R&D costs are priced differently for firms that expense all of their R&D investments (Expensers) and for firms that capitalize all or some of their R&D investments (Capitalizers). For Expensers, R&D expenditure reduces bond prices. This is in line with the literature on US firms (Eberhart et al., 2008), where firms expense all their R&D investments. For Capitalizers, the capitalized and expensed portions of R&D investments are regarded differently by bond investors. While the amount of R&D capitalized during a year reduces the cost of public debt, the expensed component is not priced. Regarding the effect of R&D investments on the cost of private debt, we find that R&D costs of Expensers are not priced in syndicated loan deals. However, in line with our hypothesis, we find that the amount of capitalized R&D reduces syndicated loan prices for Capitalizers, whereas our results show no significant effect of the expensed component. These findings provide evidence that debt investors overall regard the capitalized part of R&D investments as a signal of reduced risk from R&D projects. This is consistent with the restrictive conditions in IAS 38, which are directed towards indications of likely success of firms' capitalized development costs.

In further analysis, we show that debt market participants are able to identify firms' motives for R&D capitalization, as capitalized development costs are priced only for firms whose capitalized amount is not attributed to earnings management incentives. Furthermore, for capitalizing firms we find that only the capitalized amount contributes to future earnings, while the expensed counterpart is not related to future benefits. In fact, the positive association between capitalized R&D and firms' future earnings holds only for firms that do not show indications of employing R&D capitalization for earnings management reasons. Additionally, we document a significant positive relationship between R&D capitalization and a firm's audit fees, implying that R&D capitalization as required by IAS 38 is a costly activity and so can be deemed to be a signaling device. Lastly, when we separate the amount of R&D that a firm capitalized during a year into expected and discretionary components, we show that it is the amount of R&D a firm is expected to capitalize, which facilitates a firm's access to public debt markets, reduces bond and syndicated loan prices, and contributes to future benefits.

We contribute to the literature firstly in adressing the call of Christensen et al. (2016, p. 427) for future research by providing evidence of how "the choice among different accounting methods" facilitates debt contracting "when economic incentives to deliver an informative measure of the economic performance are present." Bharath et al. (2008), Dhaliwal et al. (2011), Florou and Kosi (2015) and Ball et al. (2017) show that firms with lower information asymmetry exhibit a greater propensity for raising funds from public debt markets than private debt markets. Thus, our analysis indicates how a specific accounting treatment, which is at the heart of the accounting choice literature, is used to reduce information asymmetries to bondholders. Secondly, our study adds to recent literature by identifying R&D capitalization as a further mechanism that helps "to correct the potential misvaluation of firms' R&D investments" (Zhang & Toffanin, 2018, p. 25). Our findings which demonstrate a positive association between development costs capitalized and future earnings as well as audit fees imply that R&D capitalization under IAS 38 is a costly, albeit effective, signaling device for managers to convey private information about the future success of their R&D projects to debtholders. Thirdly, our investigations respond to the call for research on the value relevance of accounting numbers to debtholders (Holthausen & Watts, 2001; Givoly et al., 2017). Directly relevant to our research, Givoly et al. (2017, p. 69) state that "whether capitalization [of intangible assets] is beneficial to creditors is an open question." Ours is the first study to show that capitalized development costs reduce the costs of both public and private debt.

Beyond the academic contributions stemming from our analyses, the findings will present valuable information both for standard setters and regulators. For example, in 2018 the UK's Financial Reporting Council (FRC) initiated a project not only to review current requirements and practice for the business reporting of intangibles, but also subsequently to develop practical proposals for their improvement.[1] In the feedback statement of its research agenda consultation the European Financial Reporting Advisory Group (EFRAG) is also proposing research on this area in the near future.[2]

The remainder of this paper is structured as follows. Section 2 discusses the relevant literature and hypotheses development. Section 3 describes the sample selection process and research design. Section 4 provides descriptive and multivariate analysis results. Section 5 presents sensitivity tests and section 6 concludes.

2. Literature review and hypotheses development

2.1 Debate about the accounting treatment of R&D

Lev (2001) argues that R&D investments may enable firms to obtain a temporary monopoly in the market, allowing them to extract substantial future cash flows. Consistent with this, prior literature provides evidence that R&D-intensive firms in the US generate higher

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[1] https://www.frc.org.uk/accountants/accounting-and-reporting-policy/research/intangibles-how-can-business-reporting-do-better

[2] https://www.efrag.org/News/Project-324/Feedback-Statement---2018-EFRAG-Research-Agenda-Consultation

operating performance and growth (Chan et al., 2001; Eberhart et al., 2004). However, the success of R&D projects is by no means certain. Risks involved in R&D investments relate to the innovation process itself, which, compared with the standardized production process of tangible assets, often entails a long-term search for new processes or products, the occurrence of ill-structured problems and consequently a time-lag of unknown length before the project output is available (Dosi, 1988; Lev, 2001; Wyatt, 2005; Hunter et al., 2012). In the event of project failure, alternative fields for the use of R&D expenditures are scarce (Kothari et al., 2002). Compared with capital expenditures, R&D investments are, therefore, more significantly associated with future earnings variability (Kothari et al., 2002), and stock returns volatility (Chan et al., 2001; Gharbi et al., 2014). These issues identified in prior research indicate that debate about the accounting treatment of R&D investments focuses on the associated future benefits and risks together with how to account for the trade-off.

From a US GAAP perspective, the risk component outweighs future benefits: "The estimates of the rate of success of research and development projects vary markedly […] but all such estimates indicate a high failure rate" (Statement of Financial Accounting Standards (SFAS) No. 2.39). On that basis, all R&D outlays must be expensed as incurred. Critics of this accounting treatment argue that mandatory expensing of R&D prevents managers from signaling future benefits of R&D projects, resulting in biased earnings and mispriced stock prices (Eberhart et al., 2004; Lev et al., 2005; Duqi et al., 2015). As R&D investments are found to be significantly associated with future earnings and market values (Stark & Thomas, 1998; Shah et al., 2008; Duqi & Torluccio, 2013; see also discussion in the next sub-section), there are proponents of the view that some or all R&D investments should be treated as an asset on a company's balance sheet (Aboody & Lev, 1998; Lev & Zarowin, 1999; Lev, 2004).[3]

Under IFRS, R&D projects are separated into research and development phases (IAS 38.52). Development costs must be capitalized if and only if, a firm is able to demonstrate all of the following: the technical feasibility of completing the intangible asset so that it will be available for use or sale; its intention to complete the intangible asset and its ability to use or sell it; a justification of how the intangible asset will generate future economic benefits; the availability of adequate technical, financial and other resources to complete the development of the intangible asset and to use or sell it; the ability to measure reliably the expenditure attributable to the intangible asset during its development (IAS 38.57).

Capitalized development costs are, therefore, closer to being marketed or sold, and hence will more likely "generate probable future economic benefits" (IAS 38.58). In contrast, costs arising in the research phase or development expenditures, for which the restrictive conditions are not met, must be expensed as incurred, because in the case of those costs firms cannot demonstrate whether "probable future economic benefits" will be generated (IAS 38.55, IAS 38.58)

Upon meeting these conditions, capitalized development costs reflect proprietary firm information about R&D projects that are highly likely to succeed. However, to assess the fulfillment of these restrictive conditions, managers are required to exercise discretion, which creates opportunities for earnings management. Accordingly, as Oswald and Zarowin (2007) point out, it is ultimately an empirical question whether managers employ R&D capitalization to convey true signals about the success of R&D projects to capital market participants.

[3] For a detailed literature review on the equity market implications of intangible assets in general and R&D in particular, see Stark (2008), Wyatt (2008) and Jeny and Moldovan (2018).

2.2 Capitalized development costs: future earnings, earnings management incentives and value relevance

The only exception to the universal expensing of R&D in the US is SFAS No. 86, which allows the capitalization of software development (SD) costs only after technical feasibility is attained. Aboody and Lev (1998) report a positive relationship between the change in capitalized SD costs and the change in net income one year ahead and two years ahead. More recently, Wolfe (2012) investigates the relation between capitalized SD costs and future cash flows for US firms. She documents a much stronger association of future cash flows with capitalized SD costs compared with the expensed counterpart. These findings are consistent with the view that capitalized development costs indicate future benefits.

In an Australian setting, prior to the convergence of Australian GAAP with IFRS, Wyatt (2005) shows that managers used the explicit accounting option to capitalize intangible assets under Australian GAAP predominantly for those assets that were associated with strong technological features. Also in an Australian setting, Ahmed and Falk (2009) provide evidence that expensed R&D costs as well as capital expenditures generate higher risk in future earnings than do discretionary capitalized R&D investments.

Another strand of literature examined the value relevance of capitalized development costs, albeit exclusively for equity markets. For example, capitalized development costs are found to be positively associated with equity market values for Australian (Ahmed & Falk, 2006; Ritter & Wells, 2006), Canadian (Callimaci & Landry, 2004) and UK firms (Oswald & Zarowin, 2007; Tsoligkas & Tsalavoutas, 2011; Shah et al., 2013). This evidence is mostly based on periods prior to the mandatory implementation of IFRS and lends support to the argument that markets perceive capitalized development costs as investments that genuinely represent future economic benefits.

Prior literature has attempted to shed light on the earnings management incentives associated with capitalization of development costs. For example, Wolfe (2012) reports that US firms which capitalize SD costs to meet or beat analysts' forecasts have lower subsequent cash flows than Capitalizers whose capitalized SD costs are not attributed to benchmark beating incentives. In a French pre-IFRS setting, Cazavan-Jeny and Jeanjean (2006) report a negative relation between capitalized development costs and stock prices and returns, implying that investors are concerned about possible earnings management. In the same French pre-IFRS context, Cazavan-Jeny et al. (2011) provide evidence that capitalization of development costs is used to meet or beat earnings thresholds. They also find a negative or neutral impact of capitalized R&D on future performance. For a sample of Italian firms, prior to the adoption of IFRS in 2005, Markarian et al. (2008) show that R&D capitalization facilitates the smoothing of earnings.

For German firms reporting under IFRS, Dinh et al. (2016) find that the amount of R&D a firm capitalized during a year is negatively associated with market values, consistent with the findings from Cazavan-Jeny and Jeanjean (2006) and the notion that earnings management may counteract the signaling value of R&D capitalization. However, for the sub-sample of observations where R&D capitalization is not suspected of being employed to meet or beat earnings thresholds, they find a positive relationship between capitalized development costs and market values. Dinh et al. (2016, p. 375) conclude that "market participants seem to be able to distinguish between the cases of earnings management and signaling".

Extant value relevance studies of R&D capitalization focus exclusively on the equity market, and consequently provide only a partial view of the market implications. Results from the equity market cannot be easily transferred to the debt market. Even though risks related to R&D projects impact both equity and debt investors, the effects are not the same.

Participants across the two markets have different payoff structures and thus react differently to accounting numbers (Lok & Richardson, 2011; DeFond & Zhang, 2014; Givoly et al., 2017). As with equity investors, debtholders bear the full extent of downside risk (Ciftci & Darrough, 2016; Givoly et al., 2017). However, while equity investors can also benefit from the unlimited upside potential, debtholders' returns are restricted to a fixed interest rate. Consequently, accounting information that may affect the downside risk is more relevant for debt investors than equity investors (Easton et al., 2009; Ciftci & Darrough 2016). According to Shi (2003) the debt market, therefore, provides a unique setting to investigate the fundamental question about the accounting treatment of R&D investments, as the tradeoff between the future benefits and risks of firms' R&D investments is more distinct in debt markets than it is in equity markets.

Although prior literature has provided some evidence as to the effect of R&D expenditure on debt markets (Shi, 2003; Eberhart et al., 2008; Ciftci & Darrough, 2016), these studies focus exclusively on companies reporting under US GAAP, which does not allow for any distinction between capitalized and expensed R&D costs. Thus, it remains an empirical question whether or not debt markets price the development costs capitalized and the research costs expensed under IFRS. This study provides evidence by testing the following hypotheses.

2.3 Hypotheses development

Traditionally, public debt markets held the advantage over private debt markets in that they could fund firms to a significant extent. However, recent growth in the private syndicated loan market has resulted in this becoming a more direct alternative source of funds (Altunbaş et al., 2010; Marshall et al., 2016). Thus, a firm's decision to obtain direct financing via the public debt market or financing from banks through the private syndicated loan market depends more on agency costs and asymmetric information issues rather than financial considerations (Bharath et al., 2008; Altunbaş et al., 2010; Marshall et al., 2016).

In the case of syndicated loans, prior literature emphasizes the role of banks in monitoring and screening borrowers (Altunbaş et al., 2010). A syndicated loan is provided by several banks (typically up to eight), which have access to non-public information, such as management accounts, budgets and forecasts (Bharath et al., 2008; Florou & Kosi, 2015; Brown, 2016). This communication via private channels enables banks as private lenders to base their credit decisions on proprietary firm information (Florou & Kosi, 2015).

By contrast, bondholders are a diffuse group of lenders, who, due to free-rider problems and duplication of monitoring costs, engage less in borrower monitoring (Gorton & Winton, 2003). The relationship between borrower and bond investors is characterized by much larger levels of information asymmetry, compared with private lenders, as bondholders are less likely to have access to private information. This requires bond investors to rely heavily on public financial statements when assessing the default risk of corporate borrowers (Bharath et al., 2008; Florou & Kosi, 2015).

Prior literature has found that large firms with lower degrees of information asymmetry show a higher propensity for accessing public debt markets (Dhaliwal et al., 2011; Marshall et al., 2016). In particular, the issuance of bonds is associated with large flotation costs, including bankers' filing and legal fees (Bhagat & Frost, 1986; Blackwell & Kidwell, 1988), which limit smaller firms' access to public debt markets (Krishnaswami et al., 1999; Bharath et al., 2008). As bondholders have no access to private information and are less likely to engage in monitoring borrowers and renegotiating contractual terms after initial issuance, they demand higher returns for risks generated by information asymmetries (Gorton & Winton, 2003; Altunbaş et al., 2010). In line with this, a broad stream of literature has found that firms with higher levels of information asymmetry exhibit a propensity for borrowing funds from private debt markets. For instance, Dhaliwal et al. (2011) provide evidence that firms with higher levels of disclosure are more likely to access public debt markets than private debt markets. Similarly, Bharath et al. (2008) find that higher accounting quality is positively associated with the likelihood of accessing public debt markets rather than the syndicated loan market. Ball et al. (2017) show that following a cross-listing at a US exchange firms are more likely to issue bonds than to borrow privately, as the cross-listing increases the quality of a firm's information environment.

There are costs associated with the capitalization of development costs, which may influence companies' decisions on capitalization. Firstly, R&D capitalization calls for firms to have elaborate internal management accounting systems in line with IAS 38 which requires them to demonstrate that they can distinguish between the research and development phases of R&D projects and provide evidence that the restrictive conditions for the amount of R&D capitalized are fulfilled (Dinh et al., 2016). Secondly, capitalizing R&D reveals to industry peers a firm's expectation of future benefits from R&D investments. This, in turn, may increase industry competition with respect to R&D projects and therefore give rise to proprietary costs. Thirdly, R&D capitalization may lead to a loss of credibility in the event that the signaled expected benefits do not materialize. Fourthly, R&D capitalization significantly increases audit fees (Cheng et al., 2016; Kuo & Lee, 2017), as R&D capitalization requires auditors to conduct considerably more audit work (De George et al., 2013; Cheng et al., 2016) or even to employ industry experts to determine whether or not capitalized R&D investments reflect underlying economic benefits (Cheng et al., 2016).

In sum, we expect to find that firms which borrow funds from public debt markets rather than the syndicated loan market will capitalize higher amounts of R&D in order to decrease information asymmetries regarding the future success of their R&D investments. In contrast, firms that show a propensity for borrowing from the syndicated loan market are able to communicate with banks over private channels and accordingly, from a cost-benefit perspective have fewer incentives to signal their future R&D benefits by capitalizing large amounts of development costs. Hence, we test the following hypothesis:

H1: There is a positive association between the amount of R&D that firms capitalize during a year and firms' propensity for borrowing funds from public debt markets rather than the syndicated loan market in the subsequent year.

Focusing on public debt for US companies, Shi (2003) tests the effect of R&D intensity (measured as the ratio of R&D investments to market capitalization) on bond risk premium (bond ratings) and finds a positive association between R&D intensity and proxies for the cost of debt. Eberhart et al. (2008) argue that Shi's (2003) results are driven by the measurement of R&D intensity because using market value as a denominator incorporates the market expectations of R&D investments. This inverts the true relationship between R&D intensity and the cost of public debt. Eberhart et al. (2008) scale R&D investments with sales or total assets and find that R&D investments reduce the cost of public debt. To corroborate their results, they document that R&D investments decrease firms' default risk.

In line with this evidence from the US for R&D investments (Eberhart et al. 2008), we expect that for firms expensing all of their R&D investments in a given year, there will be a negative association between these expenses and the cost of public debt. However, where firms capitalize some or all of their R&D expenditure during the year, we assume that the capitalized component fulfills the requisite conditions of IAS 38, thereby signaling R&D projects that will probably be successful. Thus, we expect that the amount of R&D which a firm capitalizes during a year is perceived by bondholders as a signal of reduced risk from R&D projects and hence positive future economic benefits. This would ultimately decrease bondholders' downside risk. We, therefore, test the following hypothesis:

H2: There is a negative association between the amount of R&D that firms capitalize during a year and firms' cost of public debt.

Private lenders have access to proprietary firm information, such as budgets and detailed financial data, which potentially reduces the weight banks place on accounting numbers (Shivakumar, 2013). However, there is ample evidence that both the quality and credibility of financial statements is priced in bank loans (Bharath et al., 2008; Costello & Wittenberg-Moerman, 2011; Anagnostopoulou, 2017). For example, Bharath et al. (2008) show that firms with higher accounting quality receive lower syndicated loan prices and favorable non-price terms in syndicated loan contracts. Similarly, in an IFRS setting, Anagnostopoulou (2017) finds that accounting quality has a significant impact on the determination of loan prices for firms located in countries with stricter enforcement. The relevance of high accounting quality standards for banks is also evident in the study of Kim et al. (2011), who find that banks charge lower loan rates to IFRS adopters than to non-adopters.

With regard to R&D investments and the cost of private debt in particular, Plumlee et al. (2015) document a negative association between loan spreads and the citation count on forthcoming patents for US firms. Using R&D intensity as a control variable, they report a significant negative association between R&D intensity and loan spreads. Interestingly, again for US firms, Ciftci and Darrough (2016) find a positive relationship between R&D investments and loan spreads.[4] Ciftci and Darrough (2016) justify these results by focusing on smaller firms with more severe benefit-risk profiles. Accordingly, both results support the notion that banks price information reflecting future benefits from R&D expenditure under US GAAP.

Considering the overall evidence that information in financial statements is priced in bank loans, we hypothesize that, in an IFRS setting, capitalized development costs would trigger loan investors to investigate firms' R&D activities more closely. Additionally,

[4] These different results in respect to the association between R&D investments and loan spreads may be attributable to sample differences in the two studies. While Plumlee et al. (2015) include firms only from R&D-intensive industries, Ciftci and Darrough (2016) do not apply a specific focus. Industry selection seems to play at least some role, as Ciftci and Darrough (2016) show that their results hold only for the sub-sample of firms which operate in industries with weak legal protection.

knowing that banks have access to non-public information, managers may be less inclined to capitalize R&D for opportunistic reasons. Consistent with this, Kim et al. (2010) point out that firms move away from accruals manipulation into real earnings management so as to avoid violating covenant thresholds in private debt contracts. Thus, we hypothesize that, also in the syndicated loan market, the amount of capitalized R&D is perceived as a signal of succesful R&D projects. This would ultimately decrease banks' downside risk. Hence, we test the following hypothesis:

H3: There is a negative association between the amount of R&D that firms capitalize during a year and firms' cost of private debt.

3. Sample selection and research design

3.1 Sample selection

We start by focusing on countries that mandatorily adopted IFRS or fully converged their local GAAP with IFRS between 2005 and 2013, as this is reported on the IFRS Foundation website.[5] We then use the Worldscope item "Accounting Standards Followed" (WC07536) and include from Worldscope only those companies reporting under IFRS or local standards. Bond and syndicated loan issues are obtained from Thomson Reuters Eikon Deal Screener ('TR Eikon') as follows. We collect corporate bond and syndicated loan issues three years after IFRS were adopted or local GAAP was fully converged with IFRS in a country. As we measure financial variables directly prior to the debt issue date (Ge & Liu, 2015; Liu & Magnan, 2016) and we also use the lag of some variables in our regressions, a lag of three years ensures that our regression models do not include any firm-specific controls from the first year of mandatory IFRS reporting when R&D costs could be misreported due to low familiarity with IFRS (Kvaal & Nobes, 2012; Mazzi et al., 2018). We exclude bonds with a floating rate note and perpetual bonds, as they behave more like equities (Bessembinder et

[5] http://www.ifrs.org/use-around-the-world/use-of-ifrs-standards-by-jurisdiction/#profiles.

al., 2009). Furthermore, we retain only bonds and syndicated loans issued by public non-financial firms (e.g. De Franco et al., 2017). To match bond issues from TR Eikon with firms covered by Worldscope we use several identifiers (Bond ISIN, issuer ticker, ticker symbol) and company name as matching criteria (Florou & Kosi, 2015; Anagnostopoulou, 2017). For syndicated loans, we rely on ticker symbol and company name as matching criteria, because these are the only possible company identifiers to match syndicated loans to firms covered by Worldscope (Florou & Kosi, 2015; Anagnostopoulou, 2017). Debt issues are included only when the issuing firm either reported an R&D asset and/or R&D expenses at the fiscal year-end directly prior to the debt issue date.[6] This ensures that we have in our sample only those firms with current R&D activity. Firms from the Oil and Gas industry are excluded, since Worldscope may classify extraction costs as capitalized development costs (Mazzi et al., 2018).

We then identify firms as possibly capitalizing some of their R&D investments during a year when they either reported an R&D asset and/or an amortization of this asset directly prior to the debt issue date. As our main variable of interest, the amount of R&D a firm capitalized during a year, cannot be directly collected from Datastream, we follow Mazzi et al. (2018) and calculate the amount of R&D a firm capitalized in the fiscal year directly prior to the debt issue date as follows: R&D $Asset_{t0}$ (WC02504) – R&D $Asset_{t-1}$ (WC02504) + Amortization of R&D $asset_{t0}$ (WC01153). Given that in more than 70% of capitalizing firms one of these items was missing, we hand-collected the relevant data from the companies' annual reports. However, during this hand-collection process, 453 debt issues were eliminated for several reasons, key among them being the publication of a large number of

[6] To identify whether a firm reports R&D expenses and/or an R&D asset, we use Worldscope items "Research & Development" (WC01201) and "Net Development Costs" (WC02504).

Chinese firms' annual reports solely in the local language.[7] We excluded firms with missing data on financial, issue and country-specific variables. As the issuance of bonds serves as a long-term financing source, we excluded all bond issues with a maturity of less than 12 months. This resulted in a total sample of 3,037 debt issues, of which 2,201 are bonds and 836 are loans.[8]

To test the relationship between the capitalized amount of R&D and a firm's propensity to borrow funds from public debt markets rather than the syndicated loan market, in line with prior literature (Florou & Kosi, 2015; Ball et al., 2017), we included only one bond and/or syndicated loan per firm-year. Accordingly, we deleted multiple bond issues by the same firm within the same year and applied the same procedure for syndicated loans. In addition, we included only countries with more than ten observations, which resulted in a sample of 1,554 debt issues for this analysis. Of those, 519 debt issues are from firms capitalizing some amount of their R&D investments during the fiscal year directly prior to the debt issue date ('Capitalizers'). By contrast, 1,035 debt issues are from firms expensing all of their R&D investments during the fiscal year directly prior to the debt issue date ('Expensers').

To test the effect of capitalized R&D on the price terms of bonds and syndicated loans, we followed prior research and performed this analysis on an issue-level (Bharath et al., 2008; Florou & Kosi, 2015; De Franco et al., 2017). Consequently, we retained all bonds and syndicated loans a firm issued in a year, as debt issues differ in their contractual terms, for instance in price, borrowed amount, maturity and special features. We deleted bonds with a negative cost of debt and, both for the bond and syndicated loan sample, again included only countries with more than ten observations. Our final sample for the cost of public debt

[7] All other annual reports were available in English and in the local language, allowing us to capture the relevant data. Other reasons for the exclusion of some observations related to misclassifications by Worldscope. For instance, when Worldscope classified acquired rights or trademarks related to R&D (e.g. patents, marketing rights) as capitalized development costs or when the capitalized amount of R&D did not stem from the capitalization of internal R&D investments but resulted from the recognition of in-process R&D projects acquired separately or in a business combination.
[8] All excluded bonds with a maturity of less than 12 months were issued by firms from China.

consists of 1,866 bond issues, of which 629 issues are from capitalizing firms and 1,237 are from expensing firms. Regarding the cost of private debt, we have a final sample of 722 syndicated loans, of which 333 are obtained by R&D capitalizing firms and 389 by firms expensing all their R&D investments. Table 1 summarizes the sample selection process for analyzing our three hypotheses. Panel A shows the sample selection process for analyzing firms' choice of source of debt financing, Panel B for analyzing firms' cost of public debt and Panel C for analyzing firms' cost of private debt.

TABLE 1 ABOUT HERE

Table 2 shows our sample composition by country for the choice of source of debt financing and cost of debt samples. SuppInfo_I and SuppInfo_II break down the two samples by country and year (the latter can be accessed online in a separate file on the Journal's website).

The information in Table 2 indicates that our sample is dominated by firms from China, France, the UK and Germany. While firms from the latter three countries are predominant in both bond and syndicated loan samples, we find that Chinese firms are far more represented in the bond sample (482 bonds to 28 syndicated loans by Chinese firms; see Table 2 and SuppInfo_II). We find a good distribution of Capitalizerers and Expensers in the syndicated loan sample. The bond sample, however, consists of more Expensers than Capitalizers. This is primarily attributable to a much higher number of Expensers from China (19 Capitalizers vs. 463 Expensers; see Table 2).[9]

TABLE 2 ABOUT HERE

[9] This imbalance resulted from the exclusion of 376 bonds from Chinese firms during our sample selection process. According to Datastream, these excluded firms reported an R&D asset, indicating that they are R&D active and presumably capitalized R&D in a year. However, their annual report was only available in Chinese. For this reason, we were unable to verify the exact amount capitalized and excluded these observations.

3.2 Empirical specifications

3.2.1 Determinants of amount of capitalized development costs

The restrictive conditions in IAS 38 require managerial judgement to differentiate between R&D investments that should be capitalized and those that should be expensed. This discretionary element causes an endogeneity problem, which might bias the association between the amount of capitalized R&D and a firm's debt financing choice (H1), as well as the effect of capitalized R&D on a firm's cost of debt (H2 and H3) (Oswald, 2008; Cazavan-Jeny et al., 2011). To mitigate this concern, in line with prior studies (e.g., Ciftci, 2010; Dinh et al., 2016), we supplemented our analysis with estimates of a two-stage-model (2SLS) when we tested our hypotheses. The latter involves first the identification of possible instrumental variables that are associated with the amount of R&D a firm capitalizes during a year.

Accordingly, we first examined factors that prior literature has found to be related with the amount of capitalized R&D by estimating equation (1) as a zero (i.e. left) censored Tobit model (Markarian et al., 2008; Dinh et al., 2016; Mazzi et al., 2018). Based on the results from estimating equation (1), we then selected variables that are significantly related to the amount of R&D a firm capitalizes in a year. These variables were employed as instrumental variables in a first stage regression to calculate fitted values for *RDCap* when testing our hypotheses.[10]

$$RDCap_t = b_0 + \sum b_i Firm\text{-}Specific\ controls_{i,t} + \sum b_i\ Country\text{-}Specific\ controls_{i,t} + \sum b_i\ Industry\ fixed\ effects_{i,t} + \sum b_i\ Year\ fixed\ effects_{i,t} + e_{i,t} \quad (1)$$

where *RDCap* is the amount of R&D investments a firm capitalizes during year *t* divided by sales. Details on the rationale and theoretical justifications for the inclusion of the control variables can be found in Wyatt (2005), Markarian et al. (2008), Oswald (2008), Cazavan-Jeny et al. (2011), Dinh et al. (2015), Dinh et al. (2016) and Mazzi et al. (2018). We report

[10] Following Larcker and Rusticus (2010) and Schultze et al. (2017), the first stage regression to estimate the fitted values of *RDCap* includes both the selected instruments from equation (1) and all the independent variables from the specific model used to test our respective hypotheses.

details on the variables employed in all our regressions, together with their sources, in Appendix I. Appendix II shows the results for this analysis.[11]

3.2.2 Hypothesis 1 – Development costs capitalized and the choice of source of debt financing

In order to test the relationship between capitalized R&D and a firm's choice of source of debt financing, we estimated the following two empirical models. They differ only in measurement of the dependent variable. Details on the rationale and theoretical justifications for the inclusion of the control variables can be found in Denis and Mihov (2003), Bharath et al. (2008), Dhaliwal et al. (2011), Florou and Kosi (2015), Marshall et al. (2016) and Ball et al. (2017).

$$Bond\_Issue_{t+1} = b_0 + b_1\, RDCap_t + b_2\, RDExp_t + \sum b_i Firm\text{-}Specific\ controls_{i,t} + \sum b_i Issue\text{-}Specific\ controls_{i,t+1} + \sum b_i\ Country\text{-}Specific\ controls_{i,t} + \sum b_i\ Industry\ fixed\ effects_{i,t} + \sum b_i\ Year\ fixed\ effects_{i,t} + e_{i,t} \quad (2)$$

$$\%\_of\_Bond\_Debt_{t+1} = b_0 + b_1\, RDCap_t + b_2\, RDExp_t + \sum b_i Firm\text{-}Specific\ controls_{i,t} + \sum b_i Issue\text{-}Specific\ controls_{i,t+1} + \sum b_i\ Country\text{-}Specific\ controls_{i,t} + \sum b_i\ Industry\ fixed\ effects_{i,t} + \sum b_i\ Year\ fixed\ effects_{i,t} + e_{i,t} \quad (3)$$

For estimating equation (2), in line with Florou and Kosi (2015) and Ball et al. (2017), we generated the dummy variable *Bond_Issue*, which equals one if a debt issue is a bond issue, and zero otherwise, and then ran a probit model on the total sample of bonds and loans (i.e. 1,554 observations). It should be noted that when a firm issues both bonds and syndicated loans in a given year, we included the firm twice in that specific year: once with the dependent variable *Bond_Issue* equal to one (for a bond issue) and once with *Bond_Issue* equal to zero (for a syndicated loan issue) (Florou & Kosi, 2015, p. 1426).

In line with Florou and Kosi (2015), in equation (3), the dependent variable is the continuous variable *%_of_Bond_Debt*, which is calculated for each firm-year. This equals the

[11] We do not discuss results for estimating equation (1) in detail later on, as this analysis serves primarily for the identifaction of valid instrumental variables. Recent literature already provides evidence on the determinants of amounts of development costs capitalized under IFRS (Dinh et al., 2016; Mazzi et al., 2018).

ratio of the total amount of borrowed public debt to the total amount of borrowed debt (bonds and syndicated loans). Thus, the dependent variable ranges from zero (i.e. a firm borrows only from the private syndicated loan market in a particular year) to one (i.e. a firm issues only bonds in a particular year). On that basis, we tested the association between the amount of R&D a firm capitalized in a year and its choice of source of debt financing by running an OLS estimation on 1,455 firm-years.

RDCap is the amount of R&D investments a firm capitalized in a year. *RDExp* is the amount of R&D investments a firm expensed in a year. Effectively, our first hypothesis predicts a positive b_1 in equations (2) and (3). We tested this relation first for the full sample, including both Capitalizers and Expensers, and present results for the observed and, to control for endogeneity, for the fitted values of *RDCap* resulting from the IV Probit/2SLS estimation.[12] Based on Chaney et al. (2004) and Chen et al. (2017), we also estimated equations (2) and (3) separately for Expensers and Capitalizers. This helps us mitigate concerns that our results are driven by sample heterogeneity, as prior studies (and our descriptive statistics later on) point out that expensing and capitalizing firms differ strongly within various firm and country-specific characteristics (Oswald & Zarowin, 2007; Oswald, 2008; Cazavan-Jeny et al., 2011; Dinh et al., 2016; Mazzi et al., 2018).

3.2.3 Hypotheses 2 & 3 – R&D Capitalization and the cost of debt

In order to test the relationship between capitalized R&D and a firm's cost of public (H2) and private debt (H3), we estimated the following empirical model separately for firms accessing the public debt market and for firms borrowing funds from the syndicated loan market. Details on the rationale and theoretical justifications for the inclusion of the control variables in relation to the cost of public debt can be found in Bharath et al. (2008), Eberhart et al.

[12] As in equation (2) the dependent variable is a dummy variable, we, in line with prior literature (e.g. Campello et al., 2011), estimate equation (2) by an endogenous probit model (IV Probit)). More specifically, this model is similar to a 2SLS estimation; however, for the second stage a probit model instead of an OLS model is estimated. For more information on the implementation of such models see Finlay and Magnusson (2009).

(2008), Florou and Kosi (2015), Ge and Liu (2015), Franco et al. (2016) and Ball et al. (2017). Details in relation to control variables for the cost of syndicated loans can be found in Bharath et al., (2008), Florou and Kosi (2015), Anagnostopolou (2016), Ciftci & Darrough (2016), Brown (2016), Franco et al. (2016) and De Franco et al. (2017).

$$Cost\ of\ debt_{t+1} = b_0 + b_2\ RDCap + b_3\ RDExp + \sum b_i Firm\text{-}Specific\ controls_{i,t} + \sum b_i\ Issue\text{-}Specific\ controls_{i,t+1} + \sum b_i\ Country\text{-}Specific\ controls_{i,t+1} + \sum b_i\ Industry\ fixed\ effects_{i,t} + \sum b_i\ Year\ fixed\ effects_{i,t} + e_{i,t} \quad (4)$$

We followed prior literature (e.g., Shi, 2003; Eberhart et al., 2008; Florou & Kosi, 2015; Ciftci & Darrough, 2016; Francis et al., 2017; De Franco et al., 2017) in estimating equation (4) at an issue-level. Accordingly, we included all bonds and syndicated loans a firm issued within a year, as debt issues differ in their contractual terms. Regarding the cost of debt for firms accessing the public debt market, we defined *Cost_of_debt* as the difference in basis points (bp) between the yield to maturity of a corporate bond at issue date and the interest yield of a treasury security (T-bill) issued by the same country, at the same date and with comparable maturity to the corporate bond (Eberhart et al., 2008; Bharath et al., 2008; Florou & Kosi, 2015).[13] When estimating equation (4) for syndicated loans, we defined *Cost_of_debt* as the amount the borrower pays in basis points over LIBOR or LIBOR equivalent for each dollar drawn (Bharath et al., 2008; Ciftci & Darrough, 2016; Franco et al., 2016).

Similarly to equations (2) and (3), *RDCap* is the capitalized amount of R&D investments and *RDExp* represents the expensed R&D investments. Thus, we first estimated equation (4) for the full sample, including both Capitalizers and Expensers, and present results for the actual and, to control for endogeneity, for the fitted values of *RDCap* resulting from the 2SLS

[13] In case the interest yield of a treasury bond is not available, we follow Shi (2003) and Ge and Liu (2015) and make use of an interpolation approach to construct it. For example, when we only have treasury securities with maturities of four and six years and the corporate bond has a maturity of five years, we add the interest yield of the treasury security of four years to the interest yield of the treasury security with a maturity of six years and divide it by two. To make sure that our results are not driven by any wrong matching of corporate bonds and treasury securities, we exclude all issues where the matching results in negative cost of debt and additionally we winsorize the cost of debt for bonds at the top and bottom 5 percentiles.

estimation. In the spirit of Chaney et al. (2004) and in line with Chen et al. (2017), we then estimated equation (4) separately for Capitalizers and Expensers. This helps us alleviate concerns that differences in firm and country characteristics between Capitalizers and Expensers may obfuscate a significant relationship between capitalized R&D and a firm's cost of debt. Separating the sample into Capitalizers and Expensers also increases the level of information we were able to derive from our results, as it enables us to investigate whether debt investors specifically differentiate between the capitalized (b_2) and expensed (b_3) R&D components of capitalizing firms.

In all equations, we added industry dummy variables based on ICB industry level 1. We controlled for cross-sectional and time series correlations by including year fixed effects and clustering by firm (Petersen, 2009). Following Oswald (2008), Cazavan-Jeny et al. (2011) and Dinh et al. (2016), all variables were adjusted to values before R&D capitalization. We winsorized all continuous variables at the 1% level on both tails of the distribution. As discussed earlier, Appendix I summarizes all variables' descriptions, including their sources.

4. Results

4.1 Descriptive statistics

Panel A of Table 3 shows descriptive results for the dependent and independent variables used in multivariate analyses for the full sample, while Panel B of Table 3 reports differences between companies that capitalize some or all of their R&D expenditures (Capitalizers) and those that expense all their R&D costs (Expensers).

TABLE 3 ABOUT HERE

For our full sample, we find that, on average, firms invest 2.5% of their sales into R&D (*RD_Intensity*), which corresponds to the average R&D intensity of the European Union

(2.1%) and OECD countries (2.38%).[14] Comparing R&D intensity between Capitalizers and Expensers, Table 3 Panel B shows a higher R&D intensity for capitalizing firms compared to expensing firms. While Capitalizers report a mean (median) R&D intensity of 3.5% (2.2%), Expensers show a mean (median) R&D intensity of 2.0% (0.9%). The T-Test (Mann-Whitney test) indicates that there is a strong statistically significant difference across the two groups. Splitting the R&D intensity of capitalizing firms into the capitalized and expensed categories, we find that, on average, the capitalized amount of R&D during the year accounts for 0.9% of sales *(RDCap)*, while the expensed amount is around 2.6% of sales *(RDExp)*. Comparing these ratios to those reported in previous literature, we find nearly the same results in the study of Dinh et al. (2016, p. 385), who document for German capitalizing firms a ratio of 0.8% (2.8%) for the amount of R&D a firm capitalized (expensed) during a year.

In terms of issue-specific variables, expensing firms both access the public debt market more frequently (mean *Bond_Issue* = 0.615 for Capitalizers vs. mean *Bond_Issue* = 0.742 for Expensers) and borrow more funds from the public debt market than Capitalizers (mean *%_of_Bond_Debt* = 0.626 for Capitalizers vs. mean *%_of_Bond_Debt* = 0.787 for Expensers). T-test and Mann-Whitney test indicate no difference in bond prices for Capitalizers and Expensers. In contrast, Expensers seem to be favored by banks, as, based on medians only, they pay lower prices for syndicated loans than Capitalizers (median *Cost_of_debt* (in bp) = 200.00 for Capitalizers vs. mean *Cost_of_debt* (in bp) = 170.00 for Expensers). Thus, these descriptive statistics provide no support for our hypotheses. These statistics, however, do not control for firm and country-specific factors affecting both a firm's choice of source of debt financing and cost of debt. Further, they do not take into account other contractual terms of debt agreements, which may have an influence on a firm's financing decisions and borrowing costs. For instance, we find that Capitalizers are able to

[14] R&D intensity data for the European Union and for OECD countries is retrieved from the OECD main science and technology indicator database.

issue bonds of larger amounts (mean *Debt_Amount* (in mil. USD) = 461.28 for Capitalizers vs. *Debt_Amount* (in mil. USD) = 416.075 for Expensers) and bonds with longer maturity (mean *Maturity* (in months) = 82.327 for Capitalizers vs. mean *Maturity* (in months) = 73.611 for Expensers).

Regarding firm-specific characteristics, we find substantial differences between Capitalizers and Expensers. In line with prior literature (Dinh et al., 2016; Mazzi et al., 2018), R&D capitalization seems to be associated with real and accounting earnings management. Firstly, more Capitalizers than Expensers report lower total R&D expenditures in the current year compared to the previous year (mean *Cut_RD* for Capitalizers = 0.344 vs. mean *Cut_RD* for Expensers = 0.283), indicating that some Capitalizers in our sample employ both real earnings management (i.e., cutting total R&D expenditures) and accruals earnings management (i.e., capitalizing R&D) simultaneously, as both methods increase a firm's reported income. Secondly, Capitalizers seem to make use of discretion in the capitalization of R&D to beat earnings benchmarks, as we find significant differences between the two groups for all three benchmark beating proxies. We note that Expensers and Capitalizers differ in the proxy for the success of a firm's R&D program (mean *RD_Value* for Capitalizers = 75.515 vs. mean *RD_Value* for Expensers = 218.427). Additionally, consistent with results from Dinh et al. (2016), the T-test and Mann-Whitney test show that capitalizing firms are larger, but less profitable (mean *ROA* = 0.061 for Capitalizers vs. mean *ROA* = 0.071 for Expensers). Also, they report less tangible assets on their balance sheet than Expensers (mean *Tangibility* = 0.242 for Capitalizers vs. mean *Tangibility* = 0.323 for Expensers). A capitalizing firm's debt issue is more likely to be rated (mean *Rated* = 0.399 for Capitalizers vs. mean *Rated* = 0.252 for Expensers). However, Capitalizers are less likely to have an investment-grade rating and consequently also carry higher default risk compared with Expensers (mean *O_Score* = -3.838 for Capitalizers vs. mean *O_Score* = -4.228 for

Expensers). Consequently, firm-level characteristics show a strong heterogeneity between Capitalizers and Expensers. In particular, Capitalizers seem to suffer from higher information asymmetry levels compared with Expensers, as they are less profitable, have a higher default risk, and invest more in R&D than in tangible assets. However, we also note that Capitalizers exhibit higher future operating earnings (mean *NI* = 0.804 for Capitalizers vs. mean *NI* = 0.644 for Expensers), indicating that capitalized R&D translates into future benefits. We find that Capitalizers pay higher audit fees than Expensers (mean *log(Fees)* = 8.377 for Capitalizers vs. mean *log(Fees)* = 7.250 for Expensers), which is in line with prior literature, indicating that R&D capitalization is associated with higher audit fees (Cheng et al., 2016; Kuo & Lee, 2017) and can therefore be deemed to be a signaling device.[15]

We next investigate whether or not differences between Capitalizers and Expensers are also reflected in country-specific characteristics. Findings show that Capitalizers are predominantly from countries with higher exchange rate volatility (mean *Exchange_Risk* = 0.040 for Capitalizers vs. mean *Exchange_Risk* = 0.033 for Expensers), higher economic uncertainty (mean *Term_Spread* = 1.504 for Capitalizers vs. mean *Term_Spread* = 1.165 for Expensers) and higher default risk.[16] However, driven presumably by the high number of Chinese Expensers compared with Capitalizers in our sample, we also note that Capitalizers operate in countries with stronger enforcement bodies (mean *Enforcement* = 44.307 for Capitalizers vs. mean *Enforcement* = 41.554 for Expensers), lower levels of corruption (mean *Corruption* = 2.791 for Capitalizers vs. mean *Corruption* = 3.833 for Expensers) and slower-growing economies (mean *GDP_Growth* = 1.352 for Capitalizers vs. mean *GDP_Growth* = 4.011 for Expensers).

[15] Variables for future profitability (*NI*) and audit fees (*log*(*Fees*)) are presented for a lower number of observations (i.e., 1,054 and 1,243). Relevant data were not available for all observations in our sample.

[16] Note that we are able to measure a firm's country of domicile's exchange rate volatility *(Exchange_Risk*), economic uncertainty (*Term_Spread*) and probability of default (*Country_PoD*) at the month and year a debt security is issued. As firms can issue multiple bonds and syndicated loans in a year, we present these country variables for each bond and syndicated loan issued (issue-level) and thus for a larger number of observations than common firm-level controls.

We report significant differences between public and private borrowers in Appendix III. Firm-specific characteristics reveal that borrowers from the public debt market are larger firms with more tangible assets and a higher leverage ratio. The public debt market enables firms to borrow debt with longer maturities, while the syndicated loan market offers opportunities for borrowing larger debt amounts. These results are consistent with prior literature (e.g., Altunbaş et al., 2010; Dhaliwal et al., 2011; Florou & Kosi, 2015, Marshall et al. 2016).

4.2 Multivariate analysis

4.2.1 Choice of source of debt financing (H1)

Table 4 reports results regarding an association between the amount of R&D a firm capitalized during a year and a firm's propensity to borrow funds from the public debt market rather than the syndicated loan market. While models 1 to 4 correspond to equation (2) with *Bond_Issue* as the dependent variable, models 5 to 8 document OLS and 2SLS results of equation (3) with the continuous variable *%_of_Bond_Debt* as the dependent variable.

TABLE 4 ABOUT HERE

For model 1, we find a positive association between capitalized R&D and a firm's propensity to issue bonds (the coefficient for *RDCap* is positive and statistically significant at the 1% level), indicating that firms capitalize larger amounts of R&D as a means of facilitating access to public debt markets. In model 2, we control for endogeneity using fitted values of *RDCap*, which are calculated by a first stage regression.[17] For the selection of relevant instrumental variables for this first stage regression, we relied on firm-specific factors that are found to drive the amount of R&D capitalized (see Appendix II). Accordingly, we selected a firm's default risk (*O_Score*), profitability (*ROA*) and earnings management incentives

[17] The first stage regression includes selected instrumental variables from equation (1) and all independent variables, except *RDCap*, from equation (2).

(*Cut_RD* and *Beat_Bench*) as instrumental variables.[18] Additionally, we selected *RD_Intensity* and *RD_Value* as instrumental variables, since descriptive statistics (compare Table 3 Panel B) suggest a strong difference between Capitalizers and Expensers for these R&D related variables. To evaluate the appropriateness of our instrumental variables, we follow Florou and Kosi (2015) and Schultze et al. (2017) and report weak instruments and over-identifying restriction tests, both suggesting that our instruments are valid.[19] Consistent with H1, also in model 2, we find a positive association between capitalized R&D and a firm's propensity to borrow funds from public debt markets (the coefficient for *RDCap* is positive and statistically significant at the 1% level). Estimating equation (2) separately for Capitalizers (model 3) and Expensers (model 4) corroborates our results for the full sample, indicating that Capitalizers employ R&D capitalization as a means of facilitating access to public debt markets (the coefficient for *RDCap* is positive and statistically significant at the 1% level in model 3). By contrast, the coefficient of *RDExp* is not significant in model 4.

In models 5 to 8, we repeat our analyses with *%_of_Bond_Debt* as the dependent variable. While model 5 is estimated by OLS, we employ 2SLS estimates in model 6, using the same instrumental variables as before. In models 7 and 8, we report results when equation (3) is estimated separately for Capitalizers and Expensers. Under all specifications, we find that firms capitalize larger amounts of R&D when they exhibit a propensity to issue bonds rather than to borrow funds from the syndicated loan market (the corresponding coefficients for *RDCap* are positive and statistically significant at the 1% level).

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[18] Results in Appendix II suggest that the variables *log(Size)*, *MTB* and *GDP_Growth* are also significantly associated with the amount of R&D a firm capitalized during a year. Following prior literature (Larcker & Rusticus, 2010; Lennox et al., 2012), we do not select them as instrumental variables, since they are already included as control variables in equation (2). In line with Larcker and Rusticus (2010), we do not employ lagged values of the endogenous regressor (i.e. in our case *Lag_RDCap*) as an instrumental variable.

[19] Table 4 model 2 documents the Kleibergen-Paap Wald F-statistic as a test of weak identification and Hansen's J-statistic as a test of overidentification. Under the first test, we obtain a test statistic value of 22.797, which exceeds the Stock and Yogo (2005) critical value of 11.12, indicating that our instruments are not weak. For the Hansen J-statistic we find a value of 4.077 ($p > 0.10$), which shows that our instruments are not partially endogenous.

Models 1, 2, 5 and 6 indicate that Capitalizers in general prefer to access the private syndicated loan market rather than the public debt market (the corresponding coefficients for the dummy variable *CAP* are negative and statistically significant at the 5% level). This corroborates our prior findings, implying that Capitalizers and Expensers constitute two substantially different groups of companies. Capitalizers, as suggested by both descriptive statistics (Table 3 Panel B) and results for the determinants for R&D capitalization (Appendix II), suffer from higher levels of information asymmetry compared with Expensers and may therefore prefer borrowing debt in syndicated loan markets. However, when Capitalizers plan to access the public debt market, they capitalize larger amounts of development costs to decrease information asymmetry levels to bond investors.

Results regarding firm and country-specific variables are in line with prior literature (Florou & Kosi, 2015; Marshall et al. (2016), Ball et al., 2017), indicating that firms with lower levels of information asymmetry are more likely to borrow funds from public debt markets than private debt markets.

4.2.2 Effect of capitalized R&D on the cost of public and private debt (H2 & H3)

Table 5 shows our results for the relationship between capitalized R&D and the cost of public debt. Similar to Table 4, model 1 of Table 5 reports findings using OLS, while model 2 controls for endogeneity by documenting 2SLS estimates.[20] While *RDCap* has, as expected, a negative sign, its coefficient is insignificant in both models. Prior descriptive statistics, as well as regression results from estimating equations (1), (2) and (3), however, show that Capitalizers and Expensers are two different groups of companies, which vary widely in

[20] Fitted values for *RDCap* in model 2 are again calculated by a first stage regression, including both selected instrumental variables from equation (1) and all independent variables, except *RDCap*, from equation (4). As instrumental variables, we select *RD_Intensity*, *RD_Value*, *O_Score*, *Beat_Bench*, *Cut_RD* and *GDP_Growth*. As reported by Kleibergen-Paap Wald F-statistic and Hansen's J-statistic, our instruments are appropriate, i.e. neither weak nor partially endogenous (see Table 5 model 2). We apply the same procedure and include the same instrumental variables (except for *O_Score*, as this variable is not associated with the amount of R&D capitalized for firms accessing the syndicated loan market (Appendix II, models 5 and 6)) to obtain fitted values for *RDCap* for analyzing firms' cost of private debt. Also for this analysis instruments can be considered valid (see Table 6, model 2).

nearly all firm and country-specific characteristics. Thus, the true relationship between R&D investments of IFRS reporting firms and their cost of debt may be obfuscated by the strong differences between the two groups of companies. Accordingly, we follow Chen et al. (2017) and estimate equation 4 separately for Expensers (model 3) and Capitalizers (model 4).

TABLE 5 ABOUT HERE

Partitioning the sample reveals findings consistent with our hypotheses. As model 4 suggests, bond investors do value the capitalized and expensed R&D costs for Capitalizers differently. In line with theoretical considerations and our hypothesis, bondholders regard only the capitalized part as valuable, resulting in a negative association between capitalized R&D and the cost of public debt in model 4 (the coefficient for *RDCap* is negative and statistically significant at the 5% level). In contrast, the expensed counterpart is not priced by bond investors, indicated by the positive and insignificant coefficient of *RDExp* in model 4.

Models 3 and 4 reveal that the coefficient of *RDExp* for the full sample (models 1 and 2) is insignificant, as bondholders price the expensed R&D investments of Expensers and Capitalizers differently. Consistent with results from Eberhart et al. (2008) for US firms, R&D costs of Expensers are regarded as valuable, leading to a reduction in the cost of public debt (the coefficient for *RDExp* is negative and statistically significant at the 1% level). Results with respect to firm, issue- and country-specific control variables are in line with prior literature (Eberhart et al., 2008; Liu & Magnan, 2016; Ball et al., 2017).

Table 6 documents results for testing the effect of capitalized R&D on the cost of private debt. Similar to the results regarding the cost of public debt, we first present results for the full sample, including 2SLS estimates to control for endogeneity in model 2. Models 3 and 4 display findings when equation (4) is estimated separately for Capitalizers and Expensers.

TABLE 6 ABOUT HERE

While we again find, for the full sample, a negative but insignificant coefficient for *RDCap*, model 4 in Table 6 shows results similar to the cost of public debt. In line with H3, we find for the sample of Capitalizers that capitalized R&D investments also reduce the cost of private debt (the coefficient for *RDCap* is negative and statistically significant at the 5% level). The expensed counterpart, though, similarly to the public debt market, is not priced in the syndicated loan market, implied by the positive and insignificant coefficient of *RDExp* in model 4. These results are consistent with our hypothesis and show a homogenous pricing of R&D investments for capitalizing firms in the syndicated loan market and public debt market. Contrary to the results on the cost of public debt, however, we find no significant effect for R&D investments of expensing firms on the cost of private debt.[21]

4.2.3 Additional analysis – Signaling vs. Earnings Management

The academic discussion about the accounting treatment for R&D under IFRS is inherently associated with signaling theory. Arguably, only when managers employ R&D capitalization to reveal truthfully proprietary firm information to investors, does capitalized R&D reflect succesful R&D projects (see discussion in sub-section 2.2 earlier).

As shown earlier, earnings management incentives to capitalize development costs are also prevalent in our sample firms. Our prior results reveal in particular that significantly more Capitalizers than Expensers cut their R&D outlays, as both cutting R&D investments and capitalizing R&D increases earnings. Additionally, our results show that firms capitalize larger amounts of R&D investments when they are suspected of employing R&D capitalization as a means of beating earnings benchmarks. In line with the development of H2 and H3, we expect that capitalized R&D reduces the cost of debt only when managers

[21] Results from the US regarding the association between R&D investments and the cost of private debt are mixed, documenting both a significant positive (Ciftci & Darrough, 2016) and negative association (Plumlee et al., 2015). Under IFRS, R&D capitalization could trigger banks to investigate a firm's R&D activities more closely, demanding private information, e.g. obtaining information with respect to forecasted future cash-flows for the capitalized and expensed parts of R&D investments. Under this assumption, capitalized R&D should only be priced in debt markets when it relates to true signals about the future success of R&D projects and not to managerial opportunism. We investigate this in the next sub-section.

employ R&D capitalization to convey genuine information about the future success of R&D projects to debt markets.

On that basis and in the spirit of Dinh et al. (2016), we split the sample of Capitalizers into two groups, conditional on firms' earnings management incentives. We assume that a capitalizing firm reveals truthful signals to public debt markets and syndicated loan markets when its capitalized amount of R&D is neither associated with real earnings management (*Cut_RD)* nor accounting earnings management incentives (*Beat_Bench)*. Conversely, we suspect that a capitalizing firm will employ R&D capitalization opportunistically when its capitalized amount of R&D is either related to real (*Cut_RD*) or accounting earnings management (*Beat_Bench*).

TABLE 7 ABOUT HERE

Table 7 displays results for the effect of capitalized R&D on the cost of public (models 1 and 2) and private debt (models 3 and 4), conditional on firms' earnings management incentives. As displayed in models 1 and 3, we find a reduction in the cost of public and private debt only when capitalized R&D is not attributed to earnings management incentives (the coefficient for *RDCap* is negative and statistically significant at the 1% (5%) level in model 1 (model 3)). By contrast, where we suspect a firm's R&D capitalization to be motivated by earnings management, capitalized R&D is not priced, implied by the insignificant coefficient of *RDCap* in models 2 and 4.

4.2.4 Additional analysis – R&D capitalization and future benefits

Our main results reveal that debt investors differentiate between the capitalized and expensed components of R&D expenditures when they price capitalizing firms. In particular, the amount of R&D a capitalizing firm expensed during a year is not priced, whilst the amount capitalized reduces the cost of debt. However, our results do not shed light on whether or not capitalized development costs reflect managers' private information about the future benefits of R&D investments.

To analyze whether capitalizing firms' R&D expenditures affect future benefits, we draw on Lev and Sougiannis (1996), who point out that earnings are a direct measure of the benefits associated with R&D.

Firstly, as already documented by our descriptive statistics, R&D capitalization under IAS 38 may enable managers to convey private information about the future success of R&D expenditures, as Capitalizers show higher future earnings than Expensers (mean *NI* = 0.804 for Capitalizers vs. mean *NI* = 0.644 for Expensers and the difference is significant at the 1% level; see Table 3 Panel B).

Secondly, in the spirit of Lev and Sougiannis (1996), we examine the determinants of future earnings by conducting a multivariate analysis, focusing on their relation with capitalizing firms' R&D investments.[22] The dependent variable is *NI* (i.e., future earnings) and is measured as the sum of earnings from year t+1 to year t+3 scaled by the market value of equity (Mazzi et al., 2018). Earnings are defined as operating income plus R&D expense, depreciation and amortization (Lev & Sougiannis, 1996; Aboody & Lev, 1998; Mazzi et al., 2018). In line with prior literature (Lev & Sougiannis, 1996; Amir et al., 2007; Mazzi et al., 2018), we add back R&D expenditure, depreciation and amortization to avoid any mechanical association in earnings that may affect our inferences.

TABLE 8 ABOUT HERE

Table 8 (model 1) reports results for the effect of capitalizing firms' R&D investments on future earnings. While we find a significant positive association between the amount of

[22] As previously, we include firm-specific and country-specific control variables as well as industry and year fixed effects. Descriptive statistics for all included variables are shown in Table 3 (Panels A and B). Also, we describe in detail all included variables in Appendix I. For further details on the rationale and theoretical justifications for the included firm and country controls, we refer to prior literature (Lev & Sougiannis, 1996; Aboody & Lev, 1998; Kothari et al., 2002; Amir et al., 2007; Ahmed & Falk, 2009; Cazavan-Jeny et al., 2011; Wolfe, 2012; Mazzi et al., 2018).

R&D a firm capitalized in a year and its future earnings (the coefficient for *RDCap* is positive and statistically significant at the 5% level), we find no such association for the expensed counterpart, documented by the insignificant coefficient of *RDExp*.

In line with our analysis for the cost of debt, we next present results for the effect of capitalized R&D on future earnings conditional on a firm's earnings management incentives in models 2 and 3 of Table 8. This analysis is again based on the premise that a capitalizing firm reveals truthful signals about the future success of its R&D investments when its capitalized amount of R&D is neither associated with real earnings management (*Cut_RD*) nor with accounting earnings management incentives (*Beat_Bench*).

Confirming the earlier findings regarding the cost of debt, debt market participants are able to identify a firm's motives for R&D capitalization. We find that capitalized development costs in a given year contribute to future earnings only when R&D capitalization is not associated with earnings management incentives (the coefficient for *RDCap* is positive and statistically significant at the 5% level in model 2). By contrast, for the subsample where earnings management incentives are prevalent, we find no effect from the capitalized amount of R&D on future earnings, indicated by the insignificant coefficient of *RDCap* in model 3.

In sum, results from this analysis imply that the capitalization of development costs, as required by IFRS, enables managers to convey private information about the future benefits of R&D projects to capital markets, which in turn allows debt investors to distinguish between successful and unsuccessful R&D projects.

4.2.5 Additional analysis – R&D capitalization and audit fees

The findings we reported earlier are based on the premise that managers accept the costs of development expenditures' capitalization in order to use R&D capitalization (compared to full expensing of R&D) as a signaling device. In fact, for a signal to be informative there needs to be costs involved (Dye, 1985). Costs associated with R&D capitalization can arise from different sources. While most are difficult to measure (e.g. increased management accounting costs or increased industry competition), audit fees can be directly observed.

Prior literature suggests that R&D capitalization requires additional audit work to verify it. For example, De George et al. (2013) find that compliance with IAS 38 is positively related to audit fees as the complexity of auditing capitalized development costs involves high audit effort. Kuo and Lee (2017) show a significant positive association between audit fees and capitalized R&D for IFRS reporting firms across several countries for the period between 2005 and 2014. Cheng et al. (2016) report similar findings for Chinese firms for the sample period 2007-2013.

We have already shown that Capitalizers pay significantly higher audit fees compared to Expensers (mean *log(Fees)* = 8.377 for Capitalizers vs. mean *log(Fees)* = 7.250 for Expensers and the difference is significant at the 1% level; see Table 3 Panel B). As a further test we follow Cheng et al. (2016) and Kuo & Lee (2017) and examine the determinants of audit fees, with a focus on the relation between R&D capitalization and audit fees.[23] Table 9 reports the results for the multivariate analysis.

TABLE 9 ABOUT HERE

In following Cheng et al. (2016), we firstly conduct the multivariate analysis without the dummy variable *CAP*, which controls for the binary decision to capitalize R&D. Similarly to Cheng et al. (2016) and Kuo and Lee (2017), we find that the amount of R&D a firm capitalizes in a year (*RDCap*) is positively associated with audit fees (the coefficient for

[23] As previously, we include firm-specific and country-specific control variables as well as industry and year fixed effects. Descriptive statistics for all included variables are shown in Table 3 (Panels A and B). For the details on the rationale and theoretical justifications for the included firm and country controls, we refer to prior literature (Cheng et al., 2016; Kuo & Lee, 2017).

RDCap is positive and statistically significant at the 5% level in model 1).[24] When we additionally control for the binary decision to capitalize R&D during a year (*CAP*) in model 2, the coefficient of *RDCap* is no longer significant. Instead, we find that the firm-specific characteristic of being a Capitalizer is significant and highly positively associated with a firm's audit fees (the coefficient for *CAP* is positive and statistically significant at the 1% level in model 2), implying that in general terms R&D capitalization can be deemed a costly signaling device. To substantiate our finding, we next exclude the capitalized (*RDCap*) and expensed amounts of R&D (*RDExp*) in model 3, but keep the dummy variable *CAP*. As model 3 shows, we still find a significant positive association between *CAP* and a firm's audit fees (the coefficient for *CAP* is positive and statistically significant at the 1% level in model 3).

All these results imply that as soon as a firm starts capitalizing development costs, audit fees increase. When a firm capitalizes some or all of its R&D investments during a year, additional audit work is required. Irrespective of the amount capitalized, R&D capitalization triggers auditors to evaluate whether a company fulfills all the conditions prescribed in IAS 38 (e.g. whether the internal management accounting systems allows a firm to distinguish between the research and development phase of its R&D projects and whether the restrictive conditions to capitalize development costs are fulfilled) and whether the capitalized amount reflects economic substance. Thus, R&D capitalization increases audit fees and can, therefore, be regarded as a signaling device.

[24] Given that in model 1 the test on endogeneity is significant, OLS estimates are biased and we, therefore, in line with Dinh et al. (2016), present 2SLS estimates for model 1 only. Fitted values for *RDCap* in model 1 are calculated by a first stage regression, including both selected instrumental variables from equation (1) and all independent variables, except *RDCap*, used to test the effect of R&D capitalization on audit fees (see Table 9). As instrumental variables, we select *RD_Intensity*, *RD_Value*, *O_Score*, *Beat_Bench*, *Cut_RD* and *GDP_Growth*. While the Kleibergen-Paap Wald F-statistic shows that our instrumental variables are not weak ($p < 0.01$), we find for the Hansen J-statistic a value of 64.195 ($p < 0.01$). Thus, our instrumental variables may be partially endogenous and hence also our 2SLS estimates for model 1 may be biased. We, therefore, follow Schultze et al. (2017) and exclude instruments from the first stage regression that are not significant (*RD_Value*, *O_Score*, *Cut_RD)* as well as the country variable *GDP_Growth*. This reduces the Hansen J-statistic to a normal level of 1.115 ($p > 0.10$), indicating that our instruments now can be considered valid, while main inferences still hold.

4.2.6 Additional analysis – Expected and discretionary R&D capitalization

Our previous results suggested that the amount of R&D a firm capitalizes in a year is valued positively by debt markets. However, given that R&D capitalization under IAS 38 requires managerial discretion, it is questionable whether there is any particular amount that debt market participants expect a firm to capitalize in a year. Put differently, through our research design we cannot rule out the possibility that firms gain access to public debt markets and receive favourable contract terms by capitalizing abnormal amounts of R&D.

To address these concerns and shed more light on our main findings, we proceed as follows. Drawing on the discretionary accruals literature (Jones, 1991; Boynton et al., 1992; DeFond & Jiambalvo, 1994; Francis et al., 2005), we perform an analysis intended to estimate both the amount of R&D a firm is expected to capitalize given its specific characteristics and the abnormal or, in the spirit of the accruals literature, "discretionary" amount of R&D a firm has capitalized during a given year. A similar approach, also in the context of capitalized R&D was recently applied by Cheng et al. (2016), Kuo and Lee (2017) and Mazzi et al. (2018).

We rely on equation (1), which previously helped us to control for endogeneity, as it identifies factors that prior literature has found will determine the amount of R&D a firm capitalizes in a year. By estimating equation (1) as a left-censored Tobit model, we receive the fitted values (i.e., *RDCap_Exp*). We regard these as reflecting the amount of R&D a firm is expected to capitalize in a year given its specific characteristics. Conversely, by calculating the residuals of equation (1), we are able to identify the unexpected or "discretionary" amount of R&D a firm capitalized in a year (Kuo & Lee, 2017; Mazzi et al., 2018). More specifically, the positive residuals of equation (1) reflect the amount of R&D a firm has overcapitalized in a year (*RDCap_Over*) compared with the expected amount (*RDCap_Exp*), while the negative residuals equal the amount of R&D a firm has undercapitalized in a year (*RDCap_Under*). As we are interested only in identifying Capitalizers expected and abnormal amounts of capitalized R&D and not in assigning a measure of potential capitalization for Expensers, we replace *RDCap_Exp*, *RDCap_Over* and *RDCap_Under* equal to zero for Expensers.

We then replicate our main analysis to reflect firms' propensity for issuing bonds rather than borrowing funds from the syndicated loan market (H1) but decompose *RDCap* to the amount of R&D a firm is expected to capitalize (*RDCap_Exp*) and the amount of R&D a firm over (*RDCap_Over*) or undercapitalized (*RDCap_Under*).[25] Results for this analysis are presented in Table 10 Panel A.[26]

TABLE 10 ABOUT HERE

While for models 1 and 2 the dependent variable is the dummy variable *Bond_Issue*, models 3 and 4 show results with the continuous variable *%_of_Bond_Debt.* Model 1 documents a significant positive relationship between the amount of R&D a firm is expected to capitalize in a year and its propensity to borrow from the public debt market (the coefficient for *RDCap_Exp* is positive and statistically significant at the 1% level). By contrast, we do not find a significant association for the over (*RDCap_Over)* and undercapitalized portion (*RDCap_Under*) of capitalized R&D. In model 2 we repeat this analysis, this time just for the subsample of Capitalizers, and we find similar results (the coefficient for *RDCap_Exp* is positive and statistically significant at the 5% level). Similarly, when using the *%_of_Bond_Debt* in models 3 and 4 as the dependent variable, our results remain qualitatively unchanged.

[25] See Francis et al. (2005) and Mazzi et al. (2018) for a similar approach in the context of discretionary accruals literature and capitalized development costs, respectively.

[26] For parsimony reasons, Table 10 only presents coefficients and corresponding t-statistics/z-statistics for the expected (*RDCap_Exp*), over- (*RDCap_Over*) and undercapitalized (*RDCap_Under*) amount of capitalized development costs. Given that we run some equations for the full sample of Capitalizers and Expensers and some for Capitalizers only, we also document coefficients and t-statistics/z-statistics for the dummy variable *CAP*. We also present results for the amount of R&D a firm expensed in a year (*RDExp*).

To explore whether the results of these tests also transfer to the pricing of capitalized R&D in debt markets, we repeat this analysis for the cost of public and private debt of capitalizing firms. Table 10 displays results for the effect of the three capitalized development cost components on the cost of public (Panel B) and private debt (Panel C).

As shown by model 1 in Panels B and C, we find a reduction in the cost of debt only for the amount of R&D a firm is expected to capitalize in a year given its firm-specific characteristics (the coefficient for *RDCap_Exp* is negative and statistically significant at the 5% level in model 1 in Panels B and C). For the amount of R&D a firm over or undercapitalized in a year, again we do not find a significant association with the prices of bonds and syndicated loans.

Next, we split Capitalizers into firms with and without earnings management incentives. Results for the cost of public debt (private debt) are presented in models 2 and 3 of Panel B (C). Similarly to our prior analyses, we find only a negative relationship between the expected amount of capitalized R&D and the cost of public and private debt, when R&D capitalization is not associated with earnings management incentives (the coefficient for *RDCap_Exp* is negative and statistically significant at the 1% (5%) level in model 2 in Panel B (C)).

These results imply, therefore, that the amount of R&D a firm is expected to capitalize facilitates firms' access to public debt markets and reduces the cost of debt. On the one hand, undercapitalized amounts of R&D may result from firms not being able to meet market expectations regarding the amount of development costs capitalized in a year; on the other hand, debt market participants may regard overcapitalized amounts either as an indication that firms are being too optimistic with respect to the future success of their R&D investments or as a sign of earnings management. Accordingly, only the expected amount of capitalized development costs should contribute significantly to future profitability, whilst the discretionary counterparts (*RDCap_Over* and *RDCap_Under*) may not represent underlying future economic benefits. To investigate these questions and analyze whether debt market participants rightfully regard the expected amount of capitalized R&D as the truthful, we repeat our analysis for the effect of capitalized R&D on future earnings and present the results in Table 10 Panel D.

As displayed by model 1, we again find a significant positive association between the expected amount capitalized and future earnings, whilst the discretionary counterparts have no significant effect on future benefits (the coefficient for *RDCap_Exp* is positive and statistically significant at the 5% level). When splitting Capitalizers into firms with and without earnings management incentives, we find results in line with debt pricing of the three development costs components. As displayed in models 2 and 3 of Panel D, we find that only the expected amount of capitalized development costs contributes to future earnings when a firm's R&D capitalization is not attributed to earnings management (the coefficient for *RDCap_Exp* is positive and statistically significant at the 5% level in model 2). Ultimately, we repeat our analyses for the effect of R&D capitalization on audit fees and present results in Table 10 Panel D (model 4). While we find no significant effect for either the expected amount of capitalized R&D (*RDCap_Exp*) or the discretionary counterparts (*RDCap_Over* and *RDCap_Under*), the dummy variable *CAP* remains positive and highly significant. This result supports our earlier analysis, implying that when a firm capitalizes some of its R&D investments in a year, additional audit work is required, as auditors must be informed about details of the projects for which costs have been capitalized.

5. Sensitivity analyses

To assess the sensitivity of our findings, we perform a series of robustness tests. Results with respect to our relevant variables *RDCap* and *RDExp* can be accessed online in the separate file provided on the Journal's website (for sensitivity tests for H1 see SuppInfo_III; for H2 and H3 see SuppInfo_IV; For sensitivity tests in respect to our additional analyses see SuppInfo_V and SuppInfo_VI).

We start by examining the robustness of our findings after incorporating further control variables in the multivariate tests.[27] Firstly, we include Ohlsons's *O_Score* and a firm's *Current_Ratio* as additional firm-specific determinants (Florou & Kosi, 2015; Ciftci & Darrough, 2016). Secondly, we include *Debt_Enforcement* (Ball et al., 2017) and *Term_Spread* (Florou & Kosi, 2015) as additional country controls when testing H2 and H3. Thirdly, we repeat our analyses with country fixed effects.[28] For all three tests, inferences remain unchanged. We find even stronger support for H2 when using country fixed effects, as under 2SLS estimation; for the full sample, i.e. including both Capitalizers and Expensers, we now also find a significant negative association between the cost of public debt and capitalized R&D (the coefficient for *RDCap* is negative and statistically significant at the 5% level). Consequently, in addition to the strong heterogeneity between Capitalizers and Expensers at firm-level, time-invariant country differences may also obfuscate a significant relationship between capitalized R&D and the cost of public debt for the full sample.

We note that our sample for testing H1 includes only one bond and/or syndicated loan per firm-year. Given that we controlled for the size and maturity of such a debt issue, arguably our results are biased, as the other bonds or syndicated loans issued by a firm in this given year may have a different amount and maturity compared with the bond or syndicated loan in our sample. Accordingly, we construct the variables *log(Amount_avg)* and *log(Maturity_avg)* (see Appendix I). This captures the average amount and maturity for all bonds and syndicated loans a firm issued in a given year. We then use these variables instead

[27] Except where otherwise indicated, in these tests, we employ the same control variables and fixed effects as in all previous analyses.

[28] To mitigate multicollinearity issues, we exclude both time-variant and time-invariant country controls. It is noted that even when we include time-variant country controls, when we test our hypotheses with country fixed effects, results remain almost identical.

of the actual size and maturity of the bond or syndicated loan in the sample. Similarly, we construct and use the variable *Term_Spread_avg*, which proxies the average economic uncertainty for a country in a year. Also for these proxies results remain unchanged.

We assess whether the results may be driven by our sample composition. Even though we captured privately placed bonds with a dummy variable when testing H2 (Ge & Liu, 2015, Liu & Magnan, 2016), we follow Franco et al. (2016) and exclude these bonds, as their pricing may be different from that of public bonds (Denis & Mihov, 2003; Ge & Liu, 2015). As an additional test, we consider the potential impact on our results of the country with largest number of observations. In the spirit of Ball et al. (2017), we randomly select and retain only 150 debt issues from Chinese firms. This action reduces the weight of observations from China in the sample relative to those from Switzerland and Sweden (see last column of Table 2). Lastly, we examine the robustness of our findings to possible impact from the financial crisis by excluding all bonds and syndicated loans issued in the years 2008 and 2009. Despite reduced sample sizes, with respect to all our hypotheses results under these three robustness tests are almost identical.

We examine the robustness of our findings against possible sample selection bias. Following prior literature (Oswald 2008; Cazavan-Jeny et al., 2011), we included in our study only R&D active firms and excluded 5,225 debt securities issued by firms whose R&D investments were either equal to zero or missing. However, this procedure may introduce a sample selection bias for two reasons. Firstly, we include only firms that decided to invest in R&D voluntarily. Secondly, Datastream may have falsely identified firms as having no R&D investments. To mitigate these endogeneity concerns, we follow Ciftci and Darrough (2016) by employing Heckman's (1979) two-stage procedure. In the first stage, we include all our sample firms (i.e. R&D active firms) and the previously excluded non R&D firms and then estimate a probit model in which the dependent variable is a dummy variable equal to one if a firm invested in R&D and zero otherwise. As independent variables we select firm (*Size*, *MTB*, *Leverage*, *ROA*, *Tangibility*, *Current Ratio*, *Sales Growth*, *O_Score*) and country (*ASD*, *Corruption*, *Enforcement*, *GDP_Growth*, *Law*) factors that potentially influence a firm's decision to invest in R&D. We then generate the Inverse Mills Ratio from this first stage regression and include it as an additional explanatory variable in the equations for our hypotheses tests. Our results remain unchanged.

We evaluate whether our results for H1 are affected by the statistical model used to analyze the effect of capitalized R&D on a firm's choice of source of debt financing. Given that our dependent variable *%_of_Bond_Debt* has a lower value of zero and an upper value of one, we estimate equation (3) using a double-censored Tobit model (Florou & Kosi, 2015). Alternatively, we also apply a logit transformation for the variable *%_of_Bond_Debt*. In both cases, the results remain similar to our main findings.

We use abnormal working capital accruals (DeFond & Park, 2001; Mazzi et al., 2017) to partition Capitalizers into groups, where an opportunistic use of R&D capitalization is more probable.[29] In line with our results presented in Table 7, we find a reduction in the cost of both public and private debt only for Capitalizers with lower abnormal working capital accruals than their respective industry peers.

We provide robustness tests for our additional analyses, where we investigated the effect of R&D capitalization on a firm's future benefits and audit fees. For the results of these tests in regard to the variables *RDCap*, *RDExp* and *CAP*, see SuppInfo_V.

To demonstrate that our results on the effect of capitalized R&D on future benefits are not conditional on our selected time-lag for future earnings, we repeat our analysis and measure future earnings for the upcoming four years instead of three. We also examine whether our results may somehow have been affected by the earnings proxy used.

[29] We consider a Capitalizer to employ R&D capitalization opportunistically when its abnormal working capital accruals (*AWCA*) are higher than the respective industry median of all capitalizing firms.

Accordingly, we assess the validity of our findings by replacing operating earnings with the net profit before extraordinary items (Mazzi et al. 2018). For both tests our results remain qualitatively unchanged. We note that the results are robust against the inclusion of further firm-specific controls (*ROA* and *O_Score*) as well as country-specific controls (*Law* and *Debt_Enforcement*). Similarly, we include a firm's *Current_Ratio* and the number of geographic segments (*log*(*#_Segments_G*)) as additional firm controls (Kuo & Lee, 2017), whilst also incorporating *Enforcement* and *Corruption* as additional country controls (Knechel et al., 2018) for our audit fee analysis. In both cases the dummy variable *CAP*, which reflects a firm's binary decision to capitalize R&D, remains positive and highly significant.

Identification of the expected (*RDCap_Exp*) and discretionary (*RDCap_Over* and *RDCAP_Under*) components of capitalized R&D depends on the firm and country-specific controls included in equation (1). To demonstrate that our results reflecting the effect of these three capitalized R&D components on debt financing are robust against different design choices for equation (1), we estimate the expected and discretionary components of capitalized R&D by using alternative firm and country variables in equation (1). We firstly exclude some control variables (*Tangibility*, *Enforcement* and *Corruption*) from equation (1). Secondly, we examine whether results change when we include some additional control variables (*Current_Ratio*, *Debt_Enforcement*) in equation (1). As shown in SuppInfo_VI Panels A and B, under both specifications results remain qualitatively similar to the main findings.

6. Conclusion

Using a global sample of bonds and syndicated loans issued by public, non-financial firms in countries which mandated IFRS or fully converged their local GAAP with IFRS from 2005 onwards, we firstly examine how R&D capitalization relates to financing decisions in debt markets. Our results show that the amount of R&D a firm capitalized during a year is positively associated with a firm's propensity for borrowing funds from public debt markets rather than the private syndicated loan market. This indicates that firms employ R&D capitalization in debt markets as a signaling mechanism to decrease information asymmetry to diffuse bondholders. Secondly, we find that both public and private debt investors price R&D investments of capitalizing firms consistent with the restrictive recognition criteria under IAS 38.57. Capitalized development costs fulfilling these recognition criteria are, therefore, closer to being used or sold, and hence are likely to generate probable future economic benefits. For Capitalizers, our results show that the capitalized component of R&D investments reduces the cost of public and private debt, whilst the expensed counterpart is not priced by debt investors. We provide evidence that debt markets are able to identify firms' motives for R&D capitalization, as we find a reduction in the cost of debt only when R&D capitalization is not attributed to earnings management incentives. In further tests we find that capitalized R&D contributes positively to future earnings, but only for the subsample of firms whose capitalized amount is not associated with earnings management incentives. Our results imply that R&D capitalization can be deemed to be a signaling device as it is positively associated with firms' audit fees. Lastly, we find that it is the expected amount of capitalized development costs and not the discretionary counterparts that facilitates firms' access to public debt markets, reduces the cost of debt, and contributes positively to future earnings.

This study is, to our knowledge, the first to examine the effects of R&D capitalization on debt markets. However, it is subject to several caveats which pave the way for future research. Firstly, our analysis focuses only on two external funding sources available to firms, the public debt market and the private syndicated loan market. Hence, our study captures only partially the complex decisions firms face when selecting their financing strategy. Further contributions to research could, therefore, result from examining how R&D capitalization is related to the choice between equity and debt issuance. Moreover, as noted by Florou and Kosi (2015), the coverage procedures of bond and syndicated loan databases are biased towards larger firms. Thus, it might be questionable as to whether our results are transferable to smaller non-public firms with more severe risk-benefit profiles. Finally, given that data on debt covenants is scarce for firms outside the US (Ball et al., 2015; Brown, 2016), we were able only implicitly to control for the existence of such covenants when analyzing the determinants of firms' capitalized R&D. Future research could, therefore, benefit from directly examining how the decision to capitalize development costs is influenced by debt covenants.

Appendix I: Variable definitions

Firm-specific variables

Capitalized R&D	The amount of R&D a firm capitalized during year *t*. It is mostly hand-collected or calculated following Mazzi et al. (2018): (net development costs$_{t0}$ (WC02504) – net development costs$_{t-1}$ (WC02504) + amortization of R&D asset$_{to}$ (WC01153)) .
Expensed R&D	The amount of R&D a firm expensed during year *t* (WC01201)
RD_Intensity	(Capitalized R&D + Expensed R&D) divided by sales (WC01001)
RDCap	Capitalized R&D divided by sales (WC01001)
RDExp	Expensed R&D divided by sales (WC01001)
Capex	A firm's capital expenditures during a year (WC04601) divided by sales (WC01001)
CAP	A dummy variable which is equal to one if a firm capitalized R&D in the fiscal year directly prior to the debt issue date, and zero otherwise
Lag_RDCap	The amount of R&D a firm capitalized during the previous year divided by previous year's sales (WC01001).
RD_Value	The success of a firm's R&D program, measured as the difference between the market value of equity (WC08001) and adjusted book value of equity (book value of equity (WC03501) – net development costs (WC02504)) divided by the sum of current and lagged R&D expenditures (Capitalized R&D + Expensed R&D)
Cut_RD	A dummy variable which is equal to one if current R&D expenditures (Capitalized R&D + Expensed R&D) are smaller than lagged R&D expenditures, and zero otherwise
Beat_Zero	A dummy variable which is equal to one if earnings assuming full expensing (earnings (WC01551) + amortization of R&D asset (WC01153) – Capitalized R&D) are negative and earnings assuming full capitalization (earnings assuming full expensing + Capitalized R&D + Expensed R&D) are positive, and zero otherwise (Dinh et al., 2016; Mazzi et al., 2018). Earnings refer to income before extra items (WC01551)
Beat_Past	A dummy variable which is equal to one if the prior year's earnings (WC01551) are higher than earnings assuming full expensing (earnings (WC01551) + amortization of R&D asset (WC01153) – Capitalized R&D) and prior year's earnings (WC01551) are lower than earnings assuming full capitalization (earnings assuming full expensing + Capitalized R&D + Expensed R&D), and zero otherwise (Dinh et al., 2016; Mazzi et al., 2018). Earnings refer to net income before extra items (WC01551)
Beat_Bench	A dummy variable which is equal to one if either *Beat_Zero* and/or *Beat_Past* is equal to one, and zero otherwise
log(Size)	Natural logarithm of adjusted total assets (Total assets in USD (WC02999) – net development costs in USD (WC02504))
MTB	Market value of equity (WC08001) divided by adjusted book value of equity (book value of equity (WC03501) – net development costs (WC02504))
Leverage	Total debt (WC03255) divided by adjusted total assets
ROA	Adjusted EBIT (EBIT(WC18191) + amortization of R&D asset (WC01153) – Capitalized R&D) divided by adjusted total assets
Tangibility	Net property plant and equipment (WC02501) divided by adjusted total assets
Rated	A dummy variable which is equal to one if a debt issue is rated by Standard and Poor's, and zero otherwise (source: TR Eikon Deal Screener)
Invest_Grade	A dummy variable which is equal to one if a firm's debt issue has an investment grade rating by Standard and Poor's, and zero otherwise. In case a firm's debt issue is not rated, we estimate it based on the procedure of Barth et al. (1998, pp. 18-20) and Florou and Kosi (2015, p. 1451 f.). More specifically, for firms with rated debt, debt ratings (on a scale of 2-27 for ratings AAA to D) are regressed on financial ratios, and the financial ratio's estimated coefficients are then used to calculate debt ratings for firms without rated debt. The estimated rating is based on the following equation (Barth et al., 1998): Rating = a_0 + a_1(adjusted total asset in USD / 10^5) + a_2(adjusted net income / adjusted total assets) + a_3(long-term-debt (WC03251) / adjusted total assets) + a_4(one if a firm paid dividend in the current year (WC05376), and zero otherwise). An estimate is transformed into a rating by rounding to the nearest whole number, with a minimum of 2 and maximum of 27. In case the estimated debt rating

	is less than 12, which is equal to S&P's cut-off between investment grade and below investment grade, we assign the debt issue an investment grade rating.
O_Score	Ohlson's (1980) O-Score computed as: -1.32 – 0.407 * natural logarithm of adjusted total assets in USD + 6.03 * (total liabilities (WC03351) / adjusted total assets) - 1.43 * (working capital (WC02201 – WC03101) / adjusted total assets) + 0.076 * (current liabilities (WC03101) / current assets (WC02201)) – 1.72 * (1 if total liabilities (WC03351) > adjusted total assets, and 0 otherwise) – 0.521 * (adjusted net income$_{t0}$ (net income (WC01651) + amortization of R&D asset (WC01153) – Capitalized R&D) – adjusted net income$_{t-1}$) / (|adjusted net income$_{to}$| + |adjusted net income$_{t-1}$|))
Current_Ratio	Current assets (WC02201) divded by current liabilities (WC03101)
AWCA	Abnormal working capital accruals scaled by the end-of-the-year adjusted total assets (DeFond & Park, 2001; Mazzi et al., 2017), computed as: (WC_t – WC_{t-1} * $Sales_{t0}$ /$Sales_{t-1}$) / adjusted total assets$_{to}$. WC stands for working capital accruals, computed as: Current assets (WC02201) – cash and equivalents (WC02001) – current liabilities (WC03101) + short-term debt (WC03051)
NI	The sum of future earnings measured from year t+1 to year t+3 scaled by the market value of equity (WC08001). Earnings are defined as the sum of operating income (WC01250), expensed R&D (WC01201), depreciation and amortization (WC01151).
log(Fees)	Natural logarithm of audit fees (WC01801) in thousands of USD.
Returns_Var	The variability of stock returns, measured as the standard deviation of monthly stock returns over the fiscal year. Monthly stock returns are computed using the total return index (RI) in Datastream.
ADR	A dummy variable which is equal to one if a firm has an ADR listed on a US exchange (WC11496), and zero otherwise.
Invrec	The sum of inventories (WC02101) and receivables (WC02051) divided by adjusted total assets
Loss	A dummy variable which is equal to one if a negative net income (WC01651) is reported, and zero otherwise
Opinion	A dummy variable which is equal to one if a firm does not receive a standard unqualified audit opinion (WC07546), and zero otherwise
Big4	A dummy variable which is equal to one if the annual report is audited by a Big 4 auditor (TR Eikon: BSAuditorCode), and zero otherwise
log(#_Segments)	The natural logarithm of one plus the number of product segments for which sales are reported (WC19501; WC19511; WC19521; […]; WC19591)
log(#_Segments_G)	The natural logarithm of one plus the number of geographic segments for which sales are reported (WC19601; WC19611; WC19621; […]; WC19691)
Bond/syndicated loan-specific variables	
Bond_Issue	A dummy variable which is equal to one if a debt issue is a bond issue, and zero otherwise (source: TR Eikon Deal Screener)
%_of_Bond_Debt	The percentage of bond debt, computed as the ratio of the total amount of borrowed public debt and the total amount of debt (public and private) (source: TR Eikon Deal Screener)
Cost_of_debt	For bonds, this is the difference in basis points between the yield to maturity of a corporate bond at issue date and the interest yield of a treasury security (T-bill) issued by the same country and with comparable maturity to the corporate bond; For syndicated loans, it is defined as the amount the borrower pays in basis points over LIBOR or a LIBOR equivalent for each dollar drawn (source: TR Eikon Deal Screener/Datastream)
log(Debt_Amount)	The natural logarithm of the size of each loan facility or bond (source: TR Eikon Deal Screener)
log(Amount_avg)	Reflecting the average amount of all bonds and syndicated loans a firm issued in a given year. It is calculated as the natural logarithm of the ratio between the amount a firm borrowed from the bond and syndicated loan market in a given year divided by the number of bonds and syndicated loans a firm issued in a given year (source: TR Eikon Deal Screener)
log(Maturity)	The natural logarithm of the number of months from the date the debt is issued until maturity (source: TR Eikon Deal Screener)

log(Maturity_avg)	Reflecting the average maturity of all bonds and syndicated loans a firm issued in a given year. It is calculated as the natural logarithm of the ratio between the sum of the maturity of all bonds and syndicated loans a firm issued in a given yeard divided by the number of bonds and syndicated loans a firm issued in a given year (source: TR Eikon Deal Screener)
Private_Placement	A dummy variable which is equal to one if a bond is issued through private placement, and zero otherwise (source: TR Eikon Deal Screener)
Callable	A dummy variable which is equal to one if a bond has a call feature, and zero otherwise (source: TR Eikon Deal Screener)
Term_Loan	A dummy variable which is equal to one if a syndicated loan is a term loan, and zero otherwise (source: TR Eikon Deal Screener)
Issue_Both	A dummy variable which is equal to one if a firm issues in a particular year at least one bond and at least one syndicated loan, and zero otherwise (source: TR Eikon Deal Screener)
Country-specific variables	
ASD	The anti-self-director index from Djankov et al. (2008)
Country_PoD	The probability of default of a firm's country of domicile in the year and month the debt is issued. This measure comes from the National University of Singapore, Risk Management Institute (see http://rmicri.org and Duan and Wang (2012)). It combines leverage and asset volatility and reflects the mean value of the probability of default across all firms within a country. The probability of default is predicted for different time horizons, ranging from 1 month to 60 months. We select a time horizon of 60 months in order to mitigate the influence of short-term shocks on a country's probability of default.
Corruption	The inverse of the Corruption Perceptions Index (CPI). This is calculated as the difference between the highest possible CPI score (i.e. 10) and each country's corruption level (source: Transparency International)
Debt_Enforcement	A country score from Djankov et al. (2008), capturing the efficiency of debt enforcement in each country
Enforcement	A country score from Brown et al. (2014), capturing differences between countries regarding the audit of financial statements and the enforcement of compliance with accounting standards
Exchange_Risk	The exchange risk volatility of a firm's country of domicile, proxied by the coefficient of the variation of daily USD to local currency exchange rates for the 12 months prior to the debt issue date (source: Datastream). For the audit fee analysis, this is calculated for the 12 months prior to the date of the fiscal year-end
GDP_Growth	Annual percentage growth rate of GDP at market prices based on constant local currency (source: World Bank)
Law	A dummy variable which is equal to one if a firm's country of domicile is a common-law country, and zero otherwise (La Porta et al., 1998)
Term_Spread	The difference between a government's ten-year and two-year T-bill rate calculated for the debt issue date (source: Datastream)
Term_Spread_avg	Reflects the economic uncertainty of a firm's country of domicile. It is calculated as the sum of the term spread of all bonds and syndicated loans a firm issued in a year divided by the number of bonds and syndicated loans a firm issued in a given year (source: datastream).

Appendix II: Determinants of the amount of capitalized R&D

Appendix II: Determinants of the amount of capitalized R&D – Tobit regressions						
	Full Sample		*Bond Sample*		*Loan sample*	
VARIABLES	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
Constant	-0.000	-0.000	-0.004	-0.004	0.000	0.000
	(-0.04)	(-0.00)	(-1.27)	(-1.30)	(0.00)	(0.09)
RD_Intensity [a]	-0.013	-0.013	-0.004	-0.004	-0.014	-0.013
	(-1.58)	(-1.60)	(-0.40)	(-0.45)	(-1.14)	(-1.06)
log(Size)	0.000	0.000	0.000**	0.000**	-0.000	-0.000
	(0.46)	(0.51)	(2.33)	(2.36)	(-0.67)	(-0.58)
MTB [a]	-0.000	-0.000	0.000	0.000	-0.000**	-0.000**
	(-1.19)	(-1.20)	(1.06)	(1.12)	(-2.00)	(-2.12)
Leverage [a]	-0.001	-0.001	-0.002	-0.002	0.003	0.003
	(-0.62)	(-0.76)	(-1.29)	(-1.36)	(0.97)	(0.94)
ROA [a]	0.002	0.001	-0.008	-0.009	0.012**	0.011*
	(0.53)	(0.31)	(-1.45)	(-1.54)	(2.00)	(1.91)
Tangibility [a]	-0.001	-0.000	0.001	0.001	-0.002	-0.002
	(-0.43)	(-0.35)	(0.52)	(0.56)	(-1.07)	(-0.95)
O_Score [a]	0.001**	0.001**	0.001**	0.001**	0.000	0.001
	(2.38)	(2.54)	(2.45)	(2.51)	(1.20)	(1.50)
RD_Value [a]	-0.000	-0.000	-0.000	0.000	-0.000	-0.000
	(-0.83)	(-0.77)	(-0.01)	(0.03)	(-1.16)	(-1.13)
Lag_RDCap [a]	1.094***	1.094***	1.060***	1.062***	1.096***	1.091***
	(34.68)	(34.98)	(30.54)	(30.73)	(19.38)	(19.35)
Cut_RD	-0.002***	-0.002***	-0.001***	-0.001***	-0.003***	-0.003***
	(-5.43)	(-5.45)	(-3.25)	(-3.31)	(-5.28)	(-5.20)
Beat_Zero	0.002**		0.002		0.003***	
	(2.27)		(1.26)		(2.66)	
Beat_Past	0.001***		0.002***		0.001	
	(3.35)		(3.74)		(1.11)	
Beat_Bench		0.002***		0.002***		0.001*
		(4.27)		(4.34)		(1.89)
Enforcement	-0.000	-0.000	-0.000	-0.000	0.000	0.000
	(-0.12)	(-0.13)	(-1.25)	(-1.22)	(1.00)	(0.94)
GDP_Growth [a]	-0.000***	-0.000***	-0.001***	-0.001***	-0.000**	-0.000**
	(-4.47)	(-4.40)	(-3.70)	(-3.60)	(-2.14)	(-2.13)
ASD	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002
	(-1.59)	(-1.59)	(-1.22)	(-1.24)	(-1.25)	(-1.23)
Corruption	-0.000	-0.000	-0.000	-0.000	0.000	0.000
	(-0.93)	(-0.95)	(-0.66)	(-0.66)	(0.18)	(0.12)
Industry dummies	Included	Included	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included	Included	Included
N	1,455	1,455	1,087	1,087	467	467
Log-Pseudolikelihood	1659.24	1659.13	1,119.94	1,120.96	714.37	712.98
Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Mean VIF	2.24	2.27	2.47	2.51	2.10	2.13

Notes: This table reports results for analyzing factors associated with the amount of R&D a firm capitalized in a year. Models 1 to 6 are estimated as a zero (i.e. left) censored Tobit model at firm-level. Models 1, 3 and 5 differ from 2, 4, and 6 only in regard to the variables employed to proxy earnings benchmark beating. Results are presented for the full sample of firms (models 1 and 2) and separately for firms accessing the public debt market (models 3 and 4) and syndicated loan market (models 5 and 6). Also note that the sum of observations for the bond and loan sample (n = 1,554) is slightly higher than the number of observations for the full sample (n = 1,455). This is because firms can issue both public bonds and syndicated loans in a given year. Hence, one specific firm-year can be included in both the bond (models 3 and 4) and loan sample (models 5 and 6). For the full sample, however, we exclude duplicate observations. For a detailed description of all presented variables see Appendix I. VIF is the Variance Inflation factor. Z-statistics based on clustered standard errors at firm-level are reported in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% (two-tailed) level, respectively.[a] Variables winsorized at the top and bottom 1 percentiles.

Appendix III: Descriptive statistics across public and private borrowers

	Public borrowers – Bond market					Private borrowers – Syndicated loan market					Comparison	
	n	*mean*	*min*	*median*	*max*	*n*	*mean*	*min*	*median*	*max*	*t-test*	*Wilcox*
Panel A: Bond and loan-specific variables												
Cost_of_debt	1,866	200.831	40.500	177.000	471.200	722	209.432	20.000	180.000	640.500	1.561	0.254
Debt_Amount (in mil. US$)	1,866	431.309	31.281	250.000	1449.485	722	1106.591	27.977	352.390	5506.609	11.454***	7.212***
Maturity (in months)	1,866	76.549	12.230	64.000	182.670	722	49.401	12.170	54.770	85.230	-21.474***	-17.399***
Callable	1,866	0.143	0.000	0.000	1.000							
Private_Placement	1,866	0.242	0.000	0.000	1.000							
Term_Loan						722	0.461	0.000	0.000	1.000		
Panel B: Firm-specific and country variables												
RD_Intensity	1,087	0.024	0.000	0.014	0.171	467	0.026	0.000	0.009	0.171	0.842	-1.795*
RDCap	1,087	0.003	0.000	0.000	0.042	467	0.003	0.000	0.000	0.042	0.645	4.551***
RDExp	1,087	0.021	0.000	0.012	0.166	467	0.023	0.000	0.007	0.166	0.701	-3.048***
Lag_RDCap	1,087	0.003	0.000	0.000	0.042	467	0.003	0.000	0.000	0.042	0.533	4.047***
CAP	1,087	0.293	0.000	0.000	1.000	467	0.428	0.000	0.000	1.000	5.207	5.164***
RD_Value	1,087	172.842	-241.250	17.560	4254.213	467	177.294	-241.250	11.628	4254.213	0.138	-2.592**
Cut_RD	1,087	0.303	0.000	0.000	1.000	467	0.313	0.000	0.000	1.000	0.391	0.391
Beat_Zero	1,087	0.025	0.000	0.000	1.000	467	0.039	0.000	0.000	1.000	1.477	1.477
Beat_Past	1,087	0.187	0.000	0.000	1.000	467	0.148	0.000	0.000	1.000	-1.856*	-1.854*
Beat_Bench	1,087	0.201	0.000	0.000	1.000	467	0.178	0.000	0.000	1.000	-1.043	-1.043
log(Size)	1,087	15.785	10.390	15.681	19.903	467	15.589	10.973	15.361	19.903	-1.990*	-2.122**
MTB	1,087	2.597	0.342	2.025	14.656	467	2.494	0.342	2.001	14.656	-0.857	-1.800*
Leverage	1,087	0.309	0.029	0.297	0.646	467	0.289	0.029	0.274	0.646	-2.560**	-2.549**
ROA	1,087	0.067	-0.089	0.063	0.226	467	0.069	-0.089	0.068	0.226	0.800	1.376
Tangibility	1,087	0.305	0.011	0.264	0.812	467	0.275	0.011	0.227	0.812	-2.749***	-3.041***
O_Score	1,087	-4.128	-6.727	-4.131	-1.435	467	-4.121	-6.727	-4.224	-1.435	0.119	-0.298
Rated	1,087	0.378	0.000	0.000	1.000	467	0.075	0.000	0.000	1.000	-12.720***	-12.109***
Invest_Grade	1,087	0.879	0.000	1.000	1.000	467	0.835	0.000	1.000	1.000	-2.304**	-2.301**
Issue_Both	1,087	0.089	0.000	0.000	1.000	467	0.208	0.000	0.000	1.000	6.563***	6.476***
NI	775	0.695	-0.055	0.540	3.052	367	0.729	-0.055	0.581	3.052	0.995	1.352
Capex	775	0.084	0.004	0.054	0.599	367	0.086	0.004	0.049	0.599	0.382	-1.847*
Returns_Var	775	0.088	0.029	0.080	0.262	367	0.090	0.029	0.077	0.270	0.585	-0.701
log(Fees)	931	7.562	3.784	7.629	13.412	395	7.983	4.754	7.904	11.561	3.928***	3.656***
ADR	931	0.286	0.000	0.000	1.000	395	0.370	0.000	0.000	1.000	3.028***	3.018***
Loss	931	0.093	0.000	0.000	1.000	395	0.167	0.000	0.000	1.000	3.857***	3.837***

Appendix III continued

Invrec	931	0.285	0.036	0.272	0.696	395	0.279	0.036	0.269	0.696	-0.623	-0.618
Opinion	931	0.000	0.000	0.000	0.000	395	0.005	0.000	0.000	1.000	2.175**	2.172**
Big4	931	0.680	0.000	1.000	1.000	395	0.944	0.000	1.000	1.000	10.719***	10.286***
log(#_Segments)	931	1.550	0.000	1.609	2.398	395	1.578	0.000	1.609	2.398	0.928	0.648
ASD	1,087	0.585	0.203	0.757	1.000	467	0.578	0.203	0.429	1.000	-0.478	-0.311
Corruption	1,087	3.748	0.600	3.000	6.500	467	2.722	0.500	2.300	6.500	-9.520***	-8.042***
Enforcement	1,087	41.475	20.000	42.000	54.000	467	45.375	20.000	45.000	54.000	9.792***	9.944***
GDP_Growth	1,087	3.531	-5.482	2.556	10.636	467	1.747	-5.482	1.806	10.636	-9.561***	-8.160***
Law	1,087	0.153	0.000	0.000	1.000	467	0.377	0.000	0.000	1.000	10.088***	9.776***
Country_PoD	1,866	0.019	0.010	0.018	0.051	722	0.020	0.011	0.019	0.051	4.065***	3.355***
Exchange_Risk	1,866	0.034	0.001	0.027	0.131	722	0.039	0.001	0.037	0.131	4.391***	6.114***
Term_Spread	1,866	1.236	-0.303	1.211	2.815	722	1.434	-0.303	1.443	2.815	6.167***	6.408***

Notes: This table reports descriptive statistics across firms accessing the the public debt market and firms accessing the private syndicated loan market in a particular year. T-test reports t-statistics for differences in means between the two groups (two-tailed). Wilcox reports z-statistics for the Wilcoxon ranksum test (Mann-Whitney) to test the equality of the population between the two groups (two-tailed). Bond- and loan-specific variables are presented at an issue-level, as every debt issue differs in its contractual terms. Firm-specific and country variables are presented at a firm-year level. In case a firm issues at least one bond and one syndicated loan in a year, the firm is presented in both groups for the specific year. For a detailed description of all presented variables see Appendix I.

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Table 1: Sample selection process

	All issues	Bonds	Syndicated Loans
Panel A: Choice of source of debt financing – Public debt market vs. private syndicated loan market			
For our sample we focus on countries that mandatorily adopted IFRS or fully converged their local GAAP to IFRS in the period between 2005 to 2013. We include only bonds/syndicated loans issued by public non-financial institutions in the period 2008-2016. Bonds with a floating rate note (Bessembinder et al., 2009; Liu & Magnan, 2016) and perpetual bonds (Liu & Magnan, 2016) are excluded.	15,631	7,202	8,427
Debt issues matched to Datastream based on several identifiers (Bond ISIN, ticker symbol, issuer ticker) and company name.	10,277	6,821	3,456
Debt issues of firms reporting according to US-GAAP	-453	-174	-279
Debt issues of firms which did not report either R&D expenses or an R&D asset in the fiscal year directly prior to the debt issue date	-5,225	-3,137	-2,088
Debt issues of firms from the Oil and Gas industry	-294	-185	-109
Debt issues of firms where the capitalized amount of R&D during the year was not accessible	-453	-434	-19
Missing data on firm-specific variables	-244	-160	-84
Missing data on country-specific variables	-80	-43	-37
Missing data on issue-specific variables	-99	-95	-4
Exclusion of bonds with short term maturity (<12 months)	-392	-392	0
Total sample	*3,037*	*2,201*	*836*
Multiple debt issues of the same type by the same firm within one year	-1,418	-1,073	-345
Only including countries with more than 10 observations	-65	-41	-24
Final sample	***1,554***	***1,087***	***467***
Debt issues where the issuing firm capitalized R&D during the year	519	319	200
Debt issues where the issuing firm only expensed R&D during the year	1,035	768	267
Panel B: Cost of public debt – Bond sample			
Total sample		2,201	
Missing data on the cost of public debt		-160	
Negative debt risk premium		-130	
Only including countries with more than 10 observations		-45	
Final sample		***1,866***	
Bond issues where the issuing firm capitalized R&D during the year		629	
Bond issues where the issuing firm only expensed R&D during the year		1,237	
Panel C: Cost of private debt – Syndicated Loan sample			
Total sample			836
Missing data on the cost of debt			-66
Only including countries with more than 10 observations			-48
Final sample			***722***
Syndicated loan issues where the issuing firm capitalized R&D during the year			333
Syndicated loan issues where the issuing firm only expensed R&D during the year			389

Notes: The sample period is 2008-2016. Panel A presents the sample selection process for analyzing the relationship between the amount of R&D a firm capitalized during a year and a firm's propensity for issuing bonds rather than borrowing funds from the syndicated loan market in the subsequent year. Panels B and C present the sample selection process for analyzing the effect of capitalized R&D on firms' cost of public (Panel B) and private debt (Panel C). We match bond issuing firms from Thomson Reuters Eikon Deal Screener to Worldscope based on multiple company identifiers (i.e., Bond ISIN, ticker symbol and issuer ticker) and company name. Similarly, we match firms obtaining syndicated loans from Thomson Reuters Eikon Deal Screener to Worldscope based on ticker symbol and company name. The amount of R&D a firm capitalized in the fiscal year directly prior to the debt issue date is either calculated based on the coding of Mazzi et al. (2018) or hand-collected from a firm's annual report.

Table 2: Sample composition by country

	Source of debt financing							Cost of debt						
	Bonds			Syndicated Loans			All	Bonds			Syndicated Loans			All
	Capitalizers	Expensers	Sum	Capitalizers	Expensers	Sum	Issues	Capitalizers	Expensers	Sum	Capitalizers	Expensers	Sum	Issues
Australia	7	19	26	9	11	20	46	8	30	38	17	20	37	75
Austria	5	16	21	1	3	4	25	5	20	25	0	0	0	25
Belgium	8	15	23	4	9	13	36	13	46	59	6	22	28	87
Brazil	4	3	7	2	5	7	14	0	0	0	0	0	0	0
Canada	3	5	8	7	17	24	32	4	7	11	7	14	21	32
China	16	386	402	6	20	26	428	19	463	482	7	21	28	510
Finland	1	33	34	0	18	18	52	4	36	40	0	23	23	63
France	87	72	159	30	27	57	216	166	197	363	48	32	80	443
Germany	46	47	93	32	31	63	156	181	91	272	56	50	106	378
Hong Kong	0	10	10	5	30	35	45	0	11	11	6	44	50	61
Italy	19	11	30	16	7	23	53	16	23	39	21	10	31	70
Malaysia	0	0	0	0	0	0	0	4	8	12	0	0	0	12
Netherlands	11	18	29	7	10	17	46	21	29	50	12	21	33	83
New Zealand	0	6	6	1	8	9	15	0	18	18	0	0	0	18
Norway	0	7	7	1	5	6	13	0	0	0	5	9	14	14
Philippines	0	0	0	0	0	0	0	8	8	16	0	0	0	16
Singapore	11	6	17	2	2	4	21	19	7	26	0	0	0	26
South Africa	0	0	0	0	0	0	0	0	0	0	4	7	11	11
Spain	8	1	9	30	3	33	42	0	0	0	71	4	75	75
Sweden	34	16	50	3	4	7	57	52	33	85	3	8	11	96
Switzerland	9	43	52	2	6	8	60	10	79	89	4	14	18	107
Turkey	4	1	5	2	7	9	14	0	0	0	5	10	15	15
UK	46	53	99	40	44	84	183	99	131	230	61	80	141	371
Total	319	768	1,087	200	267	467	1,554	629	1,237	1,866	333	389	722	2,588

Note: Table 2 presents the sample constitution for analyzing firms' choice of source of debt financing (H1) and cost of debt (H2 and H3) by country. The sample period is 2008-2016. For analyzing the effect of capitalized R&D on firms' choice of source of debt financing, we deleted multiple debt debt issues of the same type by the same firm within the same year (Dhaliwal et al., 2011; Florou & Kosi, 2015; Ball et al., 2017). This results in a total sample of 1,554 debt issues, of which 1,087 are bonds and 467 are loans. To examine the effect of capitalized R&D on firms' cost of debt, we followed prior literature (Eberhart et al., 2008; Barath et al., 2008; Florou & Kosi, 2015; Francis et al., 2017) and retained multiple debt issues of a firm in the same year, as debt issues differ in their contractual terms. This resulted in a total sample of 1,866 (722) bond (syndicated loan) issues for the cost of public (private) debt. Of these, 629 (333) are bond (syndicated loan) issues, where the bond (syndicated loan) issuing firm capitalized R&D in the fiscal year directly prior to the debt issue.

Table 3 Panel A: Descriptive statistics – Full Sample						
	n	sd	Mean	min	median	max
Choice of source of debt financing variables						
Bond_Issue	1,554	0.459	0.699	0.000	1.000	1.000
%_of_Bond_Debt	1,455	0.434	0.716	0.000	1.000	1.000
Bond-specific variables						
Cost_of_debt (in basis points)	1,866	119.280	200.831	40.500	177.000	471.200
Debt_Amount (in mil. US$)	1,866	429.307	431.309	31.281	250.000	1449.485
Maturity (in months)	1,866	45.160	76.549	12.230	64.000	182.670
Callable	1,866	0.350	0.143	0.000	0.000	1.000
Private_Placement	1,866	0.428	0.242	0.000	0.000	1.000
Loan-specific variables						
Cost_of_debt (in basis points)	722	141.105	209.432	20.000	180.000	640.500
Debt_Amount (in mil. US$)	722	1561.524	1106.591	27.977	352.390	5506.609
Maturity (in months)	722	19.101	49.401	12.170	54.770	85.230
Term_Loan	722	0.499	0.461	0.000	0.000	1.000
Firm- and country-specific variables						
RD_Intensity	1,455	0.034	0.025	0.000	0.013	0.171
RDCap	1,455	0.008	0.003	0.000	0.000	0.042
RDExp	1,455	0.032	0.022	0.000	0.010	0.166
Lag_RDCap	1,455	0.008	0.003	0.000	0.000	0.042
CAP	1,455	0.470	0.329	0.000	0.000	1.000
RD_Value	1,455	569.357	171.379	-241.250	16.511	4254.213
Cut_RD	1,455	0.460	0.303	0.000	0.000	1.000
Beat_Zero	1,455	0.169	0.030	0.000	0.000	1.000
Beat_Past	1,455	0.381	0.177	0.000	0.000	1.000
Beat_Bench	1,455	0.397	0.196	0.000	0.000	1.000
log(Size)	1,455	1.761	15.643	10.390	15.493	19.903
MTB	1,455	2.180	2.588	0.342	2.026	14.656
Leverage	1,455	0.140	0.303	0.029	0.287	0.646
ROA	1,455	0.055	0.068	-0.089	0.064	0.226
Tangibility	1,455	0.197	0.296	0.011	0.253	0.812
O_Score	1,455	1.093	-4.100	-6.727	-4.125	-1.435
Rated	1,455	0.459	0.300	0.000	0.000	1.000
Invest_Grade	1,455	0.343	0.864	0.000	1.000	1.000
Issue_Both	1,455	0.253	0.069	0.000	0.000	1.000
NI	1,054	0.533	0.702	-0.055	0.552	3.052
Capex	1,054	0.093	0.085	0.004	0.052	0.599
Returns_Var	1,054	0.043	0.089	0.029	0.080	0.270
log(Fees)	1,243	1.802	7.611	3.784	7.587	13.412
ADR	1,243	0.456	0.294	0.000	0.000	1.000
Loss	1,243	0.318	0.114	0.000	0.000	1.000
Invrec	1,243	0.160	0.287	0.036	0.276	0.696
Opinion	1,243	0.040	0.002	0.000	0.000	1.000
Big4	1,243	0.436	0.745	0.000	1.000	1.000
log(#_Segments)	1,243	0.492	1.551	0.000	1.609	2.398
ASD	1,455	0.255	0.590	0.203	0.642	1.000

Table 3 Panel A continued:

Corruption	1,455	2.031	3.490	0.500	2.700	6.500
Enforcement	1,455	7.472	42.460	20.000	44.000	54.000
GDP_Growth	1,455	3.475	3.136	-5.482	2.277	10.636
Law	1,455	0.413	0.219	0.000	0.000	1.000
Country_PoD	2,588	0.006	0.020	0.010	0.018	0.051
Exchange_Risk	2,588	0.025	0.036	0.001	0.030	0.131
Term_Spread	2,588	0.739	1.291	-0.303	1.296	2.815

Table 3 Panel B: Descriptive statistics across Capitalizers and Expensers

	Capitalizers					*Expensers*					*Comparison*	
	N	*mean*	*min*	*median*	*max*	*n*	*mean*	*min*	*median*	*max*	*t-test*	*Wilcox*
Choice of source of debt financing variables												
Bond_Issue	519	0.615	0.000	1.000	1.000	1,035	0.742	0.000	1.000	1.000	5.207***	5.164***
%_of_Bond_Debt	479	0.626	0.000	1.000	1.000	976	0.787	0.000	1.000	1.000	5.624***	5.651***
Bond-specific variables												
Cost_of_debt (in bp)	629	203.789	40.500	176.100	471.200	1,237	199.327	40.500	177.000	471.200	-0.764	-0.512
Debt_Amount (in mil. US$)	629	461.268	31.281	320.675	1449.485	1,237	416.075	31.281	233.958	1449.485	-2.152**	-2.407**
Maturity (in months)	629	82.327	12.230	74.900	182.670	1,237	73.611	12.230	61.200	182.670	-3.957***	-5.288***
Callable	629	0.141	0.000	0.000	1.000	1,237	0.144	0.000	0.000	1.000	0.140	0.140
Private_Placement	629	0.246	0.000	0.000	1.000	1,237	0.239	0.000	0.000	1.000	-0.340	-0.340
Loan-specific variables												
Cost_of_debt (in bp)	333	216.036	20.000	200.000	640.500	389	203.779	20.000	170.000	640.500	-1.164	-2.153**
Debt_Amount	333	1004.330	27.977	322.290	5506.609	389	1194.131	27.977	415.791	5506.609	1.630	1.524
Maturity	333	50.318	12.170	57.100	85.230	389	48.617	12.170	48.700	85.230	-1.194	-1.440
Term_Loan	333	0.465	0.000	0.000	1.000	389	0.458	0.000	0.000	1.000	-0.212	-0.212
Firm-specific and country variables												
RD_Intensity	479	0.035	0.000	0.022	0.171	976	0.020	0.000	0.009	0.171	-8.107***	-8.309***
RDCap	479	0.009	0.000	0.004	0.042	976						
RDExp	479	0.026	0.000	0.015	0.166	976	0.020	0.000	0.009	0.166	-3.225***	-0.751
Lag_RDCap	479	0.009	0.000	0.005	0.042	976	0.000	0.000	0.000	0.007	-25.133***	-35.414***
RD_Value	479	75.515	-241.250	5.724	4254.213	976	218.427	-241.250	26.882	4254.213	4.529***	9.190***
Cut_RD	479	0.344	0.000	0.000	1.000	976	0.283	0.000	0.000	1.000	-2.409**	-2.405**
Beat_Zero	479	0.069	0.000	0.000	1.000	976	0.010	0.000	0.000	1.000	-6.287***	-6.205***
Beat_Past	479	0.259	0.000	0.000	1.000	976	0.136	0.000	0.000	1.000	-5.827***	-5.761***

Table 3 Panel B continued

	Capitalizers					*Expensers*					*Comparison*	
	n	*Mean*	*min*	*median*	*max*	*n*	*mean*	*min*	*median*	*max*	*t-test*	*Wilcox*
Beat_Bench	479	0.305	0.000	0.000	1.000	976	0.142	0.000	0.000	1.000	-7.468***	-7.332***
log(Size)	479	15.860	10.839	15.965	19.903	976	15.536	10.390	15.377	19.687	-3.308***	-3.501***
MTB	479	2.578	0.342	2.026	14.656	976	2.592	0.342	2.026	14.656	0.112	0.306
Leverage	479	0.297	0.029	0.275	0.646	976	0.306	0.029	0.294	0.646	1.113	1.418
ROA	479	0.061	-0.089	0.061	0.226	976	0.071	-0.089	0.066	0.226	3.154***	2.764***
Tangibility	479	0.242	0.011	0.204	0.812	976	0.323	0.011	0.293	0.812	7.498***	7.676***
O_Score	479	-3.838	-6.727	-3.890	-1.435	976	-4.228	-6.727	-4.233	-1.435	-6.493***	-6.104***
Rated	479	0.399	0.000	0.000	1.000	976	0.252	0.000	0.000	1.000	-5.798***	-5.734***
Invest_Grade	479	0.806	0.000	1.000	1.000	976	0.892	0.000	1.000	1.000	4.555***	4.524***
Issue_Both	479	0.090	0.000	0.000	1.000	976	0.058	0.000	0.000	1.000	-2.225**	-2.222**
NI	384	0.804	-0.055	0.634	3.052	670	0.644	-0.055	0.514	3.052	-4.747***	-5.087***
Capex	384	0.066	0.004	0.039	0.599	670	0.096	0.004	0.064	0.599	5.057***	7.463***
Returns_Var	384	0.088	0.029	0.079	0.270	670	0.090	0.029	0.081	0.270	1.007	1.242
log(Fees)	398	8.377	4.344	8.327	13.412	845	7.250	3.784	7.237	11.321	-10.743***	-10.132***
ADR	398	0.384	0.000	0.000	1.000	845	0.251	0.000	0.000	1.000	-4.865***	-4.821***
Loss	398	0.141	0.000	0.000	1.000	845	0.102	0.000	0.000	1.000	-2.015**	-2.012**
Invrec	398	0.313	0.036	0.312	0.696	845	0.275	0.036	0.250	0.696	-3.983***	-4.935***
Opinion	398	0.003	0.000	0.000	1.000	845	0.001	0.000	0.000	1.000	-0.545	-0.545
Big4	398	0.940	0.000	1.000	1.000	845	0.653	0.000	1.000	1.000	-11.347***	-10.805***
log(#_Segments)	398	1.608	0.000	1.609	2.398	845	1.524	0.000	1.609	2.398	-2.829***	-1.979**
ASD	479	0.511	0.203	0.379	1.000	976	0.628	0.203	0.762	1.000	8.401***	7.756***
Corruption	479	2.791	0.700	2.300	6.500	976	3.833	0.500	3.000	6.500	9.468***	6.918***
Enforcement	479	44.307	20.000	45.000	54.000	976	41.554	20.000	37.000	54.000	-6.702***	-7.528***
GDP_Growth	479	1.352	-5.482	1.476	10.636	976	4.011	-5.482	3.102	10.636	14.693***	13.437***
Law	479	0.259	0.000	0.000	1.000	976	0.199	0.000	0.000	1.000	-2.611***	-2.606***
Country_PoD	962	0.020	0.010	0.019	0.051	1,626	0.019	0.010	0.018	0.051	-2.400**	-4.756***
Exchange_Risk	962	0.040	0.001	0.036	0.131	1,626	0.033	0.001	0.025	0.131	-7.372***	-10.724***
Term_Spread	962	1.504	-0.303	1.555	2.815	1,626	1.165	-0.303	1.042	2.815	-11.575***	-11.795***

Notes: Panel A reports descriptive statistics for the full sample. Panel B reports descriptive statistics across Capitalizers and Expensers. T-test reports t-statistics for differences in means between the two groups (two-tailed). Wilcox reports z-statistics for the Wilcoxon ranksum test (Mann-Whitney) to test the equality of the population between the two groups (two-tailed). Bond- and loan-specific variables are presented at issue-level, as every debt issue differs in its contractual terms. Firm-specific and country variables are presented at firm-year level. The variable *Bond_Issue* is a dummy variable which is equal to one if a debt issue is a bond issue, and zero otherwise. It is presented after multiple bonds/loans issued by the same firm within the same year are deleted. *%_of_Bond_debt* is calculated for each firm-year and equals the ratio of the total amount of borrowed public debt to the total amount of borrowed debt (public and private). *Cost_of_debt* for bonds is measured as the difference in basis points between the yield to maturity of a corporate bond at issue date and the interest yield of a treasury security (T-bill) issued by the same country with comparable maturity to the corporate bond. *Cost_of_debt* for syndicated loans is defined as the amount the borrower pays in basis points over LIBOR or a LIBOR equivalent. *Debt_Amount* is the size of each bond issue/syndicated loan facility in millions of USD. *Maturity* is the number of months from the date the debt is issued until its maturity. *Callable* is a dummy variable which is equal to one if a bond has a call feature, and zero otherwise. *Private_Placement* is a dummy variable which is equal to one if a bond is issued through private placements, and zero otherwise. *Term_Loan* is a dummy variable which is equal to one if a syndicated loan is a term loan, and zero otherwise. *RD_Intensity* is a firm's total R&D expenditures divided by sales. *RDCap* is the amount of R&D a firm capitalized during a year divided by sales. *RDExp* is the amount of R&D a firm expensed during a year divided by sales. *Lag_RDCap* is the amount of R&D a firm capitalized in the previous year divided by previous year's sales. *RD_Value* is the difference between market and book value of equity divided by current and lagged R&D expenditures. *Cut_RD* is a dummy variable which is equal to one if current R&D expenditures are lower than the previous year's R&D expenditures, and zero otherwise. *Beat_Zero* is a dummy variable which is equal to one if the current year's earnings assuming full expensing are smaller than the zero earnings threshold and the current year's earnings assuming full capitalization are greater than the zero earnings threshold, and zero otherwise. *Beat_Past* is a dummy variable which is equal to one if a firm's prior year earnings are higher than current year's earnings assuming full expensing and smaller than current year's earnings assuming full capitalization, and zero otherwise. *Beat_Bench* is a dummy which is equal to one if *Beat_Zero* and/or *Beat_Past* is equal to one, and zero otherwise. *Log(Size)* is the natural logarithm of total assets. *MTB* is the market value divided by the book value. *Leverage* is the ratio between total debt and total assets. *ROA* is the return on assets calculated as the ratio between EBIT and total assets. *Tangibility* is defined as the ratio between PPE and total assets. *O_Score* is Ohlson's measure of default risk. *Rated* is a dummy variable which is equal to one if a firm's debt issue is rated, and zero otherwise. *Invest_Grade* is a dummy variable which is equal to one if a firm's debt issue has an investment grade rating, and zero otherwise. *Issue_Both* is a dummy variable which is equal to one if a firm issues at least one bond and one syndicated loan in a year. *NI* is the sum of future earnings measured from year t+1 to year t+3 scaled by the market value of equity. *Capex* is a firm's capital expenditures divided by sales. *Returns_Var* is the standard deviation of a firm's monthly stock return over the last fiscal year. *Log(Fees)* is the natural logarithm of audit fees. *ADR* is a dummy variable which is equal to one if a firm has an ADR listed on a US exchange, and zero otherwise. *Loss* is a dummy variable which is equal to one if a negative net income was reported, and zero otherwise. *Invrec* is the sum of inventories and receivables divided by total assets. *Opinion* is a dummy variable which is equal to one if a firm does not receive a standard unqualified audit opinion, and zero otherwise. *Big4* is a dummy variable which is equal to one if an annual report was audited by a Big 4 auditor, and zero otherwise. *Log(#_Segments)* is the natural logarithm of one plus the number of product segments. *ASD* is the anti-self-dealing index from Djankov et al. (2008). *Country_PoD* is the probability of default of a firm's country of domicile in the year and month the bond/syndicated loan is issued. *Corruption* is the inverse of the Corruption Perception Index (CPI), taking higher values when a country suffers under higher levels of corruption. *Enforcement* is an index capturing the quality of audit function and degree of accounting enforcement in each country (Brown et al., 2014). *Exchange_Risk* controls for the exchange rate volatility of a firm's country of domicile and is measured as the coefficient of variation of daily USD to local currency exchange rates for the twelve months before the bond/syndicated loan is issued. *GDP_Growth* is the annual percentage growth rate of GDP at market prices based on constant local currency. *Law* is a dummy variable which is equal to one if a firm's country of domicile is a common-law country, and zero otherwise. *Term_Spread* is the difference between a government's ten-year and two-year T-bill rate measured at the date a bond/syndicated loan is issued.

Table 4: Choice of source of debt financing – Public Debt Market vs. Private Syndicated Loan Market

	Bond_Issue as dependent variable				*%_ of_Bond_Debt as dependent variable*			
VARIABLES	*Full Sample*	*Full Sample*	*Capitalizers*	*Expensers*	*Full Sample*	*Full Sample*	*Capitalizers*	*Expensers*
	Model 1 – Probit	*Model 2 – IV Probit*	*Model 3 – Probit*	*Model 4 – Probit*	*Model 5 – OLS*	*Model 6 – 2SLS*	*Model 7 – OLS*	*Model 8 – OLS*
Constant	-6.760***	-6.759***	-11.830***	-5.780***	-0.686***	-0.687***	-1.086***	-0.448**
	(-8.28)	(-8.28)	(-6.80)	(-6.08)	(-4.23)	(-4.28)	(-3.66)	(-2.33)
RDCap [a]	22.172***	21.360***	24.212***		5.436***	4.991***	5.656***	
	(3.08)	(2.95)	(2.59)		(3.08)	(2.63)	(2.81)	
RDExp [a]	-0.332	-0.329	-1.096	-1.610	-0.032	-0.015	-0.153	-0.224
	(-0.18)	(-0.18)	(-0.31)	(-0.71)	(-0.07)	(-0.03)	(-0.18)	(-0.43)
log(Size)	0.365***	0.364***	0.546***	0.316***	0.067***	0.067***	0.068***	0.059***
	(5.75)	(5.75)	(5.91)	(3.79)	(5.98)	(6.05)	(4.13)	(4.11)
CAP	-0.318**	-0.312**			-0.079**	-0.075**		
	(-2.35)	(-2.28)			(-2.44)	(-2.26)		
MTB [a]	0.032	0.032	0.020	0.052	0.007	0.007	0.007	0.009
	(1.36)	(1.36)	(0.57)	(1.52)	(1.45)	(1.47)	(0.67)	(1.40)
Issue_Both	-0.456***	-0.455***	-0.276	-0.616***	-0.262***	-0.262***	-0.253***	-0.272***
	(-3.72)	(-3.70)	(-1.39)	(-3.47)	(-8.06)	(-8.16)	(-5.52)	(-5.85)
Leverage [a]	-0.070	-0.064	-0.707	0.192	0.012	0.014	-0.174	0.071
	(-0.17)	(-0.16)	(-0.91)	(0.39)	(0.13)	(0.16)	(-1.12)	(0.68)
Tangibility [a]	0.697**	0.693**	1.010*	0.392	0.146**	0.145**	0.177	0.101
	(2.36)	(2.35)	(1.93)	(1.05)	(2.17)	(2.17)	(1.49)	(1.36)
Rated	1.801***	1.801***	1.983***	1.786***	0.354***	0.353***	0.378***	0.320***
	(11.96)	(11.95)	(8.20)	(8.74)	(10.96)	(11.07)	(8.49)	(7.62)
Invest_Grade	0.355**	0.354**	0.010	0.401**	0.084**	0.083**	0.031	0.090*
	(2.45)	(2.44)	(0.04)	(1.98)	(2.48)	(2.47)	(0.64)	(1.92)
log(Debt_Amount)	-0.708***	-0.708***	-0.974***	-0.628***	-0.134***	-0.134***	-0.138***	-0.121***
	(-7.80)	(-7.80)	(-8.50)	(-5.16)	(-9.19)	(-9.31)	(-6.99)	(-6.19)
log(Maturity)	0.773***	0.773***	1.771***	0.633***	0.118***	0.118***	0.222***	0.090***
	(7.84)	(7.84)	(6.52)	(5.67)	(7.36)	(7.45)	(6.00)	(5.05)
GDP_Growth [a]	0.058*	0.058*	0.045	0.058	0.015**	0.015**	0.015	0.006
	(1.94)	(1.95)	(0.84)	(1.53)	(2.24)	(2.27)	(1.12)	(0.72)
ASD	2.691***	2.690***	2.773**	2.467***	0.638***	0.639***	0.568**	0.540***
	(4.67)	(4.67)	(2.44)	(3.65)	(4.28)	(4.33)	(2.33)	(2.98)
Law	-2.301***	-2.300***	-1.919***	-2.298***	-0.541***	-0.541***	-0.411***	-0.521***
	(-6.74)	(-6.74)	(-2.78)	(-5.84)	(-6.38)	(-6.45)	(-2.86)	(-5.17)
Corruption	-0.074	-0.074	-0.128	-0.051	-0.016	-0.016	-0.038*	0.002
	(-1.42)	(-1.42)	(-1.39)	(-0.72)	(-1.21)	(-1.23)	(-1.97)	(0.13)
Term_Spread [a]	-0.149*	-0.149	0.015	-0.214*	-0.039*	-0.039*	0.004	-0.057**
	(-1.65)	(-1.64)	(0.10)	(-1.89)	(-1.87)	(-1.90)	(0.13)	(-2.08)

Table 4 continued	*Bond_Issue as dependent variable* Full Sample	Full Sample	Capitalizers	Expensers	*%_ of_Bond_Debt as dependent variable* Full Sample	Full Sample	Capitalizers	Expensers
Industry dummies	Included	Included	Included	Included	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included	Included	Included	Included	Included
N	1,554	1,554	519	1,035	1,455	1,455	479	976
Test on endogeneity		0.261				0.248		
Kleibergen-Paap		22.797**				27.700**		
Hansen J Statistic		4.077				6.188		
(Pseudo) – Adj. R2	0.423	0.452	0.480	0.392	0.40	0.40	0.45	0.37
Cluster	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Mean VIF	2.83	2.84	3.19	3.04	2.85	2.86	3.17	3.06

Notes: This table reports results regarding the effect of capitalized R&D on firms' propensity for issuing bonds rather than borrowing funds from the syndicated loan market. Models 1 to 4 are estimated using a probit model with *Bond_Issue* as the dependent variable. This variable is equal to one if a debt issue is a bond issue, and zero otherwise. Models 4 to 8 are estimated using OLS with *%_of_Bond_Debt* as the dependent variable. This variable is calculated for each firm-year and equals the ratio of the total amount of borrowed public debt to the total amount of debt (public and private). Models 3 and 7 (4 and 8) are estimated for Capitalizers (Expensers) only. Models 2 and 4 control for endogenity of R&D capitalization by documenting results from a two-stage-model (IV Probit/2SLS) estimation. *RDCap* is the amount of R&D a firm capitalized during a year divided by sales. *RDExp* is the amount of R&D a firm expensed during a year divided by sales. *Log(Size)* is the natural logarithm of total assets. *CAP* is a dummy variable which is equal to one if a firm capitalized R&D in the fiscal year directly prior to the debt issue date, and zero otherwise. *MTB* is the market value divided by the book value. *Issue_Both* is a dummy variable which is equal to one if a firm issues at least one bond and one syndicated loan in a year, and zero otherwise. *Leverage* is the ratio between total debt and total assets. *Tangibility* is defined as the ratio between PPE and total assets. *Rated* is a dummy variable which is equal to one if a debt issue is rated, and zero otherwise. *Invest_Grade* is a dummy variable which is equal to one if a debt issue has an investment grade rating, and zero otherwise. *Log(Debt_Amount)* is the natural logarithm of the size of each debt issue. *Log(Maturity)* is the natural logarithm of the number of months from the date the bond/syndicated loan is issued until its maturity. *GDP_Growth* is the annual percentage growth rate of GDP at market prices based on constant local currency. *ASD* is the anti-self-dealing index from Djankov et al. (2008). *Law* is a dummy variable which is equal to one if a firm's country of domicile is a common-law country, and zero otherwise. *Corruption* is the inverse of the Corruption Perception Index (CPI), taking higher values when a country suffers under higher levels of corruption. *Term_Spread* is defined as the difference between a government's ten-year and two-year T-bill rate measured at the date a bond/syndicated loan is issued. VIF is the Variance Inflation factor. Z-statistics (t-statistics) for models 1 to 4 (models 5 to 8) based on clustered standard errors at firm-level are reported in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% (two-tailed) level, respectively. [a] Variables winsorized at the top and bottom 1 percentiles.

Table 5: Cost of public debt				
	Full Sample	*Full Sample*	*Expensers*	*Capitalizers*
VARIABLES	*Model 1 – OLS*	*Model 2 – 2SLS*	*Model 3 – OLS*	*Model 4 – OLS*
Constant	784.600***	787.212***	726.882***	823.457***
	(12.67)	(12.80)	(8.85)	(8.33)
RDCap [a]	-67.367	-509.582		-1197.287**
	(-0.11)	(-0.75)		(-2.09)
RDExp [a]	-198.115	-181.342	-474.817***	422.775
	(-1.52)	(-1.41)	(-2.93)	(1.40)
log(Size)	-26.398***	-26.366***	-30.584***	-21.793***
	(-8.75)	(-8.82)	(-8.49)	(-4.44)
CAP	-0.503	3.512		
	(-0.05)	(0.35)		
ROA [a]	-483.449***	-487.856***	-493.166***	-393.312***
	(-5.48)	(-5.58)	(-4.61)	(-2.65)
MTB [a]	-0.894	-0.929	-1.762	-1.019
	(-0.46)	(-0.48)	(-0.69)	(-0.34)
Leverage [a]	98.068***	100.744***	83.620**	83.573*
	(3.51)	(3.64)	(2.32)	(1.93)
Tangibility [a]	-7.191	-9.387	10.960	-115.289***
	(-0.29)	(-0.39)	(0.37)	(-3.02)
Invest_Grade	-97.783***	-98.643***	-57.821***	-160.545***
	(-6.22)	(-6.31)	(-2.91)	(-12.73)
log(Debt_Amount)	-5.387	-5.432	0.143	-13.642**
	(-1.32)	(-1.35)	(0.03)	(-2.03)
log(Maturity)	2.026	1.769	6.652	10.585
	(0.33)	(0.29)	(0.85)	(0.99)
Callable	18.798*	18.439*	32.075**	-4.577
	(1.84)	(1.82)	(2.33)	(-0.33)
Private_Placement	-4.940	-4.940	2.762	-14.408
	(-0.50)	(-0.50)	(0.23)	(-0.84)
Exchange_Risk [a]	356.434*	355.163*	207.004	832.957***
	(1.83)	(1.84)	(0.81)	(3.35)
Country_PoD [a]	3162.498***	3150.988***	3877.427***	1837.750**
	(4.29)	(4.30)	(4.17)	(1.98)
Industry dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
N	1,866	1,866	1,237	629
Test on endogeneity		1.243		
Kleibergen-Paap		31.002**		
Hansen J Statistic		6.788		
Adj. R2	0.36	0.36	0.34	0.46
Cluster	Firm	Firm	Firm	Firm
Mean VIF	2.25	2.27	2.22	3.31

Notes: This table reports results regarding the influence of capitalized R&D on the cost of public debt. Models 1 and 2 are estimated for the full sample, while models 3 and 4 are estimated separately for Expensers and Capitalizers. Model 2 controls for the endogenity of R&D capitalization by documenting results from a two-stage-model (2SLS) estimation. Dependent variable is a firm's *Cost_of_debt* measured as the difference in basis points between the yield to maturity of a corporate bond at issue date and the interest yield of a treasury security (T-bill) issued by the same country with comparable maturity to the corporate bond. *RDCap* is the amount of R&D a firm capitalized during a year divided by sales. *RDExp* is the amount of R&D a firm expensed during a year divided by sales. *Log(Size)* is the natural logarithm of total assets. *CAP* is a dummy variable which is equal to one if a firm capitalized R&D in the fiscal year directly prior to the date a bond is issued, and zero otherwise. *ROA* is the return on assets, calculated as the ratio between EBIT and total assets. *MTB* is the market value divided by the book value. *Leverage* is the ratio between total debt and total assets. *Tangibility* is defined as the ratio between PPE and total assets. *Invest_Grade* is a dummy variable which is equal to one if a bond issue has an investment grade rating, and zero otherwise. *Log(Debt_Amount)* is the natural logarithm of the size of each bond. *Log(Maturity)* is the natural logarithm of the number of months from the date the bond is issued until its maturity. *Callable* is a dummy variable which is equal to one if a bond has a call feature, and zero otherwise. *Private_Placement* is a dummy variable which is equal to one if a bond is issued through private placements, and zero otherwise. *Exchange_Risk* controls for the exchange rate volatility of a firm's country of domicile and is measured as the coefficient of variation of daily USD to local currency exchange rates for the twelve months before the issue date. *Country_PoD* measures the probability of a firm's country of domicile on the year and month the bond is issued. VIF is the Variance Inflation factor. T-Statistics based on clustered standard errors at firm-level are reported in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% (two-tailed) level, respectively. [a] Variables winsorized at the top and bottom 1 percentiles.

Table 6: Cost of private debt				
	Full Sample	*Full Sample*	*Expensers*	*Capitalizers*
VARIABLES	*Model 1 – OLS*	*Model 2 – 2SLS*	*Model 3 – OLS*	*Model 4 – OLS*
Constant	434.391***	426.309***	439.515***	465.316***
	(5.72)	(5.71)	(3.79)	(4.94)
RDCap [a]	-1060.444	-183.457		-2704.027**
	(-1.05)	(-0.12)		(-2.24)
RDExp [a]	-173.056	-186.849	-379.007	424.646
	(-0.84)	(-0.91)	(-1.30)	(0.97)
log(Size)	-18.692***	-18.171***	-15.286	-27.356***
	(-2.83)	(-2.80)	(-1.62)	(-3.92)
CAP	-3.281	-9.174		
	(-0.21)	(-0.55)		
ROA [a]	-243.169*	-236.085*	-142.990	-481.537**
	(-1.84)	(-1.81)	(-0.86)	(-2.46)
MTB [a]	-5.210**	-5.422**	-7.246*	-3.702
	(-2.02)	(-2.10)	(-1.72)	(-0.88)
Leverage [a]	203.779***	200.993***	196.963**	217.560**
	(3.55)	(3.55)	(2.51)	(2.58)
Tangibility [a]	-45.917	-43.380	-42.572	-61.197
	(-1.36)	(-1.31)	(-0.94)	(-1.21)
Invest_Grade	-44.053**	-44.512**	-84.694***	11.576
	(-2.07)	(-2.14)	(-3.22)	(0.43)
log(Debt_Amount)	-7.874	-8.220	-12.588	0.831
	(-1.20)	(-1.28)	(-1.49)	(0.11)
log(Maturity)	11.161	11.585	25.351**	-6.723
	(1.16)	(1.23)	(2.44)	(-0.42)
Term_Loan	69.744***	69.681***	68.724***	60.802***
	(7.73)	(7.92)	(5.03)	(4.88)
Exchange_Risk [a]	517.499*	532.555*	1001.788**	-141.577
	(1.82)	(1.92)	(2.46)	(-0.31)
Country_PoD [a]	2220.254**	2252.749***	1312.871	3535.400***
	(2.50)	(2.59)	(1.00)	(2.79)
Industry dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
N	722	722	389	333
Test on endogeneity		0.435		
Kleibergen-Paap		13.222*		
Hansen J Statistic		3.189		
Adj. R2	0.43	0.43	0.46	0.49
Cluster	Firm	Firm	Firm	Firm
Mean VIF	2.01	2.02	2.09	2.49

Notes: This table reports results regarding the influence of capitalized R&D on the cost of private debt. Models 1 and 2 are estimated for the full sample, while models 3 and 4 are estimated separately for Expensers and Capitalizers. Model 2 controls for endogenity of R&D capitalization by documenting results from a two-stage-model (2SLS) estimation. Dependent variable is a firm's *Cost_of_debt* in a syndicated loan deal. It is measured as the amount the borrower pays in basis points over LIBOR or a LIBOR equivalent for each dollar drawn. *RDCap* is the amount of R&D a firm capitalized during a year divided by sales. *RDExp* is the amount of R&D a firm expensed during a year divided by sales. *Log(Size)* is the natural logarithm of total assets. *CAP* is a dummy variable which is equal to one if a firm capitalized R&D in the fiscal year directly prior to the date a syndicated loan is obtained, and zero otherwise. *ROA* is the return on assets, calculated as the ratio between EBIT and total assets. *MTB* is the market value divided by the book value. *Leverage* is the ratio between total debt and total assets. *Tangibility* is defined as the ratio between PPE and total assets. *Invest_Grade* is a dummy variable which is equal to one if a syndicated loan has an investment grade rating, and zero otherwise. *Log(Debt_Amount)* is the natural logarithm of the size of each loan facility. *Log(Maturity)* is the natural logarithm of the number of months from the date the syndicated loan is obtained until its maturity. *Term_Loan* is a dummy variable which is equal to one if a syndicated loan is a term loan, and zero otherwise. *Exchange_Risk* controls for the exchange rate volatility of a firm's country of domicile and is measured as the coefficient of variation of daily USD to local currency exchange rates for the twelve months before the issue date. *Country_PoD* measures the probability of a firm's country of domicile on the year and month the syndicated loan is obtained. VIF is the Variance Inflation factor. T-Statistics based on clustered standard errors at firm-level are reported in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% (two-tailed) level, respectively. [a] Variables winsorized at the top and bottom 1 percentiles.

Table 7: Cost of debt – Signaling vs. Earnings Management				
	Cost of public debt		*Cost of private debt*	
VARIABLES	*Model 1 – Signaling*	*Model 2 – Earn. Mgmt.*	*Model 3 – Signaling*	*Model 4 – Earn. Mgmt.*
Constant	850.568***	810.505***	435.802***	424.393***
	(6.29)	(6.60)	(3.06)	(3.21)
RDCap [a]	-2722.051***	-826.616	-3590.260**	-1025.460
	(-2.89)	(-1.19)	(-2.21)	(-0.66)
RDExp [a]	915.627	112.268	595.915	-271.250
	(1.64)	(0.34)	(1.05)	(-0.67)
log(Size)	-13.595**	-25.778***	-28.806***	-20.241**
	(-2.19)	(-4.33)	(-3.19)	(-2.04)
ROA [a]	-131.353	-530.552***	-436.213	-488.219**
	(-0.59)	(-2.80)	(-1.47)	(-2.04)
MTB [a]	-0.143	-3.126	-6.737	-2.111
	(-0.03)	(-0.86)	(-1.12)	(-0.48)
Leverage [a]	3.062	151.331***	189.588	203.566**
	(0.06)	(2.92)	(1.36)	(2.20)
Tangibility [a]	-127.956**	-90.911**	-79.053	-86.326
	(-2.16)	(-2.05)	(-0.81)	(-1.27)
Invest_Grade	-200.262***	-135.759***	21.379	-3.251
	(-8.22)	(-8.25)	(0.48)	(-0.12)
log(Debt_Amount)	-15.684**	-14.932*	7.336	-7.864
	(-2.35)	(-1.98)	(0.79)	(-0.65)
log(Maturity)	0.986	19.739	-8.896	-9.103
	(0.07)	(1.61)	(-0.37)	(-0.43)
Callable	-29.341	0.632		
	(-1.21)	(0.04)		
Private_Placement	7.104	-27.645		
	(0.30)	(-1.46)		
Term_Loan			75.273***	54.222***
			(4.49)	(2.95)
Exchange_Risk [a]	360.561	1218.158***	-672.988	792.308
	(0.78)	(3.36)	(-1.09)	(1.18)
Country_PoD [a]	1942.008	166.954	4545.535**	2221.448
	(1.08)	(0.12)	(2.34)	(1.27)
Industry dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
N	258	371	187	146
Adj. R2	0.46	0.49	0.40	0.61
Cluster	Firm	Firm	Firm	Firm
Mean VIF	5.72	3.07	3.32	3.06

Notes: This table reports OLS results regarding the influence of capitalized R&D on the cost of public (models 1 and 2) and private debt (models 3 and 4) conditional on a firm's motives for R&D capitalization. Models 1 and 3 include Capitalizers, for which R&D capitalization is not related to earnings management incentives. Models 2 and 4 include Capitalizers, for which R&D capitalization is related to earnings management incentives. *Cost_of_debt* for bonds is measured as the difference in basis points between the yield to maturity of a corporate bond at issue date and the interest yield of a treasury security (T-bill) issued by the same country with comparable maturity to the corporate bond. *Cost_of_debt* for syndicated loans is defined as the amount the borrower pays in basis points over LIBOR or a LIBOR equivalent for each dollar drawn. *RDCap* is the amount of R&D a firm capitalized during a year divided by sales. *RDExp* is the amount of R&D a firm expensed during a year divided by sales. *Log(Size)* is the natural logarithm of total assets. *ROA* is the return on assets calculated as the ratio between EBIT and total assets. *MTB* is the market value divided by the book value. *Leverage* is the ratio between total debt and total assets. *Tangibility* is defined as the ratio between PPE and total assets. *Invest_Grade* is a dummy variable which is equal to one if a debt issue has an investment grade rating, and zero otherwise. *Log(Debt_Amount)* is the natural logarithm of the size of each bond issue/syndicated loan facility. *Log(Maturity)* is the natural logarithm of the number of months from the date the bond/syndicated loan is issued until its maturity. *Callable* is a dummy variable which is equal to one if a bond has a call feature, and zero otherwise. *Private_Placement* is a dummy variable which is equal to one if a bond is issued through private placements, and zero otherwise. *Term_Loan* is a dummy variable which is equal to one if a syndicated loan is a term loan, and zero otherwise. *Exchange_Risk* controls for the exchange rate volatility of a firm's country of domicile and is measured as the coefficient of variation of daily USD to local currency exchange rates for the twelve months before the date a bond/syndicated loan is issued. *Country_PoD* measures the probability of a firm's country of domicile on the year and month the bond/syndicated loan is issued. VIF is the Variance Inflation factor. T-

Statistics based on clustered standard errors at firm-level are reported in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% (two-tailed) level, respectively. [a] Variables winsorized at the top and bottom 1 percentiles.

Table 8: R&D Capitalization and future benefits			
	Capitalizers	*Capitalizers – Signaling*	*Capitalizers – Earn. Mgmt.*
VARIABLES	*Model 1 – OLS*	*Model 2 – OLS*	*Model 3 – OLS*
Constant	-0.788*	-0.514	-1.056*
	(-1.96)	(-1.10)	(-1.74)
RDCap [a]	11.502**	19.318**	6.300
	(2.18)	(2.38)	(1.21)
RDExp [a]	-0.667	-2.233	0.725
	(-0.55)	(-1.27)	(0.49)
Capex [a]	-0.287	0.050	-0.670
	(-0.50)	(0.09)	(-0.55)
log(Size)	0.035	0.054**	0.020
	(1.46)	(1.99)	(0.66)
MTB [a]	-0.070***	-0.083***	-0.075**
	(-3.66)	(-4.12)	(-2.32)
Returns_Var [a]	3.014***	2.850**	3.271**
	(2.85)	(2.30)	(2.35)
Tangibility [a]	0.425	0.078	0.714**
	(1.53)	(0.23)	(2.35)
ADR	0.214**	0.150*	0.368**
	(2.16)	(1.72)	(2.54)
ASD	-0.312**	-0.149	-0.281
	(-2.21)	(-0.72)	(-1.30)
Enforcement	0.015***	0.009	0.019***
	(3.10)	(1.47)	(3.00)
Corruption	0.018	0.014	0.047
	(0.63)	(0.53)	(1.18)
Industry dummies	Included	Included	Included
Year dummies	Included	Included	Included
N	384	173	211
Adj. R2	0.30	0.36	0.35
Cluster	Firm	Firm	Firm
Mean VIF	2.35	2.94	2.41

Notes: This table reports OLS results regarding the effect of a capitalizing firm's R&D investments on future benefits. Model 1 documents the association between capitalized R&D and future benefits, irrespective of the firm's earnings management incentives. Model 2 includes Capitalizers, for which R&D capitalization is not related to earnings management incentives. Model 3 includes Capitalizers, for which R&D capitalization is related to earnings management incentives. The dependent variable is *NI,* which reflects a firm's future benefits. It is calculated as the sum of future earnings measured from year t+1 to year t+3 scaled by the market value of equity. *RDCap* is the amount of R&D a firm capitalized during a year divided by sales. *RDExp* is the amount of R&D a capitalizing firm expensed during a year divided by sales. *Capex* is a firm's capital expenditures divided by sales. *Log(Size)* is the natural logarithm of total assets. *MTB* is the market value divided by the book value. *Returns_Variability* is the standard deviation of a firm's monthly stock returns over the fiscal year. *Tangibility* is defined as the ratio between PPE and total assets. *ADR* is a dummy variable which is equal to one if a firm has an ADR listed on a US exchange, and zero otherwise. *ASD* is the anti-self-dealing index from Djankov et al. (2008). *Enforcement* is an index capturing the quality of audit function and degree of accounting enforcement in each country (Brown et al., 2014). *Corruption* is the inverse of the Corruption Perception Index (CPI), taking higher values when a country suffers under higher levels of corruption. VIF is the Variance Inflation factor. T-Statistics based on clustered standard errors at firm-level are reported in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% (two-tailed) level, respectively.[a] Variables winsorized at the top and bottom 1 percentiles.

Table 9: R&D Capitalization and audit fees			
	Full Sample	*Full Sample*	*Full Sample*
VARIABLES	*Model 1 – 2SLS*	*Model 2 – OLS*	*Model 3 – OLS*
Constant	-3.152***	-3.161***	-3.162***
	(-7.76)	(-7.83)	(-7.89)
RDCap [a]	7.610**	-4.329	
	(2.08)	(-0.96)	
RDExp [a]	-0.987	-0.724	
	(-0.90)	(-0.64)	
CAP		0.280***	0.238***
		(3.16)	(3.36)
log(Size)	0.625***	0.628***	0.625***
	(27.99)	(28.28)	(28.31)
MTB [a]	0.053***	0.052***	0.050***
	(4.22)	(4.08)	(3.97)
ROA [a]	-0.328	-0.288	-0.211
	(-0.48)	(-0.41)	(-0.30)
Leverage [a]	-0.926***	-0.929***	-0.914***
	(-3.52)	(-3.60)	(-3.55)
Loss	0.169*	0.168*	0.173*
	(1.73)	(1.71)	(1.76)
Invrec [a]	-0.014	-0.058	-0.059
	(-0.06)	(-0.26)	(-0.26)
Opinion	-0.044	-0.040	-0.019
	(-0.17)	(-0.21)	(-0.10)
ADR	0.357***	0.322***	0.327***
	(3.83)	(3.40)	(3.53)
Big4	1.144***	1.101***	1.104***
	(13.96)	(13.07)	(13.18)
log(#_Segments) [a]	0.125**	0.119**	0.125**
	(2.22)	(2.08)	(2.25)
Exchange_Risk [a]	11.102***	10.275***	10.354***
	(5.85)	(5.48)	(5.53)
ASD	-0.563***	-0.541***	-0.528***
	(-3.97)	(-3.83)	(-3.80)
Industry dummies	Included	Included	Included
Year dummies	Included	Included	Included
N	1,243	1,243	1,243
Test on endogeneity	2.715*		
Kleibergen-Paap	29.601***		
Hansen J Statistic	64.195***		
Adj. R2	0.84	0.84	0.84
Cluster	Firm	Firm	Firm
Mean VIF	2.10	2.11	2.11

Notes: This table reports results regarding the effect of R&D capitalization on audit fees. While models 2 and 3 are estimated using OLS, model 1 controls for endogenity of R&D capitalization by documenting results from a two-stage-model (2SLS) estimation.The dependent variable is *log(Fees)*, which is the natural logarithm of audit fees in thousands of USD. *RDCap* is the amount of R&D a firm capitalized during a year divided by sales. *RDExp* is the amount of R&D a firm expensed during a year divided by sales. *CAP* is a dummy variable which is equal to one if a firm capitalized R&D in the fiscal year, and zero otherwise. *Log(Size)* is the natural logarithm of total assets. *MTB* is the market value divided by the book value. *ROA* is the return on assets, calculated as the ratio between EBIT and total assets. *Leverage* is the ratio between total debt and total assets. *Loss* is a dummy variable which is equal to one if a firm reported negative earnings in a fiscal year, and zero otherwise. *Opinion* is a dummy variable which is equal to one when a firm does not receive a standard unqualified audit opinion, and zero otherwise. *ADR* is a dummy variable which is equal to one if a firm has an ADR listed on a US exchange, and zero otherwise. *Big4* is a dummy variable which is equal to one if a firm is audited by a Big 4 auditor, and zero otherwise. *log(#_Segments)* is the natural logarithm of one plus the number of product segments. *Exchange_Risk* controls for the exchange rate volatility of a firm's country of domicile and is measured as the coefficient of variation of daily USD to local currency exchange rates for the twelve months prior to the fiscal year-end date. *ASD* is the anti-self-dealing index from Djankov et al. (2008). VIF is the Variance Inflation factor. T-Statistics based on clustered standard errors at firm-level are reported in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% (two-tailed) level, respectively.[a] Variables winsorized at the top and bottom 1 percentiles.

Table 10: Expected and Discretionary R&D Capitalization

Panel A: Expected and Discretionary R&D Capitalization and firms' propensity to borrow funds from public debt markets rather than the private syndicated loan market

	Bond_Issue	*Bond_Issue*	*%_of_Bond_Debt*	*%_of_Bond_Debt*
VARIABLES	*Model 1 – Full Sample*	*Model 2 – Capitalizers*	*Model 3 – Full Sample*	*Model 4 – Capitalizers*
RDCap_Over	-7.192	24.496	0.139	5.261
	(-0.31)	(0.94)	(0.03)	(0.90)
RDCap_Exp	21.691***	24.056**	5.544***	5.610***
	(3.09)	(2.52)	(3.11)	(2.74)
RDCap_Under	15.411	17.287	4.345	2.387
	(0.73)	(0.73)	(0.66)	(0.35)
RDExp	-0.499	-1.205	-0.065	-0.215
	(-0.27)	(-0.34)	(-0.14)	(-0.24)
CAP	-0.227		-0.063*	
	(-1.52)		(-1.75)	
Debt Issue Controls	Included	Included	Included	Included
Firm & Country Controls	Included	Included	Included	Included
Industry & Year f.e.	Included	Included	Included	Included
N	1,554	519	1,455	479
(Pseudo) – Adj. R2	0.42	0.48	0.40	0.45
Mean VIF	2.79	3.14	2.81	3.12

Panel B: Expected and Discretionary R&D Capitalization and the cost of public debt

	Cost of public debt	*Cost of public debt*	*Cost of public debt*
VARIABLES	*Model 1 – Capitalizers*	*Model 2 – Signaling*	*Model 3 – Earn. Mgmt.*
RDCap_Over	-2461.932	-4782.355	-1486.106
	(-1.11)	(-1.25)	(-0.57)
RDCap_Exp	-1104.543**	-2539.779***	-819.537
	(-2.00)	(-2.76)	(-1.25)
RDCap_Under	-523.405	2931.127	-1387.235
	(-0.34)	(0.30)	(-0.69)
RDExp	399.765	942.652	95.895
	(1.35)	(1.60)	(0.29)
CAP			
Debt Issue Controls	Included	Included	Included
Firm & Country Controls	Included	Included	Included
Industry & Year f.e.	Included	Included	Included
N	629	258	371
Adj. R2	0.46	0.474	0.48
Mean VIF	3.32	5.67	3.14

Panel C: Expected and Discretionary R&D Capitalization and the cost of private debt

	Cost of private debt	*Cost of private debt*	*Cost of private debt*
VARIABLES	*Model 1 – Capitalizers*	*Model 2 – Signaling*	*Model 3– Earn. Mgmt.*
RDCap_Over	-1336.150	-704.847	-1896.575
	(-0.82)	(-0.32)	(-0.46)
RDCap_Exp	-2928.336**	-6939.353**	-1146.493
	(-2.15)	(-2.14)	(-0.63)
RDCap_Under	-929.375	-18111.766	788.707
	(-0.29)	(-0.62)	(0.30)
RDExp	314.906	723.277	-234.294
	(0.89)	(1.27)	(-0.47)
CAP			
Debt Issue Controls	Included	Included	Included
Firm & Country Controls	Included	Included	Included
Industry & Year f.e.	Included	Included	Included
N	333	187	146
Adj. R2	0.49	0.41	0.61
Mean VIF	2.48	3.49	3.12

Panel D: Expected and Discretionary R&D Capitalization and its effect on future benefits and audit fees

	NI	*NI*	*NI*	*Audit fees*
VARIABLES	*Model 1 – Capitalizers*	*Model 2 – Signaling*	*Model 3 – Earn. Mgmt.*	*Model 4 – Full Sample*
RDCap_Over	9.332	16.454	-0.673	-17.082
	(0.80)	(1.22)	(-0.04)	(-1.33)
RDCap_Exp	11.549**	20.336**	6.554	-3.095
	(2.08)	(2.37)	(1.25)	(-0.73)
RDCap_Under	8.652	44.554	4.812	-9.077
	(0.85)	(0.43)	(0.46)	(-0.69)
RDExp	-0.750	-2.212	0.575	-0.704
	(-0.60)	(-1.21)	(0.40)	(-0.63)
CAP				0.297***
				(3.20)
Debt Issue Controls	No	No	No	No
Firm & Country Controls	Included	Included	Included	Included
Industry & Year f.e.	Included	Included	Included	Included
N	384	173	211	1,243
Adj. R2	0.30	0.35	0.34	0.85
Mean VIF	2.35	2.93	2.45	2.11

Notes: This table documents the effect of the expected, over and undercapitalized amount of R&D on a firm's propensity to borrow funds from public debt markets rather than the syndicated loan market (Panel A), on its cost of public (Panel B) and private debt (Panel C), as well as on its future profitability (*NI*) and audit fees (Panel D). *RDCap_Over* is the amount of R&D a capitalizing firm overcapitalized beyond the expected amount. *RDCap_Exp* is the amount of R&D a capitalizing firm is expected to capitalize during a year given its specific characteristics. *RDCap_Under* is the amount of R&D a capitalizing firm undercapitalized compared to the expected amount. *RDExp* is the amount of R&D a firm expensed during a year. *CAP* is a dummy variable which is equal to one if a firm capitalized R&D during a year, and zero otherwise. In all models, we include the same issue, firm and country-specific control variables as in the previous analyses. Additionally, all models include industry and year fixed effects. VIF is the Variance Inflation factor. Z-Statistics/T-statistics based on clustered standard errors at firm-level are reported in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% (two-tailed) level, respectively.