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R&D Accounting Discretion as an Income Smoothing Tool: An Empirical Analysis of German Listed Companies

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Abstract

Capitalization of development costs is compulsory according to IFRS if a set of criteria is fulfilled. However, this obligation is considered as a de facto right for capitalization since the criteria are quite subjective, allowing for a certain degree of flexibility. Hence, the question arises whether managers use research and development (R&D) accounting to conduct earnings management in terms of income smoothing. Using a sample of German listed companies, the study conducts several regression analyses to test whether there is a negative relationship between R&D capitalization and different income smoothing proxies. Results show that the hypothesis is supported independent of the income smoothing proxy used. The study proofs that managers indeed use R&D capitalization judgments to conduct income smoothing.

Keywords: R&D capitalization; income smoothing; earnings management; R&D accounting; development costs.

1. Introduction

"Nature builds no machines, no locomotives, railways [...] etc. [...]. They are organs of the human brain, created by the human hand; the power of knowledge, objectified" (Marx, 1857).

What we currently observe as the transformation from a manufacturing to a knowledge-based economy has already been envisaged by Karl Marx in 1857. Digitalization and globalization led to a technology-caused structural interruption that puts substantial pressure on current business models and whole industries. This forces companies to heavily invest in research and development (R&D) to remain competitive and improve their businesses (Hoffmann, 2017). As reported by the R&D Magazine's current 2017 Global R&D Funding Forecast, worldwide spending on R&D reaches $ 2.066 trillion[1], which represents 1.72 % of the global gross domestic product (Industrial Research Institute, 2017).

This ongoing development has also been recognized by German politics. The new coalition agreement (2018) intends to introduce tax incentives to promote R&D investments. Additionally, 3.5 % of gross domestic product are planned to spend on R&D until 2025 to support high-tech strategies such as artificial intelligence (Koalitionsvertrag, 2018).

Obviously, the transformation towards a R&D intensive economy is also reflected in the companies' financial statements. According to a study conducted by Pricewaterhouse-Coopers GmbH in 2014, intangible assets determine 75 % of a firm's value (Hadjiloucas, 2014). Simultaneously, several researchers denounce exhaustive sluggishness in R&D measuring and reporting systems (Boulton et al., 2000). Neither literature nor standard setters can agree on a uniform accounting treatment leading to a variety of different rules among countries (Garanina et al., 2016). While some presume R&D capitalization to be value relevant signaling future economic benefits, opponents condemn the loss of objectivity and the possible incentive for earnings management, demanding complete expensing of R&D (Lev and Sougiannis, 1996).

Following this debate, the thesis wants to assess whether managers really use R&D capitalization opportunities to engage in income smoothing in terms of accrual-based earnings management. Since research on that topic does not lead to a consistent result, the thesis contributes to previous literature by conducting an analysis in a setting of German listed companies over a period of four years and across different industries.

Section two introduces R&D accounting in Germany focusing mainly on International Financial Reporting Standards (IFRS). After discussing the trade-off between objec-

[1]Hereinafter, the thesis uses German notation of numbers.

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tivity and relevance, focus shifts on earnings management research and the income smoothing hypothesis. Whereas section four reviews previous literature, the following chapter develops the research hypothesis analyzed. Section six and seven are concerned with research methodology and the empirical data analysis that consists of a descriptive statistic, correlation, regression and sensitivity analysis. In the end, the thesis critically assesses the analysis made by pointing out limitations and further research opportunities before drawing a conclusion.

2. R&D accounting in Germany

2.1. Terminology, recognition and measurement

Introducing the Accounting Law Modernization Act in Germany in 2009, legislature lifts the ban on capitalization of self-generated intangibles assets as stated in § 248 (2) German Commercial Code (HGB). Companies got the option to recognize development expenses at acquisition costs while research expenses are not allowed to be capitalized. According to HGB, development costs mainly include applied research results or knowledge for further advancement or recent developments, while research focuses on the search for knowledge itself. If companies are not able to separate research and development, they must account both as an expense (§ 255 (2a) HGB).

Since European International Accounting Standards (IAS) regulation article 4 requires capital market orientated companies to prepare their consolidated financial statements in accordance to IFRS starting in 2005, it is not appropriate to apply HGB when analyzing German listed companies. Therefore, the thesis focuses on IFRS accounting principles. Accounting for intangible assets including R&D is governed in IAS 38 (Figure 1). In line with German legislation, IFRS distinguishes between research and development phase. Although the definitions are quite similar, they are treated differently. During the research phase, the company is not able to demonstrate an intangible asset that is expected to create future economic benefits. Since recognition criteria for an intangible asset pursuant to IAS 38.21 are not fulfilled in the research phase, these costs must be charged as an expense. This mainly includes obtaining knowledge, evaluating research or selecting alternatives (IAS 38.54 - 56).

In the development phase, expenditures are obligated to be recognized as an intangible asset if the basic definition and recognition principles (IAS 38.8 – 28.23) in addition to the following six criteria are satisfied:

1. Technical feasibility
2. Intention of completion for sale or use
3. Ability to use or sale
4. Proof of how to generate future economic benefits
5. Availability of sufficient resources (technical, financial and other) to complete the development
6. Reliability in measuring attributable costs

Design, construction and testing of alternatives, pre-production or pilot plants can be considered as appropriate examples (IAS 38.57 - 60). According to IAS 38.71 restatement of past expenses is prohibited. Additionally, IFRS forces companies to expense their R&D if they are not able to distinguish between research and development phase (IAS 38.53).

If all criteria for recognition are fulfilled, R&D expenditures that arose from that date on are capitalized at cost. These expenditures include all directly attributable costs like materials, employee benefits, fees etc. to bring the asset into the intended shape (IAS 38.65 – 38.67). For subsequent measurement, IAS 38.72 requires the use of the cost model unless there is an active market. If the latter applies, companies get the option to adopt the revaluation model.

In addition, the entity has to determine whether the useful life of the asset capitalized is finite or infinite using the criteria stated in IAS 38.90. While a finite useful life calls for amortization, an infinite one requires the company to conduct an impairment test in line with IAS 36 on an annual basis and if an indication for impairment arises (IAS 38.97; IAS 38.108).

In terms of disclosure, the company has to differentiate between internally generated and other intangible assets. These categories need to include gross carrying amount along with a reconciliation at the end and beginning of the period, useful life (if any), amortization method and accumulated amount including impairment, reasons supporting various assessments and other special requirements stated in IAS 38.118 – 38.128. Although IFRS capitalization policy differs from German standards as they only provide an option for capitalization, the discrepancy is rather formal than substantial. The mentioned criteria obligating capitalization of R&D are considered as quite subjective and therefore allow a certain degree of flexibility. If managers intend to expense some of their R&D instead of capitalizing, they can simply justify the assessment. Therefore, R&D accounting might be driven by earnings management incentives such as to smooth income (Markarian et al., 2008).

2.2. The trade-off between relevance and objectivity

Hardly any topic shows as much different accounting treatments among countries as R&D (Garanina et al., 2016). The decision to allow or even force companies to capitalize R&D expenditures is mainly a trade-off between relevance and objectivity. Financial Accounting Standard Board (FASB) forces US companies to expense all their R&D costs. Capitalization is prohibited due to the fear of impaired objectivity. FASB argues that expensing prevents managers from capitalizing R&D projects that show low probability to create future economic benefits. Additionally, expensing should avoid managers to conduct earnings management when deciding to capitalize R&D. (Cazavan-Jeny et al., 2011; Healy et al., 2002; Lev and Sougiannis, 1996).

International Accounting Standard Board (IASB) as well as German legislature, focus on the value relevance aspect by allowing capitalization. Thereby they respond to the arising importance of R&D, arguing that it represents a high value

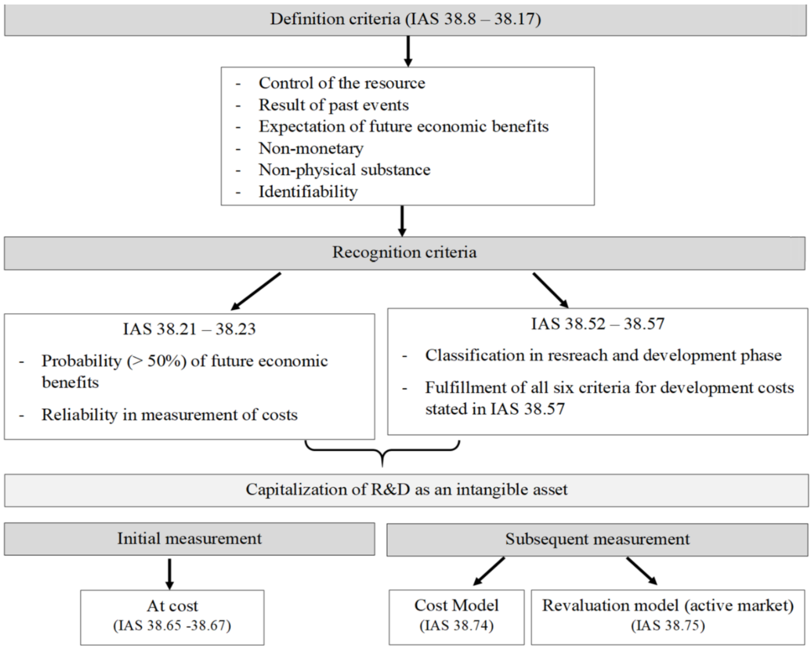

Figure 1: R&D accounting according to IFRS (own figure based on IAS 38)

asset whose disregard would earnestly decrease credibility and relevance of financial statements (Healy et al., 2002). It is reasoned that R&D creates a positive impact on profitability and market value and thus provides value relevant information to shareholders and investors (Lev and Sougiannis, 1996; Sougiannis, 1994).

3. Earnings management through R&D

3.1. Definition and incentives

The most popular definition of earnings management is given by Schipper (1989), indicating that it is "the purposeful intervention in the external financial reporting process, with the intent of obtaining some private gain". Since financial reports should reflect managers' perception of the firms' performance, accounting standards have to allow for a certain range of judgment. However, mangers can also use this flexibility to alter reports in a way that deceives stakeholders about the true economic performance or influences contractual outcomes that are based on accounting numbers (Healy and Wahlen, 1999). This issue exactly reflects the problem of discretion in R&D accounting. On the one hand, standard setters of the IASB want to enable a certain degree of judgment since managers themselves are the best qualified to assess whether a R&D project will create future economic benefits and therefore should be recognized as an asset. On the other hand, it is obvious that managers might tend to act opportunistically to improve outcomes and thus misuse the given flexibility. However, it is important to distinguish earnings management from fraud. In contrast to fraud, earnings management uses accounting judgements that are in line with legal boundaries and generally accepted accounting principles (Makar et al., 2000).

Earnings management through R&D capitalization represents a kind of accrual-based earnings management since managers defer expenditures to subsequent periods when the intangible asset will be amortized (if useful live is finite) or impaired. Thus, managers can deal with accruals to improve their results. The total amount spend on R&D is a way to conduct real earnings management as the amount of R&D investments directly influences financial statements (Enomoto et al., 2015).

Incentives to exercise earning management through R&D comprise income smoothing, bonus plans and debt covenants (Markarian et al., 2008). The latter proposes that managers are more likely to choose income increasing accounting policies when their companies are high leveraged and closer to violate debt covenants (Duke and Hunt III, 1990). The bonus plan incentive suggests that managers tend to choose accounting policies that improve their bonuses (Healy and Wahlen, 1999). However, the focus of the thesis will be on income smoothing caused by R&D capitalization, meaning that managers apply earnings management to reduce income fluctuations (Hepworth, 1953). This is justified by the lack of sufficient data to analyze the bonus plan hypothesis and by the restricted extent of the thesis to include the debt covenant incentive. Additionally, income smoothing is the most examined hypothesis in the current literature regarding R&D accounting discretion.

3.2. The income smoothing hypothesis

Income smoothing comprises all tools managers may use in order to scale down fluctuations of disclosed income figures, with regard to some income targets, using artificial (accounting) or real (transactional) variables (Koch, 1981; Leuz et al., 2003). There are several accounting techniques to smooth income like gross revenue manipulation, overproduction of finished goods, property accounting or intangible asset accounting, which also includes R&D (Hepworth, 1953). As this thesis focuses on accounting discretion, only artificial variables are considered, looking at how managers potentially use accruals in terms of R&D capitalization, to reduce income variability. Concerning the income smoothing hypothesis, income reflects the normal earnings power of a company, which is reported as operating income or earnings before interest and tax (EBIT) in the companies' financial statements (Koch, 1981). This is consistent with prior studies indicating operating profitability as the income smoothing target (Barnea et al., 1976; Makar et al., 2000; Moses, 1987). Therefore, in the following, earnings and income are used synonymously. However, a sensitivity analysis will be conducted later in section 7.4. to examine if there are probably other income smoothing targets such as net income or earnings per share (EPS) since it cannot be presumed that operating profitability is the company's only smoothing target (Imhoff, 1981).

Motives for managers to smooth earnings over time through R&D are multi-layered. One of the most important aspects is the reduced risk through low income fluctuation. The lower the observed volatility, the lower is the perceived assessment of various claimants about the stability and potential bankruptcy of the company. Thus, borrowing costs of the enterprise decrease as debt capital providers are more confident in getting back their money on time (Trueman and Titman, 1988). Simultaneously, the selling price of shares increases as (risk averse) investors tend to prefer companies characterized by a low risk. Stable earnings are also desirable form a shareholder's perspective since they are better suited to indicate higher dividend payment than variable earnings. (Beidleman, 1973). Other stakeholders also feel more confident with an income smoothing approach, as it reflects security and stability, leading to higher overall satisfaction (Hepworth, 1953).

Additionally, the company itself benefits from a smooth income. Having huge fluctuation in earnings, it becomes difficult to develop detailed plans and budgets for further periods, as these are based on past performance. Furthermore, managers themselves are assessed by budgets established (Beidleman, 1973). Since volatility in the firm's income could be a potential reason to displace managers, they are interested in smooth income. Also income based compensation might serve as an incentive for managers to conduct income smoothing (Brayshaw and Eldin, 1989).

Smooth income further incorporates tax advantages. In case of a progressive tax rate for example, companies would show direct tax savings by smoothing their income, compared to high volatility (Hepworth, 1953).

The underlying reason to engage in income smoothing determines whether the managers' aim is to convey private, internal information to stakeholders like described by Beidleman (1973) or to reach some opportunistically driven targets (Vander Bauwhede et al., 2003). It is important to consider that income smoothing also faces some difficulties. Assessing the right amount that has to be adjusted is often quite ambitious. It involves guesses and estimations that might lead to over- or under adjustment and thus counter-smoothing. (Vander Bauwhede et al., 2003).

4. Literature review

Starting in the mid-20th century, earnings management has been developed as one of the main research areas in accounting literature. First, the focus was primarily on detecting and investigating earnings management followed by an analysis of incentives, conditions and tools managers might use to alter earnings. In 1953, Hepworth was one of the first researchers who looked at possible motivations to engage in income smoothing as a part of earnings management. At that time, various research evolved, indicating that manager use accounting discretion and choices to influence earnings and thus proofed the existence of earnings management. Burgstahler and Dichev (1997) detected that there is an unusual high amount of slightly positive earnings compared to small negative ones, giving the evidence that companies engage in earnings management to avoid reporting losses. The income-smoothing hypothesis was confirmed i. a. by Beidleman (1973) and Koch (1981), who indicated that income smoothing is higher if costs for it are low and ownership is diverse.

As R&D investments have become more and more important in the early 2000s, researchers were concerned with the best R&D accounting policy that avoids discretion and therefore earnings management. Various studies as those performed by Lev and Sougiannis (1996) or Zhao (2002) proofed that R&D capitalization is value relevant and should therefore be the preferred accounting method. Cazavan-Jeny and Jeanjean (2003) described R&D capitalization as a signal for stakeholders as it is positively related with stock returns. This was supported by Oswald and Zarowin (2007) who showed that the association between current year returns and future earnings is higher in case of R&D capitalization. However, Chan et al. (2007) claimed that higher R&D intensity indicates company's performance, independent of the accounting method used. Wang et al. (2017) considered R&D accounting policy mainly as a trade-off between accounting performance that is supported through expensing and market value that is increased by capitalization.

Real earnings management was examined by Osma and Young (2009), Cazavan-Jeny et al. (2011) and Tahinakis (2014), who concluded that companies cut their R&D investments to avoid reporting losses or to show positive earnings. Additionally, Seybert (2010) proofed that managers tend to overinvest in R&D in case of capitalization due to reputation concerns.

Besides, managers might also use accrual-based earnings management through R&D capitalization. However, research on that topic is relatively young and result are inconsistent. Zicke (2014) and Abrahams and Sidhu (1998) came to the result that managers capitalize more of their R&D expenditures to avoid reporting losses or earnings decrease. Furthermore, Markarian et al. (2008) and Triki-Damak and Halioui (2013) examined that managers use R&D capitalization to smooth earnings over periods in a setting of French and Italian companies. This is only partly supported by Persson and Fuentes (2011) who could merely indicate income smoothing through R&D capitalization in one of three periods looking at Swedish enterprises. This difference can be explained by Garanina et al. (2016) who indicated that earnings management incentives to capitalize R&D vary across countries. While income smoothing through R&D was detected in Germany, Russia used R&D to meet debt covenants which was also proofed in France by Triki-Damak and Halioui (2013). However, the study conducted by Guidara et al. (2014) in France suggested that managers do not use R&D accounting discretion to smooth earnings but rather support the real earnings management literature.

5. Hypothesis development

As already stated in section 2.1., R&D accounting according to IFRS allows for a certain degree of flexibility. The de facto right for capitalization enables managers to easily decide how to account for R&D based on the current economic situation. If they prefer expensing instead of capitalization or vice versa they can simply substantiate this approach by arguing that they are not able to generate future economic benefits or costs on a project cannot be measured reliable for capitalization (Garanina et al., 2016; Makar et al., 2000; Markarian et al., 2008).

The discretion in accounting for R&D given by IFRS can be used by managers as an instrument to conduct income smoothing in terms of accrual-based earnings management as described in section 3. Auditors confirm that accruals are among the most common methods to manage earnings. As R&D capitalization choice is based on accruals by deferring development expense to future periods through amortization/impairment, it is reasonable to argue that managers use R&D accounting to engage in earnings management to smooth income (Nelson et al., 2003; Persson and Fuentes, 2011). There are many studies indicating that managers do smooth their income and have reasonable incentives (see 3.2. and 4.) such as to reduce borrowing cost or increase share prices (Beidleman, 1973; Trueman and Titman, 1988).

To moderate fluctuation in their income managers first analyze their pre-managed operating profitability as this is presumed to be the income smoothing target (Barnea et al., 1976; Makar et al., 2000; Moses, 1987). If they realize that the current pre-managed operating profitability is below the previous years' profitability measure, they opt for accounting methods that increase reported earnings and vice versa (Markarian et al., 2008). As R&D accounting policy directly influences the extend of earnings, managers can control profitability by choosing to expense or capitalize development costs (Persson and Fuentes, 2011).

Thus, it is expectable that managers prefer to capitalize a higher magnitude of their R&D expenditures if their pre-managed operating profitability before R&D capitalization is below the profitability of previous years. In return, expensing is observed when pre-managed operating profitability before R&D capitalization is above the past years' profitability. Before R&D capitalization means that the amount of development costs recorded as an intangible asset is not considered in the pre-managed profitability, assuming that all costs are expensed first. Capitalization is determined only after comparing the pre-managed profitability to previous years (Markarian et al., 2008). Hence, managers decide on the amount of development costs capitalized based on the company's profitability change with the aim to report a smooth income over the periods (Persson and Fuentes, 2011). Since profitability commonly defines the relation between a company's profit and the size of the business, this analysis defines the change in operating profitability as the current year's pre-managed EBIT minus the average of the last two years' EBIT normalized by the current year's total assets before R&D capitalization (Markarian et al., 2008). This aspect will be explained in section 6.2.1.

Therefore, the hypothesis examined is formulated as follows:

> H: There is a negative relationship between the change in a firm's operating profitability and R&D capitalization.

6. Research methodology

6.1. Sample selection

Data for the subsequent empirical analysis is gathered from German listed companies. Germany is regarded to be a suitable object of research because it is known to be one of the innovation leaders, showing the highest R&D investments in Europe in 2016 (Hernández et al., 2017).

At first, all German listed companies are assigned to their respective sectors (sector and industry are considered interchangeably) based on Global Industry Classification Standard (GICS). Additionally, the category "conglomerate" is added for companies engaging in various fields. Financials, real estate, energy and consumer staples sectors are excluded from the analysis since they do not show any or sufficient R&D investments or do not publish them and are therefore not appropriate to be considered.

Secondly, companies within an industry are ranked based on their market capitalization. Within each industry annual reports are analyzed from the greatest to the smallest company over a period of four years (2013 – 2016). Those who do not show any R&D capitalization, do not disclose them concretely or refuse to disaggregate capitalized development cost from other intangible asset are removed from the list. Still, it cannot be assumed that these companies do not engage in earnings management through R&D (Persson and Fuentes, 2011).

For the remaining companies, the largest of each sector are incorporated to end up with a total sample size of 92. Recapitulated, the analysis is based on an entire population of 23 companies over a time range of four years. Annual reports of six years have to be analyzed for each company since the estimation of changes over periods requires to go back further in the past for the first year incorporated (see 6.2.1.).

For the empirical analysis, R&D numbers have to be collected manually, looking at the annual reports of the companies. R&D capitalization can either be disclosed directly within the consolidated balance sheet, in the intangible asset movement schedule or in the notes. Other numbers necessary were partially gathered from the data platform WRDS. For the remaining individual figures and ratios, formulas were calculated with Excel. To conduct the empirical analysis, SPSS is used as a statistical software.

Data selection reveals that the extend of R&D disclosure is quite different. While the amount of qualitative information is very extensive this is not always the case for quantitative reports. Sometimes it is difficult to determine the exact amount capitalized during the year as companies hesitate to disclose a large scale of figures. However, this has been improving over the years, showing that R&D has been becoming more and more important for companies to communicate to their stakeholders. Approximately every fourth euro expensed for R&D currently reappears as an asset in the companies' balance sheets but the amount capitalized differs across industries (Leibfried & Pfanzelt, 2014).

Capitalization in the pharmaceutical industry is rather rare although it is known to be R&D intensive. Due to the high risks until the pharmaceutical product approval is reached, companies are forced to expense R&D. The most common reason refraining from capitalization is the lack of probable future economic benefits.

6.2. Specification of variables

6.2.1. Dependent and independent variables

For each observation of the sample, a set of variables must be defined and calculated in order to perform the empirical analysis. First, RDCapitalization is introduced as the dependent variable. It is calculated as the absolute gross amount of development cost capitalized in each year divided by the company's total assets (Markarian et al., 2008; Persson and Fuentes, 2011).

Amortization and impairment on intangible assets of the respective year are not considered in the total amount capitalized (as some prior studies did) because they are not subjected to any accounting choice and additionally could also refer to previous years' issues. Another approach would be to include the amortized and impaired amount of the development cost capitalized during the respective year, if there are any, since they reappear in the income statement and thus reduce earnings. This would lead to an opposite effect reducing the income increasing consequence of R&D capitalization, but this information is not published in any annual report. Additionally, these amounts would be very small and therefore are not presumed to change the results significantly. Consistent with preceding earnings management studies, total assets serve as a deflator (Jones, 1991). Another way to scale R&D capitalization could be net income as it is directly related to earnings. This approach could bias the results since all years which show negative values would have to be removed from the sample (Markarian et al., 2008).

To examine the established hypothesis above, ΔRoA serves as the independent variable. It reflects the change in return on assets (RoA) over the average of two years and represents the operating profitability progress of the company. Thus, ΔRoA is calculated by subtracting the average of the last two years' EBIT from the current year's pre-managed EBIT (without R&D capitalization) normalized by the current year's total assets before R&D capitalization (Markarian et al., 2008).

$$\Delta RoA_t = \frac{(EBIT_t - \text{R\&D capitalized}_t) - \frac{EBIT_{t-1}+EBIT_{t-2}}{2}}{\text{Total assets}_t - \text{R\&D capitalized}_t} \quad (1)$$

Since R&D capitalized is deducted from current EBIT, it is appropriate to equally adjust current assets by subtracting the same amount. How to exactly account for ΔRoA slightly differs in previous studies. It is not clearly defined whether total assets are used with or without R&D capitalization. (Garanina et al., 2016; Triki-Damak and Halioui, 2013; Markarian et al., 2008; Persson and Fuentes, 2011). However, as the amount capitalized during a year is relativity low compared to total assets, this should not lead to profound changes in the results.

The average over the previous two fiscal years is used because it is assumed that managers as well as the market consider the change in operating profitability as the change in "base" earnings, rather than the change related to the latest earnings reported (Markarian et al., 2008). This approach has been examined by Markarian et al. (2008) who indicate that R^2 decreases when taking the change over one instead of two periods. This aspect will also be examined in section 7.4.

Even though this thesis solely focuses on R&D capitalization to smooth income, it could not be ruled out that managers simultaneously use other accruals or operating decisions to conduct earnings management. Thus, it could not be assumed that pre-managed RoA is not influenced by other instruments (Markarian et al., 2008; Persson and Fuentes, 2011).

6.2.2. Control variables

To decrease variance error and increase validity of the empirical analysis, several control variables are added to the model. The first one comprises the current year's pre-managed RoA, which is calculated as the company's EBIT before R&D capitalization divided by current total assets less capitalized R&D. The present operating profitability serves as a proxy for the expected future operating profitability since this data is not available (Miller and Skinner, 1998). Expected future operating profitability is presumed to be an indicator for successful completion of R&D projects. A high value increases the probability to obtain future economic benefits (one of the six criteria stated in IAS 38 for

Table 1: Sample by industries (own table)

Industry	Number of companies	Number of observations	Percentage
Conglomerate	2	8	9%
Consumer discretionary	4	16	17%
Health care	4	16	17%
Industrials	4	16	17%
Information technology	2	8	9%
Materials	3	12	13%
Telecommunication services	2	8	9%
Utilities	2	8	9%
Total	23	92	100%

R&D capitalization). Further, current profitability might also signal that the company commands sufficient resources to finalize and use the R&D project, which also reflects one of the six capitalization criteria according to IFRS. Therefore, expected future profitability and R&D capitalization might be positively related (Markarian et al., 2008). Though, the argumentation also works the other way around considering the earnings management approach. Profitable firms have an incentive to expense large parts of their R&D in order to decrease tax payments as well as political costs. Companies characterized by low profitability tend to capitalize as much of their R&D as possible to eke out achievements (Markarian et al., 2008; Persson and Fuentes, 2011). Additionally, Cazavan-Jeny and Jeanjean (2003) argue that highly profitable companies prefer to expense their R&D as they do not want to ruin the analysts' image concerning their earnings quality. This is also supported by Aboody and Lev (1998) who examined that less profitable firms capitalize more of their development costs than high profitable ones. Following this argumentation, a negative relationship should be observed between RDCapitalization and RoA. Hence, from a methodological point of view, the association cannot be clearly determined in advance.

RDTotal represents the second control variable. It comprises the total amount of R&D investments spent by the company within one year divided by total assets in the current fiscal year before R&D capitalization. It could be assumed that more R&D projects fulfill IAS 38's recognition criteria if the companies' R&D investments are higher. Thus, managers capitalize more in case of higher R&D spending, indicating a positive relation between RDTotal and RDCapitalization. Nevertheless, IAS 38 incorporates a certain degree of subjectivity, meaning that managers can decide on how much to capitalize by arguing appropriately. In addition, it has to be considered that there is a variety of other aspects and circumstances that determine managers' R&D accounting policy such as conservative accounting behavior (Garanina et al., 2016; Markarian et al., 2008). Besides, there are arguments indicating a negative association between RDTotal and RDCapitalization. R&D intensive enterprises used to carry out more R&D projects than companies spending less on R&D. Hence, it is more complex and elaborate for them to review whether recognition criteria are fulfilled for each single project. Since this is perceived to be very time consuming, managers might simply expense R&D (Garanina et al., 2016; Markarian et al., 2008). It could also be argued that companies which spend less on R&D in a period (maybe because they are facing bad times) rather continue to work on existing projects. Thus, the probability of those projects to fulfill recognition criteria increases. In consequence, it is not possible to make ex ante predictions concerning the relation of RDTotal and RDCapitalization (Garanina et al., 2016; Markarian et al., 2008).

Given that high leveraged companies are presumed to have an incentive to capitalize more of their R&D costs to improve their result, (financial) Leverage is introduced as third control variable. It is computed as the fraction of total debt from total assets before R&D capitalization (Markarian et al., 2008). Managers that avoid violating debt covenants through R&D capitalization increase their probability to get attractive loans and reduce (perceived) risk of the business. Therefore, a positive relationship between Leverage and RDCapitalization is expected (Aboody and Lev, 1998; Cazavan-Jeny and Jeanjean, 2003; Hamada, 1972).

(Firm) Size is defined as the natural logarithm of current year's total assets before R&D capitalization effects (Markarian et al., 2008). Due to nature of research this variable is implemented to control for the companies' political sensitivity and market/political visibility as these aspects seem to influence accounting decisions of managers and thus R&D capitalization (Liberty and Zimmerman, 1986; Markarian et al., 2008). Since larger companies tend to be more sensitive to political cost pressure, they are exposed to higher capital transfers. Therefore, governments focus more on huge firms as their ability to contribute to state income is higher. Companies want to avoid this pressure by reducing reported earnings. In terms of R&D, managers will prefer expensing as it decreases the company's income (Aboody and Lev, 1998; Dufour and Zemzem, 2005; Triki-Damak and Halioui, 2013; Othman and Zéghal, 2006). But not only the government pays particular attention to large companies. As the company size increases, managers face more and stronger examination by several analysts. The growing visibility rather prevents managers from excessively influencing reported earnings (Garanina et al., 2016; Othman and Zéghal, 2006). Another aspect why to consider size effects has been indicated by Cazavan-Jeny and Jeanjean (2003). They propose that large enterprises primarily invest in basic research, maintenance and product upgrades. Major parts of these costs typically do not fulfill recognition criteria of IAS 38 and therefore must be expensed. These suggestions anticipate a negative relationship between Size and RDCapitalization.

High-Capitalizer as the fourth control variable is calculated as a dummy variable equal to one if the capitalized R&D amount normalized by earnings is above the median of the sample firms and zero if it is below the median. High-Capitalizer is introduced to control for a potential, significant impact of R&D capitalization on earnings (Markarian et al., 2008).

LagCapitalization as the fifth variable refers to capitalized R&D during the previous year, since lagged variables are considered as a strategy to control for endogeneity (Boone et al., 2007). The decision not to take LagCapitalization into account excludes a seriously correlated variable (Markarian et al., 2008). Further, the variable implies how consistent companies perform their R&D accounting policy (Zicke, 2014). However, it is quite difficult to determine a company's consistency if managers conduct earnings management. Additionally, it has to be kept in mind that R&D investments are basically difficult to predict and outcomes of R&D spending could fluctuate over the years (Garanina et al., 2016). Even though there might be concerns due to serial correlation between LagCapitalization and RDCapitalization, Markarian et al. (2008) proofed that worries are unfounded using Durbin Watson statistic and calculating a first order autocorrelation.

To control for future growth opportunities, (stock market) performance and risk of a company, GrowthExpectation is introduced as sixth variable. It represents the market-to-book ratio dividing market capitalization of a company by its book value of equity. (Cazavan-Jeny and Jeanjean, 2003; Fama and French, 1992; Markarian et al., 2008; Persson and Fuentes, 2011). It is expected that companies characterized by a high market-to-book ratio indicate a higher R&D intensity than companies having a low market value compared to their book value of equity (Cazavan-Jeny and Jeanjean, 2003). Additionally, it might be that companies which prefer to invest in growth opportunities (such as R&D) rather than in assets already in place show a higher market-to-book ratio since investors include those investments in their present value calculation leading to a higher share price. Due to these high investments company's debt might increase. This causes lenders to include higher (investment and financing) restrictions in their lending contracts limiting the firm's funding policy. These restrictions could refer to underinvestment issues or general accounting-based debt covenants. Obviously, managers want to avert the constraints using accounting discretion and thus tend to capitalize R&D to improve results and avoid showing underinvestment in their balance sheets. Thus, a positive relation between GrowthExpectation and RDCapitalization is hypothesized (Triki-Damak and Halioui, 2013; Myers, 1976; Shabou and Taktak, 2002).

Growth is introduced as seventh control variable, calculated as the percentage change in sales over one period. Growth is included as it is presumed that high growing companies engage in more R&D projects and thus invest more in R&D than companies with small growth rates (Cazavan-Jeny and Jeanjean, 2003; Persson and Fuentes, 2011).

The analysis additionally controls for years and industry effects by adding dummy variables to the regression. For each year and each industry, dummy variables are calculated while one of each category is excluded in the regression since there must be a reference category in case of categorial variables. For a detailed overview of the variables considered, including definition and formula, please refer to Appendix 1.

7. Data analysis and empirical results

7.1. Descriptive statistics

Table 2 shows the descriptive statistic on selected variables for the empirical analysis. Mean of RDCapitalization indicates that sample firms capitalize on average 1.61 % of their total assets. At the final ninetieth percentile, capitalization measures 5.24 % of total assets. Companies basically spend 6.03 % of their assets (assets are considered as before R&D capitalization as described in 6.2) on R&D. The most R&D intensive firms (last decile) even invest 15.97 % of their assets in R&D, while less R&D focused firms do not reach at least 1 %. Examining the relationship between RDCapitalization and RDTotal shows that companies capitalize on average 26.5 % of their R&D expenditures. The mean level of indebtedness reaches 65.69 %, indicating that selected companies are largely financed by debt rather than equity. The average (pre-managed) RoA shows that companies are profitable at 5.3 %, while the change in RoA clarifies that profitability of the sample firms decreases compared to the previous two fiscal years with a mean of -1.26 %. However, the first decile shows a positive RoA development at 2.21 %. The average market-to-book ratio is around 3.09 indicating that market capitalization of the analyzed companies is more than three times higher than their book value of equity. Thus, shareholders perceive these companies to be highly profitable. Even the lowest 10 % nearly show a ratio of one. Companies' growth in revenue reaches on average 6.85 % with a first decile of 23.07 %, indicating mostly positive growth rates. In the analysis Size, measured as the natural logarithm of total assets, indicates a mean of 9.37. Assets of the sample firms are on average 59 billion euros.

As the analysis is conducted across industries, it is appropriate to additionally perform a descriptive statistic by industry, presented in Table 3. Information technology and telecommunication services sectors show the highest R&D capitalization rates with 7.22 % and 4.10 % of their assets. These companies also record the highest R&D investments per assets indicating an average of 21.96 % and 11.57 %. The remaining industries vary between 5.81 % and 2.15 %. Companies of the materials sector and conglomerates reveal the

Table 2: Descriptive statistics on selected variables (own table)

	Mean	Std. Deviation	Minimum	Maximum	Percentiles 10	Percentiles 90
RDCapitalization	0.016055	0.030586	0.000131	0.138229	0.000511	0.052395
RDTotal	0.060349	0.093376	0.001134	0.752232	0.003046	0.159667
Leverage	0.656868	0.154544	0.185897	0.929359	0.483224	0.844783
ROA	0.052995	0.046261	-0.063809	0.153846	-0.018890	0.110108
ΔRoA	-0.012644	0.042872	-0.173077	0.046064	-0.069908	0.022120
GrowthExpectation	3.086864	3.281002	0.413424	27.923232	0.921325	5.049868
Growth	0.068518	0.111889	-0.244769	0.401038	-0.056788	0.223071
Size	9.366865	2.330831	3.802208	12.909126	5.644880	12.039085
Assets (EUR millions)	59,010.97	88,264.17	51.90	409,732.00	306.88	171,077.20

lowest R&D capitalization rate with 0.07 % and 0.2 %. The most leveraged companies are those from the utilities and conglomerate sector with a debt to asset (before R&D) ratio of 78.89 % and 81.70 %. Companies in the health care sector are the least leveraged firms with debt of 54.72 % of their assets. All industries indicate an average positive profitability ratio before R&D capitalization, with the health care and materials sectors performing best at a pre-managed RoA of 8.6 %. Telecommunication services only reaches 0.32 % having the lowest profitability ratio before R&D capitalization. All industries, except health care, indicate a decreasing change in RoA compared to their previous two fiscal years with information technology companies having the lowest value (-8.2 %). This is consistent with the fact that these firms simultaneously show the highest R&D capitalization rate per assets. Their pre-managed RoA is relatively low compared to the operating profitability of previous years where R&D has already been capitalized. This leads to a highly negative change in RoA. Thus, these firms' performance largely depends on R&D capitalization.

7.2. Correlation analysis

In addition to the descriptive statistic, a correlation analysis (Table 4) is conducted to examine the (linear) relationships between the selected variables. As they are all scaled metrically, it is appropriate to perform a Bravais-Pearson correlation. It should be considered that Bravais-Pearson correlation analyzes associations at a univariate level. It does not incorporate cross-correlations between independent and control variables, which can change the results significantly. Additionally, the direction of the relationship cannot be determined. This calls for caution in interpreting the results. Furthermore, significant correlation does not necessarily indicate causality between variables (Markarian et al., 2008; Persson and Fuentes, 2011).

At first, the outcome statistically supports the hypothesis developed above since ΔRoA and RDCapitalization show a strong and significant negative relationship. The same applies to pre-managed RoA being highly significant below the 0.01 level. This is visualized in Figure 2 showing a biaxial scatter diagram that plots the relationship between RoA and RDCapitalization as well as ΔRoA and RDCapitalization.

Leverage and RDCapitalization show a positive correlation, supporting the assumption that managers also use R&D capitalization to avoid debt covenants violations. However, this relation is not significant. The strong positive relationship between RDTotal and RDCapitalization with high significance indicates that companies which invest more in R&D also tend to capitalize more as they have more resources available to finalize their projects (Figure 3).

It is interesting to observe that RDTotal and pre-managed RoA are significantly negatively correlated. This leads to the assumption that less profitable firms invest more in R&D than profitable ones. This might be due to the hope to increase their RoA when spending more on R&D. This guess stresses the importance of R&D investments from a firm's perspective. The same can be observed for the relation between ΔRoA and RDTotal. The analysis also uncovers that small companies spend relatively more on R&D and tend to capitalize more than big companies since there is a negative significant relation between Size and RDTotal as well as Size and RDCapitalization. Finally, it could be observed that Growth and RDCapitalization are positively correlated. This demonstrates that companies being able to increase their sales compared to the previous year capitalize more of their R&D. This is in line with the correlation of RoA / ΔRoA and RDCapitalization, since, ceteris paribus, a higher amount of revenue leads to a higher RoA. To decrease earnings in the current year, firms capitalize less to get closer to the prior years' earnings and thus smooth income.

Correlation by industry points out that the industries characterized by the highest capitalization rates, information technology and telecommunication services, also reveal the strongest, highly significant correlations between ΔRoA and RDCapitalization. Simultaneously industries with low capitalization rates indicate low and insignificant relations between these two variables. The strongest relation between RDTotal and RDCapitalization can be found in telecommunication services and utilities industry with a correlation coefficient above 0.9. For further details on industry level a detailed Bravais-Pearson correlation among selected variables can be found in Appendix 2.

Table 3: Descriptive statistics on selected variables by industry (own table)

Industry		Mean	Std. Deviation	Minimum	Maximum
Industrials	RDCapitalization	0.009157	0.004916	0.003341	0.019698
	RDTotal	0.029791	0.014085	0.010810	0.051334
	Leverage	0.653007	0.104438	0.493048	0.780309
	ROA	0.066361	0.025685	0.033399	0.126325
	ΔRoA	-0.002101	0.016233	-0.024824	0.043442
Health care	RDCapitalization	0.010442	0.016033	0.000278	0.059322
	RDTotal	0.058173	0.053209	0.009190	0.162162
	Leverage	0.547237	0.191795	0.185897	0.735515
	ROA	0.086307	0.032081	0.027156	0.153846
	ΔRoA	0.000621	0.022612	-0.060360	0.020377
Consumer discretionary	RDCapitalization	0.008643	0.004427	0.001499	0.014034
	RDTotal	0.043423	0.019482	0.027697	0.080884
	Leverage	0.725234	0.064679	0.594415	0.784248
	ROA	0.052659	0.042292	-0.024117	0.123249
	ΔRoA	-0.004819	0.017374	-0.056443	0.022371
Telecommunication services	RDCapitalization	0.040983	0.043028	0.000704	0.083992
	RDTotal	0.115746	0.122290	0.001134	0.238525
	Leverage	0.618622	0.125519	0.488592	0.739036
	ROA	0.003151	0.053632	-0.062815	0.060898
	ΔRoA	-0.037811	0.056588	-0.113842	0.021535
Conglomerate	RDCapitalization	0.002017	0.000889	0.000567	0.002975
	RDTotal	0.037886	0.028177	0.010108	0.098334
	Leverage	0.817013	0.109941	0.701608	0.929359
	ROA	0.035130	0.025970	-0.020665	0.061358
	ΔRoA	-0.005757	0.031667	-0.074000	0.026908
Utilities	RDCapitalization	0.011815	0.011909	0.001389	0.030133
	RDTotal	0.021508	0.019598	0.002959	0.044223
	Leverage	0.788916	0.094291	0.693869	0.896771
	ROA	0.018339	0.039073	-0.055501	0.066681
	ΔRoA	-0.000237	0.046842	-0.081836	0.046064
Materials	RDCapitalization	0.000760	0.000926	0.000131	0.003303
	RDTotal	0.024361	0.019280	0.001566	0.060960
	Leverage	0.568811	0.051969	0.480923	0.642905
	ROA	0.086136	0.022301	0.031566	0.125187
	ΔRoA	-0.004677	0.024695	-0.045414	0.039978
Information technology	RDCapitalization	0.072192	0.065243	0.008637	0.138229
	RDTotal	0.219554	0.222554	0.094549	0.752232
	Leverage	0.625258	0.234131	0.359281	0.917293
	ROA	0.012970	0.057223	-0.063809	0.073979
	ΔRoA	-0.081982	0.082921	-0.173077	0.013906

Table 4: Bravais-Pearson correlation among variables (own table);
*. Correlation is significant at the 0.05 level (2-tailed).; **. Correlation is significant at the 0.01 level (2-tailed).

		Size Capitalization	Lag Capitalization	RD Capitalizer	High	RDTotal	Leverage	ROA	ΔRoA	Growth Expectation
LagCapizalization	Pearson Correlation	-0.326**								
	Sig. (2-tailed)	0.002								
RDCapitalization	Pearson Correlation	-0.681**	0.517**							
	Sig. (2-tailed)	0.000	0.000							
HighCapitalizer	Pearson Correlation	-0.388**	0.162	0.454**						
	Sig. (2-tailed)	0.000	0.122	0.000						
RDTotal	Pearson Correlation	-0.594**	0.455**	0.801**	0.326**					
	Sig. (2-tailed)	0.000	0.000	0.000	0.002					
Leverage	Pearson Correlation	0.401**	-0.035	0.011	-0.041	-0.134				
	Sig. (2-tailed)	0.000	0.743	0.918	0.698	0.203				
ROA	Pearson Correlation	0.084	-0.196	-0.549**	-0.333**	-0.260*	-0.519**			
	Sig. (2-tailed)	0.425	0.062	0.000	0.001	0.012	0.000			
ΔRoA	Pearson Correlation	0.429**	-0.481**	-0.794**	-0.277**	-0.649**	-0.122	0.671**		
	Sig. (2-tailed)	0.000	0.000	0.000	0.008	0.000	0.245	0.000		
GrowthExpectation	Pearson Correlation	-0.359**	0.028	0.067	-0.094	0.055	-0.174	0.300**	0.137	
	Sig. (2-tailed)	0.000	0.794	0.525	0.375	0.602	0.098	0.004	0.194	
Growth	Pearson Correlation	-0.334**	0.030	0.228*	0.319**	0.133	-0.114	-0.001	0.170	0.234*
	Sig. (2-tailed)	0.001	0.779	0.029	0.002	0.208	0.281	0.989	0.106	0.025

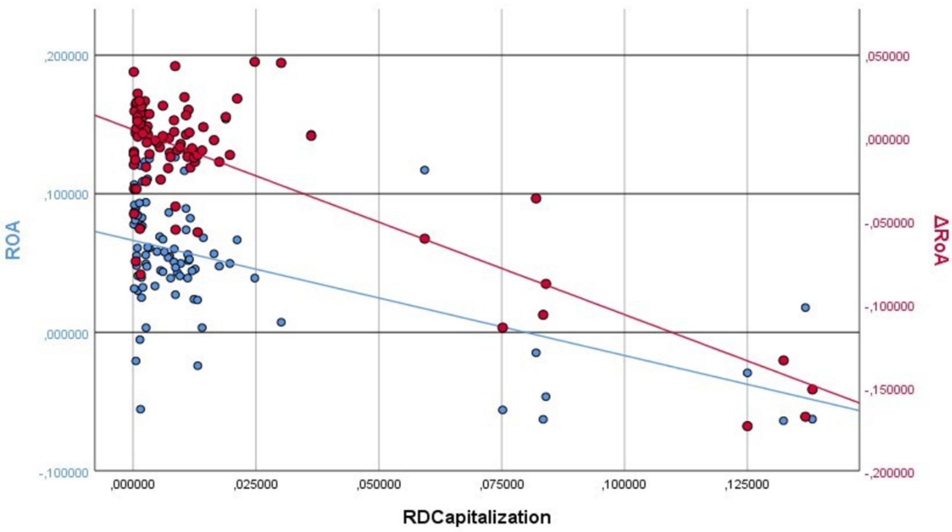

Figure 2: Scatter diagram between RoA, ΔRoA and RDCapitalization (own figure)

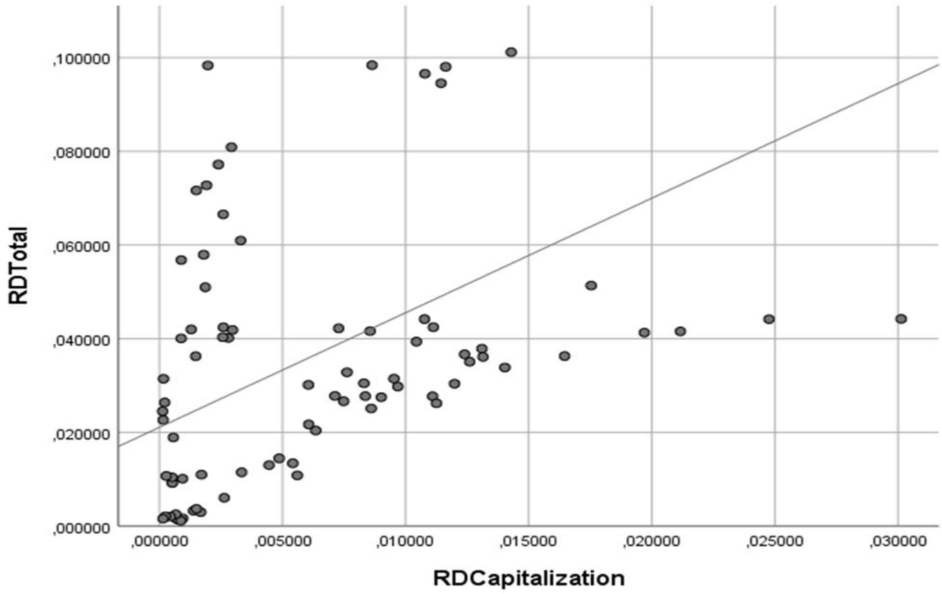

Figure 3: Scatter diagram between RDTotal and RDCapitalization (own figure)

7.3. Regression model

To test the hypothesis established, the statistical equation for the multiple linear regression has the following general form. The subscripted t represents different time periods, while i typifies each sample firm included in the analysis.

$$\begin{aligned}\text{RDCapitalization}_{it} &= b_{0it} + b_{1it}\Delta ROA_{it} + b_{3it}\text{Leverage}_{it}\\&+ b_{4it}\text{RDTotal}_{it} + b_{5it}\text{LagCapitalization}_{it}\\&+ b_{6it}\text{HighCapitalizer}_{it} + b_{7it}\text{Size}_{it} + b_{8it}\text{Growth}_{it}\\&+ b_{9it}\text{Growth}_{i}\text{Expectation}_{t} + b_{10it}\text{YearDummies}_{it}\\&+ b_{11it}\text{IndustryDummies}_{it} + u_{it}\end{aligned} \tag{2}$$

According to the hypothesis developed in section 5, it is expected to observe a negative coefficient for b1it. Table 5 presents the regression results.

Model 1 shows that ΔRoA is significantly negative as predicted in hypothesis H. This indicates that companies tend to capitalize more if their current pre-managed profitability is lower than the average of the previous two fiscal years. Through R&D capitalization, managers avoid showing huge amounts of R&D investments on the income statement and thus improve their results and decrease the gap to prior years' earnings. In case of a higher profitability in the present year compared to the past, mangers prefer to expense R&D since this helps them to lower their profitability and get closer to

Table 5: Model 1 - Multiple linear regression testing hypothesis H (own table);
The regession controls for years and industries; **Significant at the 0.01 level / *Significant at the 0.05 level; R = 0.956 / R Square = 0.914 / Adjusted R Square = 0.891 / Std. Error of the Estimate = 0.0101

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.053	0.014		3.725	0.000	0.024	0.081
ΔRoA	-0.158*	0.065	-0.222	-2.426	0.018	-0.288	-0.028
ROA	-0.119*	0.059	-0.179	-1.998	0.049	-0.237	0.000
Leverage	0.024*	0.011	0.123	2.161	0.034	0.002	0.047
RDTotal	0.075**	0.021	0.228	3.561	0.001	0.033	0.116
LagCapizalization	0.058*	0.023	0.107	2.491	0.015	0.012	0.105
HighCapitalizer	-0.002	0.003	-0.027	-0.468	0.641	-0.008	0.005
Size	-0.006**	0.001	-0.470	-5.742	0.000	-0.008	-0.004
Growth	0.016	0.014	0.058	1.121	0.266	-0.012	0.044
GrowthExpectation	0.000	0.000	0.016	0.341	0.734	-0.001	0.001

the reported earnings of previous years. This result clearly proofs the assumption (developed in section five) that managers engage in accrual-based earnings management through R&D accounting discretion to smooth their income. The findings are consistent with prior studies conducted by Markarian et al. (2008), Triki-Damak and Halioui (2013) and Abrahams and Sidhu (1998) who also demonstrated that managers smooth income by exercising R&D accounting discretion. Garanina et al. (2016) also support the results in some parts as they find significant influence of ΔROA on RDCapitalization in Germany but not in Russia. Additionally, Persson and Fuentes (2011) confirm the outcomes at least in one of three periods observed. However, the study conducted by Guidara et al. (2014) was not able to proof that R&D accounting choice is a management tool to smooth income.

Moreover, Model 1 shows that RoA is negatively significant at a 0.05 level. This suggests that profitable firms (those with a high pre-managed RoA) capitalize less than companies with a lower profitability. The finding indirectly confirms the hypothesis H since it reveals that less profitable firms capitalize more of their R&D to compensate bad performance while highly profitable firms prefer expensing to offset results above average, i. a. to decrease political cost and fluctuation in their earnings (Aboody and Lev, 1998; Markarian et al., 2008; Persson and Fuentes, 2011). It also supports the assumption of Cazavan-Jeny and Jeanjean (2003) who argue that high profitable companies prefer to expense their R&D as they do not want to ruin the analysts' image concerning their earnings quality. The assumption that high profitability signals sufficient resources to finalize the R&D project and increases the probability to obtain future economic benefits has to be rejected (Markarian et al., 2008).

Leverage shows a positive and significant coefficient, indicating that the debt-covenant hypothesis can be confirmed as well. According to the results, managers do also use R&D accounting to avoid violating debt covenants (Aboody and Lev, 1998; Cazavan-Jeny and Jeanjean, 2003; Hamada, 1972). This is in line with studies conducted by Triki-Damak and Halioui (2013). However, Markarian et al. (2008) have not found a significant association between Leverage and RD-Capitalization. Garanina et al. (2016) could only support the debt covenant hypothesis for Russian but not for German companies.

Furthermore, RDTotal is significantly and positively related to RDCapitalization indicating that firms that invest more in R&D also capitalize larger parts of their R&D projects. Thus, it could be argued that the probability of R&D projects to fulfill the recognition criteria of IAS 38 increases if companies spend more on R&D. Nevertheless, it has to be taken into account that IAS 38 is subjected to accounting discretion (Garanina et al., 2016; Markarian et al., 2008). The results additionally show that companies do not tend to expense R&D due to the complexity to determine whether recognition criteria are met in case of higher R&D investments (Garanina et al., 2016; Markarian et al., 2008). Further, it is not confirmed that companies which spend less on R&D rather promote existing projects that increase the probability to fulfill recognition criteria.

As LagCapitalization reveals a positive coefficient, managers capitalize more in the current year if they did so in the previous period. It points out that companies attach importance to consistency and uniformity in their reporting behavior despite of underlying earnings management incentives (Markarian et al., 2008; Zicke, 2014).

HighCapitalizer is not significant, showing that the impact of capitalization on earnings does not determine R&D capitalization behavior (Markarian et al., 2008).

Model 1 proofs that Size is negatively (significant) associated with RDCapitalization as well. This is in line with the assumption that large enterprises face higher market/political visibility, leading to stronger and more detailed examinations by several analysts. Thus, these companies cannot afford to heavily engage in earnings management (Garanina et al., 2016; Othman and Zéghal, 2006). Conversely, small companies that face less public attention can capitalize more and thus improve their results more easily. It further suggests that huge companies mainly invest in basic research, maintenance and product upgrades that typically do not meet recognition criteria of IAS 38 (Cazavan-Jeny and Jeanjean, 2003; Persson and Fuentes, 2011). Another interpretation leads to the assumption that big enterprises expense larger parts of their R&D in order to avoid high political costs (Dufour and Zemzem, 2005). It is also possible that large companies undertake riskier projects than small firm do as managers' compensations are often based on stock options that correlate positively with the risk of underlying assets (Daves et al., 2000; Garanina et al., 2016).

Growth shows a positive but insignificant coefficient. Thus, it could not be assumed that growing companies that usually invest a lot in R&D tend to capitalize more due to increasing R&D resources available. (Cazavan-Jeny and Jeanjean, 2003; Persson and Fuentes, 2011).

Finally, GrowthExpectation is not significant as well. This shows that companies characterized by a high market-to-book ratio do not capitalize more, indicating that the stock market does not have an impact on capitalization behavior in this model. A detailed comparison of how the results of this study behave to prior literature can be found in Appendix 3.

To determine the quality of the regression model, adjusted R^2 must be considered as the normal R^2 automatically grows with increasing number of independent variables and therefore provides little informative value. Adjusted R^2 indicates that 89.1 % of variance in RDCapitalization is explained by independent variables. Thus, the model appears to be a good estimation. The ANOVA table (Appendix 4) additionally shows that the regression creates significant results and can therefore be used as a valid model.

To examine whether some variables must be excluded due to collinearity, tolerance and variance inflation factor (VIF) are calculated. Table 6 points out that the regression does not face collinearity problems since tolerance exceeds the threshold of 0.1 and VIF is below 10 for all variables.

7.4. Sensitivity tests

In the following section it will be examined whether changes in the regression model lead to fundamental changes in the results to determine the robustness of the analysis. Table 7 provides an overview of the tests that will be performed.

First, Model 2 is calculated replacing ΔRoA by ΔRoA2. In Model 1 it is assumed that managers as well as the market consider the change in operating profitability as the change in "base" earnings (Markarian et al., 2008). That is why ΔRoA refers to the average of the previous two fiscal years. Nevertheless, it could also be expected that managers' smoothing target refers to the change related to the latest earnings reported. Therefore, ΔRoA2 is introduced as the change in operating profitability over one period (Markarian et al., 2008).

The results in table 8 show that ΔRoA2 is negative like in Model 1 but insignificant. Thus, the hypothesis H would be rejected in case of ΔRoA2. Additionally, adjusted R^2 decreases, indicating that the explanatory power in Model 1 is slightly higher. The outcomes suggest that the managers' smoothing target refers to the change in "base" profits rather than to the change compared the previous year.

In Model 3 the dummy variable Manage is introduced to check for earnings thresholds. It equals to one if R&D capitalization helps managers to convert a negative change in operating profitability to a positive one. This might be relevant because managers who face difficulties to reach positive ΔRoA could have an incentive to expense their R&D even though it is below the established targets, as achieving a positive ΔRoA is impossible either way. Thus, Manage assesses whether R&D capitalization is influenced by the fact that the target of prior years' profitability is unattainable. It can be determined whether R&D capitalization is only driven by thresholds and benchmark beating or is also used for income smoothing purposes. Therefore Manage is expected to show a positive coefficient (Burgstahler and Dichev, 1997; Markarian et al., 2008; Zicke, 2014).

The results show that Manage is positively significant at a 0.01 level in both cases, indicating that the ability to offset a negative change in operating profitability through R&D capitalization has to be considered in managers' R&D capitalization behavior. Furthermore, ΔRoA as well as ΔRoA2 are significant showing a negative coefficient. This proofs that the income smoothing hypothesis is still confirmed even if benchmark-beating ability is taken into account. Adjusted R^2 increases in both models by 1.8 % / 1 % showing that the explanatory power increases if Manage is added to the model. Therefore, it is appropriate to consider the additional control variable when examining R&D capitalization behavior. These findings are consistent with the study conducted by Markarian et al. (2008). In this model, income smoothing based on prior year's numbers turns out to be considerable which is previously rejected in Model 2. Even though explanatory power is higher in case of ΔRoA, it could be suggested that managers focus on base profits as well as on profits of the prior year. As both income smoothing references seem to be decisive, this will also be considered in the following analysis.

Although most of the literature determines operating profitability as the income smoothing target as stated in section 3.2., there is still some disagreement about the primary smoothing target of a company. Therefore, a sensitivity analysis is used to evaluate whether managers might also use R&D capitalization in terms of other smoothing targets than operating profitability (Barnea et al., 1976; Makar et al., 2000; Markarian et al., 2008; Michelson et al., 1995; Moses, 1987). Basically, the decisive criterion to determine the variable to be smoothed is the management's assumption about how different stakeholders assess the smoothness of income. Obviously, this is not always clearly determined, leading to discussions and different perceptions about the smoothing object. This makes it difficult for researchers to operationalize the very general manner of the income smoothing hypothesis. Additionally, each company can pursue another smoothing target, which is of course not easy to identify (Imhoff, 1981; Ronen and Sadan, 1981). It might also be that managers act opportunistically and choose the smoothing target that maximizes their personal welfare. Based on

Table 6: Collinearity statistics (own table)

	Tolerance	VIF
ΔRoA	0.143	6.974
RoA	0.149	6.727
Leverage	0.372	2.691
RDTotal	0.293	3.410
LagCapizalization	0.651	1.537
HighCapitalizer	0.372	2.689
Size	0.179	5.601
Growth	0.444	2.251
GrowthExpectation	0.543	1.840

Table 7: Overview of the sensitivity tests performed (own table);
* Each model also tests the one year change and includes Manage as an additional variable. These variations can be found in the appendix.

Models		Sensitivity test
Model 2	Replacing ΔRoA by ΔRoA2	Considering a one year change in RoA instead of a two year change
Model 3	Introducing control variable Manage to Model 1 and 2	Considering benchmark-beating ability
Model 4*	Replacing ΔRoA by ΔRoE	Considering the change in net income normalized by total equity as the income smoothing target
Model 5*	Replacing ΔRoA by ΔNetIncome/Assets	Considering the change in net income normalized by total assets as the income smoothing target
Model 6*	Replacing ΔRoA by ΔEPS	Considering the change in earnings per share as the income smoothing target

Table 8: Model 2 - Replacing ΔRoA by ΔRoA2 (own table);
The regession controls for years and industries; **Significant at the 0.01 level / *Significant at the 0.05 level; R = 0.954 / R Square = 0.911 / Adjusted R Square = 0.887 / Std. Error of the Estimate = 0.0103

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.059	0.014		4.306	0.000	0.032	0.087
ΔRoA2	-0.101	0.056	-0.140	-1.814	0.074	-0.211	0.010
ROA	-0.164**	0.053	-0.247	-3.092	0.003	-0.269	-0.058
Leverage	0.022*	0.011	0.113	1.964	0.053	0.000	0.045
RDTotal	0.084**	0.020	0.256	4.111	0.000	0.043	0.125
LagCapizalization	0.061**	0.024	0.111	2.513	0.014	0.013	0.109
HighCapitalizer	-0.003	0.003	-0.045	-0.799	0.427	-0.010	0.004
Size	-0.006**	0.001	-0.479	-5.663	0.000	-0.008	-0.004
Growth	0.011	0.014	0.038	0.750	0.456	-0.017	0.038
GrowthExpectation	0.000	0.000	0.013	0.263	0.793	-0.001	0.001

Table 9: Model 3 - Introducing control variable Manage (own table);
The regession controls for years and industries; **Significant at the 0.01 level / *Significant at the 0.05 level; First table: R = 0.964 / R Square = 0.929 / Adjusted R Square = 0.909 / Std. Error of the Estimate = 0.0092; Second table: R = 0.959/ R Square = 0.920 / Adjusted R Square = 0.897 / Std. Error of the Estimate = 0.0098

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.054	0.013		4.200	0.000	0.028	0.080
ΔRoA	-0.143*	0.060	-0.201	-2.400	0.019	-0.262	-0.024
ROA	-0.098	0.054	-0.148	-1.800	0.076	-0.207	0.011
Manage	0.012**	0.003	0.165	3.919	0.000	0.006	0.018
Leverage	0.023*	0.010	0.117	2.252	0.027	0.003	0.044
RDTotal	0.077**	0.019	0.235	4.030	0.000	0.039	0.115
LagCapitalization	0.053*	0.021	0.096	2.454	0.017	0.010	0.095
HighCapitalizer	-0.005	0.003	-0.088	-1.622	0.109	-0.012	0.001
Size	-0.006**	0.001	-0.483	-6.450	0.000	-0.008	-0.004
Growth	0.011	0.013	0.039	0.810	0.421	-0.015	0.037
GrowthExpectation	0.000	0.000	0.027	0.625	0.534	-0.001	0.001

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.053	0.013		3.980	0.000	0.026	0.079
ΔRoA2	-0.125*	0.054	-0.174	-2.331	0.023	-0.232	-0.018
RoA	-0.131**	0.052	-0.198	-2.527	0.014	-0.234	-0.028
Manage2	0.009**	0.003	0.120	2.842	0.006	0.003	0.015
Leverage	0.024*	0.011	0.122	2.221	0.030	0.002	0.046
RDTotal	0.073**	0.020	0.224	3.690	0.000	0.034	0.113
LagCapitalization	0.056*	0.023	0.102	2.412	0.018	0.010	0.102
HighCapitalizer	-0.003	0.003	-0.057	-1.049	0.298	-0.010	0.003
Size	-0.006**	0.001	-0.462	-5.715	0.000	-0.008	-0.004
Growth	0.006	0.013	0.020	0.408	0.684	-0.021	0.032
GrowthExpectation	0.000	0.000	0.028	0.609	0.544	-0.001	0.001

that assumption, managers who are compensated dependent on net income are less interested in smoothing net income than managers getting compensated by the market value of the company. It has to be considered that all these factors again depend on how much influence these managers have on income smoothing (Imhoff, 1981). As it becomes clear that the income smoothing target is not easy to determine, the sensitivity analysis tests different smoothing objectives to examine which variable is most likely to be smoothed without specifying that this is the only target used across all firms. This extends prior literature on income smoothing through R&D accounting since it solely focused on operating profitability.

Model 4 replaces ΔRoA by ΔRoE (Return on equity), which is calculated as the difference between current pre-managed net income before R&D capitalization and the average net income the previous two fiscal years normalized by current year's equity.

$$\Delta RoE_t = \frac{(\text{NetIncome}_t - \text{R\&D capitalized}_t) - \frac{\text{NetIncome}_{t-1} + \text{NetIncome}_{t-2}}{2}}{\text{Equity}_t} \tag{3}$$

Net income is chosen because prior research on income smoothing suggests that managers who are concerned with long term performance might prefer net income as the appropriate target (Ronen and Sadan, 1981). It must be considered that tax effects are neglected in this model since pre-managed net income is only calculated by subtracting R&D capitalization from bottom line profit without taking the tax effects incorporated into account (R&D reduces earnings before tax and thus tax payments). Table 10 shows the results after replacing ΔRoA by ΔRoE.

The regression reveals that ΔRoE is also highly negatively significant and thus an essential factor that has to be considered when analyzing R&D capitalization behavior. The model indicates that managers also focus on income smoothing in terms of bottom line profit. In consequence, operating profitability cannot be assumed to be the only smoothing target of a company. Adjusted R^2 decreases by nearly two percentage points compared to Model 1 indicating that ΔRoA is somewhat more important than ΔRoE in terms of income smoothing. RoE, Leverage, RDTotal, LagCapitalization and Size remain significant with the same coefficient signs as in Model 1. Adding Manage (related to ΔRoE) to the Model as performed in Model 3, shows that adjusted R^2 increases with Manage being positively significant (Appendix 5). This is consistent with findings in the previous model. In conclusion, there are no fundamental changes if ΔRoA is replaced by ΔRoE.

In a second step, ΔRoE is substituted by ΔRoE2 which measures the change in RoE over one period to face the issue discussed in Model 2. ΔRoE2 also shows a significant negative coefficient indicating that managers are not only concerned with base RoE but also with the change to the previous year. Adjusted R^2 increases marginally, showing that ΔRoE2 explains R&D capitalization variability slightly better than ΔRoE. As in the previous models, including Manage (related to ΔRoE2) increases explanatory power once more by nearly 1 %. The respective regressions can be found in Appendix 6.

Model 5 uses nearly the same variable definition as Model 4. The only difference is that the change in net income is normalized by total assets before R&D capitalization.

$$\Delta \text{NetIncome/Assets}_t = \frac{(\text{NetIncome}_t - \text{R\&D capitalized}_t) - \frac{\text{NetIncome}_{t-1} + \text{NetIncome}_{t-2}}{2}}{\text{EquityTotal assets}_t - \text{R\&D capitalized}_t} \tag{4}$$

Table 11 shows the results after replacing ΔRoA by ΔNetIncome/Assets.

As expected, the slight adjustment in Model 5 does not change the results fundamentally. ΔNetIncome/Assets is still negatively significant. However, adjusted R^2 increases by more than 2.4 percentage points up to 0.915 compared to Model 1. This indicates a very good explanatory power of the variables included. Consequently, the outcomes suggest that net income and its change normalized by total assets before R&D capitalization might even be more important concerning management's smoothing target than operating profitability. Otherwise, the findings equal those in Model 1 and Model 4 in terms of significance and the variables' coefficient signs except Leverage which is no longer significant. Also, in this model Manage (related to ΔNetIncome/Assets) is positively significant with an increasing adjusted R^2 (Appendix 7). Regressing for ΔNetIncome/Assets2, which again looks at one-year changes shows a negative and significant coefficient with the same adjusted R^2 as in Model 5. Thus, ΔNetIncome/Assets can be considered equally important to managers as ΔNetIncome/Assets2. Manage (related to ΔNetIncome/Assets2) additionally increases explanatory power by 1 %. The regressions for the second analysis can be found in Appendix 8.

The last model uses ΔEPS as the smoothing variable. It is calculated by dividing net income before R&D capitalization by the total number of shares. This measure is introduced since some prior income smoothing literature suggest to use EPS as an income smoothing object because of its importance in annual reports and several analysis (White, 1970).

$$\Delta EPS_t = \frac{(\text{NetIncome}_t - \text{R\&D capitalized}_t)}{\text{Total numbers of shares}_t} - \frac{\frac{(\text{NetIncome}_{t-1})}{\text{Total numbers of shares}_{t-1}} + \frac{(\text{NetIncome}-t-2)}{\text{Total numbers of shares}_{t-2}}}{2} \tag{5}$$

Table 12 illustrates the results after replacing ΔRoA by ΔEPS.

The outcomes suggest that ΔEPS is also negatively significant as in prior models. Therefore, it can be assumed that ΔEPS is integrated in managers' smoothing targets too. This model indicates the lowest adjusted R^2 with 0.856. Even though explanatory power is still high, it decreased by 3.5 % compared to Model 1. Like in Model 4 and Model 1, Leverage becomes significant when taking ESP into account, supporting the debt covenant hypothesis. Pre-managed ESP however is not significant indicating that companies characterized by a low ESP do not capitalize more to improve their EPS. It seems that companies are only interested in smooth EPS but are rather less concerned with the absolute magnitude. Further, Manage (related to ΔEPS) increases adjusted R^2 by nearly 2 % (Appendix 9). As in the previous models, ΔEPS is replaced by ΔEPS2 to assess whether base changes or one-year changes are perceived as more important. ΔEPS2 is significantly negative associated to R&D capitalization with a slightly decreasing adjusted R^2 compared to Model 6. Manage (related to ΔEPS2) leads to improved explanatory power of 3.3 %. The analysis can be found in Appendix 10.

Table 13 summarizes the results of the sensitivity analysis. The outcomes suggest that mangers do not only use operating profitability as the income smoothing target as assumed by prior R&D capitalization studies.

Net income as well as EPS are also considered by managers in terms of income smoothing. The findings extend prior literature on that field since no study investigated R&D capitalization based on net income or EPS smoothing even though these variables are highly significant and therefore have to be taken into account. Additionally, it can be proofed that companies do not only focus on base numbers but also consider the change to the prior year. Adding Manage to the models consistently increases explanatory power indicating that benchmark-beating ability should always be considered.

Table 10: Model 4 - Replacing ΔRoA by ΔRoE (own table)
The regession controls for years and industries; **Significant at the 0.01 level / *Significant at the 0.05 level ; R = 0.949 / R Square = 0.901/ Adjusted R Square = 0.874 / Std. Error of the Estimate = 0.0108

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.048	0.012		4.122	0.000	0.025	0.071
ΔRoE	-0.024**	0.008	-0.164	-3.139	0.002	-0.040	-0.009
RoE	-0.025*	0.011	-0.130	-2.342	0.022	-0.046	-0.004
Leverage	0.040**	0.011	0.201	3.598	0.001	0.018	0.062
RDTotal	0.073**	0.021	0.224	3.445	0.001	0.031	0.116
LagCapitalization	0.069**	0.024	0.126	2.829	0.006	0.020	0.117
HighCapitalizer	0.002	0.003	0.029	0.507	0.614	-0.005	0.009
Size	-0.007**	0.001	-0.564	-6.690	0.000	-0.010	-0.005
Growth	0.002	0.014	0.007	0.127	0.899	-0.026	0.030
GrowthExpectation	0.000	0.000	-0.038	-0.766	0.446	-0.001	0.001

Table 11: Model 5 - Replacing ΔRoA by ΔNetIncome/Assets (own table)
The regession controls for years and industries; **Significant at the 0.01 level / *Significant at the 0.05 level ; R = 0.966 / R Square = 0.933/ Adjusted R Square = 0.915 / Std. Error of the Estimate = 0.0089

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.059	0.011		5.251	0.000	0.037	0.082
ΔNetIncome/Assets	-0.154**	0.051	-0.220	-3.036	0.003	-0.254	-0.053
NetIncome/Assets	-0.201**	0.059	-0.284	-3.386	0.001	-0.319	-0.083
Leverage	0.005	0.013	0.024	0.367	0.715	-0.021	0.031
RDTotal	0.059**	0.019	0.181	3.175	0.002	0.022	0.097
LagCapitalization	0.058**	0.020	0.107	2.889	0.005	0.018	0.099
HighCapitalizer	0.000	0.003	0.003	0.069	0.945	-0.005	0.006
Size	-0.006**	0.001	-0.430	-5.997	0.000	-0.008	-0.004
Growth	0.007	0.012	0.027	0.638	0.525	-0.016	0.031
GrowthExpectation	0.000	0.000	-0.015	-0.357	0.722	-0.001	0.001

Table 12: Model 6 - Replacing ΔRoA by ΔEPS (own table)
The regession controls for years and industries; **Significant at the 0.01 level / *Significant at the 0.05 level ; R = 0.942 / R Square = 0.887/ Adjusted R Square = 0.856 / Std. Error of the Estimate = 0.0117

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.066	0.016		4.019	0.000	0.033	0.098
ΔEPS	-0.001**	0.000	-0.119	-2.609	0.011	-0.001	0.000
EPS	0.001	0.000	0.092	1.415	0.161	0.000	0.002
Leverage	0.056**	0.011	0.284	5.249	0.000	0.035	0.078
RDTotal	0.076**	0.023	0.231	3.359	0.001	0.031	0.121
LagCapitalization	0.081**	0.026	0.148	3.067	0.003	0.028	0.133
HighCapitalizer	0.000	0.004	-0.004	-0.059	0.953	-0.008	0.007
Size	-0.009**	0.001	-0.693	-7.846	0.000	-0.011	-0.007
Growth	-0.017	0.015	-0.063	-1.190	0.238	-0.046	0.012
GrowthExpectation	0.000	0.000	-0.052	-0.976	0.333	-0.001	0.001

Table 13: Summary of results of sensitivity analysis (own table)

Variables	Result	Significance level	Adjusted R Square
ΔRoA	significantly negative	0.018	0.891
ΔRoA (inc. Manage)	significantly negative	0.019	0.909
ΔRoA2	insignificantly negative	0.074	0.887
ΔRoA2 (inc. Manage)	significantly negative	0.023	0.897
ΔRoE	significantly negative	0.002	0.874
ΔRoE (inc. Manage)	significantly negative	0.007	0.881
ΔRoE2	significantly negative	0.000	0.877
ΔRoE2 (inc. Manage)	significantly negative	0.001	0.885
ΔNetIncome/Assets	significantly negative	0.003	0.915
ΔNetIncome/Assets (inc. Manage)	significantly negative	0.008	0.920
ΔNetIncome/Assets2	significantly negative	0.003	0.915
ΔNetIncome/Assets2 (inc. Manage)	significantly negative	0.002	0.926
ΔEPS	significantly negative	0.011	0.856
ΔESP (inc. Manage)	significantly negative	0.001	0.873
ΔEPS2	significantly negative	0.033	0.852
ΔESP2 (inc. Manage)	significantly negative	0.018	0.885

8. Limitations and further research potential

Even though the analysis proofed that managers engage in income smoothing through R&D accounting discretion, there are some limitations of the research that have to be regarded.

First, the thesis only focuses on accrual-based earnings management to smooth income while neglecting real earnings management, even though prior studies indicate that the latter does influence R&D expenditures (Cazavan-Jeny et al., 2011; Markarian et al., 2008; Osma and Young, 2009; Seybert, 2010; Tahinakis, 2014). If it is assumed that managers prefer to regulate their income by adopting R&D expenditures rather than change R&D capitalization ratio, this would impair the results leading to a lower association between the variables expatiated and R&D capitalization (Markarian et al., 2008). Since IFRS's aim is to provide decision useful information, primary to investors, it supports investor protection. Hence, companies might choose to favor real earnings management since this is less observable than accrual-based earnings management (Enomoto et al., 2015).

Second, R&D related data has to be collected by hand. This is very time consuming and therefore leads to a relatively low sample size. Additionally, data collection was partly restricted by disclosing issues, since not all companies publish their R&D numbers concretely and therefore have to be excluded from the sample. Beside of the very elaborate preselection of companies that are suitable for the analysis over the examined period, the elimination of the companies which do not disclose R&D numbers appropriately might cause a potential bias in the results since these companies could also be engaged in earnings management (Persson and Fuentes, 2011).

Additionally, the analysis only focuses on German listed companies which limits the validity to only one country. Since research results on that topic are quite diverse and vary by the country examined, further research could explore how the findings change if the analysis is conducted including multiple countries. The prevailing accounting and financial conditions as well as the level of control and regulation in a country might influence managers' accounting behavior and targets. Especially developing countries with rising R&D intensity and globalization effects could be interesting to observe in the future. Another possible research topic could be based on a comparison between two countries that differ in how to account for R&D. If a country with R&D capitalization options is opposed to a country that demands expensing of all R&D, the results determine the importance and role of accruals (Garanina et al., 2016; Triki-Damak and Halioui, 2013).

Further, there are some mediating and moderating effects that were not considered and might alter the results. The thesis does not incorporate the economic situation in the years examined even though it is possible that the accounting behavior of companies changes based on economic development (Garanina et al., 2016; Persson and Fuentes, 2011). In addition, it would be worth to consider Wang et al. (2017) suggestion that family-owned companies tend to show a higher quality of earnings than other stock companies. Consequently, it could be assumed that family owned business are less engaged in earnings management. Other factors that are suggested to influence the results are board size and its independence as these are considered as influencing factors in terms of monitoring effectiveness. The smaller the board and the higher its independence the better the associated monitoring quality. It could be assumed that a better monitoring quality allows for less earnings management through accounting discretion (Klein, 2002; Makar et al., 2000; Vafeas, 2000). Another aspect of interest might be the compensation of executives since the bonus plan hypothesis suggests that managers conduct earnings management to increase their personal wealth if their compensation is based on accounting numbers (Garanina et al., 2016; Triki-Damak and Halioui, 2013; Makar et al., 2000). The analysis also neglects the role of auditors. The quality of audit might be an additional variable of interest since a detailed and good external audit allows for less earnings management possibilities. However, it is difficult to quantify a high or low audit quality (Triki-Damak and Halioui, 2013; Othman and Zéghal, 2006). In fact, these factors are not considered because they are mostly not disclosed in the annual reports of the companies examined. Despite the fact that all these potentially influential factors are not included, the explanatory power of the present analysis is very high (always above 80 %) indicating that most of the significant variables that determine R&D capitalization behavior have already been identified.

9. Conclusion

The thesis examines whether managers of German listed companies use the flexibility to capitalize R&D expenditures given by IAS 38 to engage in income smoothing in terms of accrual-based earnings management. It is argued that there is a negative relationship between the companies' change in operating profitability and R&D capitalization.

To investigate the association between R&D capitalization and income smoothing, a multiple linear regression analysis is performed including relevant control variables. The outcomes support the established hypothesis, since ΔRoA shows a negative and significant coefficient. This proofs that managers do conduct earnings management through R&D capitalization to smooth their incomes. Further, a set of sensitivity analysis is conducted. The findings indicate that the hypothesis is still confirmed even if benchmark-beating ability is considered. Explanatory power even increases when adding the new variable. Additionally, the analysis proofs that operating profitability could not presumed to be the only income smoothing target since ΔRoE, ΔNetIncome/Assets and ΔEPS are significant as well. This extends prior literature as they only focus on operating profitability. Further, the results suggest that income smoothing could refer to base profits as well as to profits of the prior year.

The analysis contributes to the convergence project between the United States Generally Accepted Accounting Principles (US-GAAP) and IFRS, signed in 2002 (Cheney, 2017). It supports the view of FASB arguing that R&D capitalization opportunities pave the way for earnings management and thus impair objectivity of financial statements (Cazavan-Jeny et al., 2011; Healy et al., 2002; Lev and Sougiannis, 1996). However, while full expensing of R&D prevents managers from accrual-based earnings management, it could not be ensured that companies will not conduct real earnings management by adjusting their total amount of R&D investments made, according to current performance. If companies reduce their R&D spending in times of low profitability this is counterproductive since new technologies might help them to improve their business. Hence, US-GAAP might prevent companies from investing in R&D even though these investments are vital for today's companies to survive. In consequence, FASB and ISAB have to find a way of accounting practice that does not impair objectivity, maintain reliability and support R&D investments since a knowledge-based society forces companies to come up with new developments and improvements. To reach that, standard setters, politics and the companies itself have to work together to cope with the technology-caused structural change that is currently observed in the economy.

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