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# The determinants of capitalising development costs in private companies: evidence from Germany

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**Abstract** Empirical literature on accounting choices and the use of discretion when accounting for R&D seems to be abundant. However, most of these studies investigate the accounting behaviour of public firms. General research on accounting choices in public and private companies, in contrast, often suggests that incentives for accounting choices in private firms largely differ from those made by public firms due to differences in the group of financial statements' users. While public companies are driven by capital market forces, private businesses are assumed to be driven mainly by tax and dividend incentives. Hence, empirical evidence on the capitalisation of development costs in public companies cannot be transferred to the context of non-listed companies. Considering their economic importance worldwide and the overall sparse empirical accounting literature covering this sector, our paper investigates the accounting choice of capitalising development costs for private companies in Germany. As this specific accounting option provided by the German Commercial Code has neither an influence on taxable income nor dividend payments, the German context offers an interesting setting for evaluating the drivers of accounting choices in private companies. Based on a sample of 586 large and medium-sized private companies preparing their financial statements in accordance with German GAAP, we find that in the absence of tax and dividend incentives, the determinants for capitalising development costs in public and private firms are similar. Comparable to the results for listed companies, we find private companies to be driven mainly by incentives from debt contracting and the need to ameliorate financial numbers in case of low profitability and negative income. Nevertheless, in contrast to public firms, private companies seem not to be impacted by agency conflicts and the pressure of political costs.

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Furthermore, we investigate whether private companies would rather use the capitalising option in order to inform their financial statements' users about the high earnings potential of their R&D or capitalise development costs simply to ameliorate financial numbers, thus misleading their stakeholders as to their true overall performance and success in R&D. We created a matched sample of companies differing solely in regard to R&D success. Our findings show that if companies are otherwise similar, R&D success has no significant impact on the capitalising decision, suggesting that there are companies both using the capitalising option opportunistically and also informing their financial statements' users.

**Keywords** R&D accounting · Private companies · Earnings management · Accounting choices · German GAAP

**JEL Classification** D82 · M41 · O3

## 1 Introduction

Accounting for intangibles and in particular the capitalisation of development outlays has always been a controversial issue. As varying as opinions regarding this topic are today, so are accounting rules for internally generated intangible assets provided by standard setters. With accounting rules ranging from direct expensing of all R&D outlays (e.g. US GAAP) to a mandatory capitalisation of development costs conditional on the fulfilment of certain criteria (e.g. IAS 38), we also find capitalising options (e.g. German GAAP).

Having decided to offer an accounting option regarding the capitalisation of development costs, the German legislator now provides companies relying heavily on R&D with the means of providing useful information about their R&D projects to financial statements' users. Nevertheless, as has been frequently cited, a real opportunity to conduct earnings management to the detriment of financial statements' users has also been introduced. Prior literature on listed companies has shown that motives regarding the strategic use of such discretion can often be found in contracting incentives and the pressure of political costs. This has led to the assumption that in the specific case of public companies, discretion in accounting for development costs is used mainly by those with low performance and/or negative income as income numbers can—at least in the short-run—be increased by capitalising development cost (e.g. Aboody and Lev 1998; Cazavan-Jeny et al. 2011). However, to date there is only limited and mainly descriptive evidence regarding the determinants of R&D accounting in private companies. Nevertheless, literature on accounting choices and earnings management suggests in general strong differences between the accounting behaviour of listed and non-listed companies (e.g. Penno and Simon 1986; Coppens and Peek 2005; Burgstahler et al. 2006) due to distinctions in the group of financial statements' users. Thus insights from studies regarding accounting for development outlays in public companies may not be unrestrictedly transferable to the context of private companies.

We aim to contribute to the question of whether or not, within the scope of discretion or accounting options regarding the capitalisation of internally generated intangible assets, private companies are driven by different incentives than those which are publicly listed. Our study, thereby, complements existing empirical literature on listed companies' accounting behaviour when accounting for R&D by examining non-listed companies whose accounting policy choice is frequently assumed to be different from their listed counterparts.

For this purpose, we first ran a logistic regression of companies' capitalising decisions to investigate empirically the determinants in the capitalisation of development costs. Our results indicate that private companies with high information asymmetries in contracts with creditors are more likely to capitalise development costs as they either try to overcome this asymmetrical distribution of information or opportunistically use the fact that their financial statements' users are uninformed. In contrast, information asymmetries between equity investors and management do not influence the capitalising decision. This may be due to the fact that agency conflicts between managers and owners are usually less severe in private companies (Penno and Simon 1986; Francis et al. 2008). The same seems to hold for the influence of company size, leading to the assumption that political costs provide no incentives for strategic accounting choices in non-listed companies. Comparable with studies examining listed companies, we gain evidence that in a situation where the capitalisation of development costs can lead to a substantial amelioration of the company's standing that is transferred to contracting partners, e.g. when suffering a loss or showing a low return on assets, companies are more frequently capitalisers than expensers of development costs. Additionally, being familiar with intangibles seems to have an important impact on private companies' accounting policy choice to capitalise development costs. This suggests that they are more likely to capitalise internally generated intangible assets if they expect low costs from capitalising due to already existing management accounting structures for intangibles.

To investigate further whether private companies use the accounting option in an opportunistic manner or to inform their financial statements' users about high-potential R&D projects, we applied propensity score matching. Accordingly, we created matched pairs of companies differing in regard to the success of their R&D projects, but being as similar as possible otherwise. The results of examining this matched sample led to the conclusion that in the case of a non-listed company, the likelihood of capitalising development costs does not depend on the success of its R&D projects. Consequently, it could be assumed that private companies use the capitalising option under German GAAP both in order to inform their financial statements' users about successful R&D projects and also to ameliorate their financial numbers opportunistically.

This study, therefore, contributes to previous literature in several ways. Firstly, it extends prior research on the voluntary or discretionary capitalisation of development costs by being the first to examine the determinants of a capitalisation in private companies within a multivariate context. Secondly, it adds to the general literature on financial accounting differences in public and private companies. We contribute to this stream of literature by comparing our results regarding the

determinants of development costs to the already existing findings about the factors influencing listed companies. Thus we show that in the absence of tax and dividend incentives, private and public companies' accounting policy choices are similar. Nevertheless, in some ways, such as the impact of agency conflicts between management and shareholders as well as political costs on accounting choices, private and public companies still differ from one another. Finally, our study offers an insight into the determinants of accounting policy choices in private companies generally and, compared with the economic importance of non-listed companies (Chen et al. 2011), hereby adds to the rather underdeveloped empirical accounting literature. Overall, this study may be equally useful both for the group of financial statements' users and also the standard setters of private companies as it sheds light on the motives of those entities which are using the capitalising option for development costs.

The remainder of this paper is structured as follows. First, we present the motivation for our study and provide a link to prior literature (Sect. 2). Thereafter, we give a summary of accounting for R&D outlays according to German GAAP (Sect. 3). Then our research hypotheses are developed (Sect. 4), following which we give an overview of the sample and variable selection as well as the sample's characteristics (Sect. 5). Next the empirical results are discussed (Sect. 6) and further robustness checks are conducted (Sect. 7). Finally we provide a summary of the research question covered as well as the corresponding results, closing with comments about the implications and limitations of our study (Sect. 8).

## 2 Motivation and review of prior literature

Imperfect information and conflicts of interest induce costs resulting from an asymmetrical distribution of information (Holthausen and Leftwich 1983; Lee and Hsieh 1985).[1] Within this setting, accounting in general may lower such transaction costs, also referred to as the "information asymmetry component of the cost of capital" (Verrecchia 2001, p. 164). Hence, managers may have an incentive to use accounting options and accounting discretion—for example, when accounting for development costs—in a way that leads to a decrease in a company's transaction costs (Holthausen and Leftwich 1983).

The 'demand hypothesis' thereby suggests that managers use accounting choices and discretion to reveal otherwise private information in order to satisfy the information needs of their financial statements' users (e.g. Ball and Shivakumar 2005; Hope et al. 2013). In turn, information asymmetries between a company's managers and its financial statements' users are mitigated so that transaction costs burdening the company can be lowered. Consequently, if shareholders recognise this 'truthful' capitalisation which is linked to the expectation of future economic benefits, this should lead to higher share prices (e.g. Dinh et al. 2015). In contrast, the 'opportunistic behaviour hypothesis' states that managers rather use accounting policy choices in order to obfuscate a company's true performance making it appear

[1] This is based on the idea of the company as a nexus of contracts, as proposed by Coase (1937).

better off in the view of its financial statements' users (e.g. Cahan et al. 2008; Hope et al. 2013; Dinh et al. 2014b). This may, at least in the short run,[2] also lead to a reduction in a company's transaction costs. Yet the information imbalance between a company's management and its financial statements' users is not reduced. Hence, this may be reflected in a lower valuation of the company's shares (Cazavan-Jeny and Jeanjean 2006). Nevertheless, Givoly et al. (2010), for instance, suggest that the two hypotheses are non-exclusive.

In line with this, prior empirical literature on the voluntary capitalisation of development costs and discretionary accounting for intangibles has unsurprisingly found a broad variation of factors influencing accounting policy choice in publicly listed companies, which can often be linked to both honourable and opportunistic motivations. A large body of literature finds evidence for a public company's contractual relationships with providers of debt capital offering incentives to use accounting discretion and options regarding the capitalisation of intangibles in an income increasing manner (Daley and Vigeland 1983; Shehata 1991; Aboody and Lev 1998; Dhaliwal et al. 1999; Cazavan-Jeny and Jeanjean 2006; Tutticci et al. 2007; Givoly and Shi 2008; Oswald 2008; Cazavan-Jeny et al. 2011; Dinh et al. 2014a, 2015). Several studies document evidence showing that low performing listed companies especially use capitalisation in order to ameliorate accounting numbers such as reported income and equity (Aboody and Lev 1998; Cazavan-Jeny and Jeanjean 2006; Markarian et al. 2008; Zicke 2014). The same seems to hold for growing, not yet established companies (Dhaliwal et al. 1999; Oswald 2008; Ballas and Anagnostopoulou 2014) as well as those with negative reported income which try to meet income benchmarks (Markarian et al. 2008; Jones 2011). Some authors also identify public companies with volatile income patterns, and hence strong incentives for income smoothing, as being more likely capitalisers of development costs (Shehata 1991; Oswald 2008) and companies with high discretionary accruals to capitalise intangibles more excessively (Jones 2011).

Listed companies are often assumed to suffer from costs due to their size and thus political visibility e g. in course of regulation and taxation. Several authors, therefore, submit evidence documenting the use of discretion in accounting for larger companies' intangibles in an income decreasing manner (Daley and Vigeland 1983; Shehata 1991; Aboody and Lev 1998, Smith et al. 2001; Cazavan-Jeny and Jeanjean 2006; Givoly and Shi 2008; Oswald 2008; Jones 2011; Cazavan-Jeny et al. 2011). This is usually taken as evidence for managers intending to lower the burden of costs associated with political processes by reducing a company's size regarding both net income in the short run and also total assets generally. Mixed evidence is provided for companies' R&D intensity as a determinant of capitalising development costs. While some studies show that public companies with high R&D outlays are more likely to capitalise development costs (Shehata 1991; Aboody and Lev 1998; Percy 2000; Tutticci et al. 2007; Givoly and Shi 2008; Ballas and Anagnostopoulou 2014), other studies reveal converse results, showing that

[2] Akerlof (1970) suggests in his seminal paper on the "market for 'lemons'" that in markets where publicly observable characteristics of traded goods, e.g. companies, cannot be used in order to distinguish them regarding their quality, in the long run transaction costs will increase again.

development costs are primarily capitalised by companies with low R&D activities (Wyatt 2005; Cazavan-Jeny and Jeanjean 2006; Oswald and Zarowin 2007; Oswald 2008; Cazavan-Jeny et al. 2011; Zicke 2014). Using patent citation based variables, Wyatt (2005) additionally finds no clear evidence as to how a company's R&D characteristics influence management's discretion to capitalise R&D outlays.

Determinants such as low performance and incentives to meet income benchmarks are often associated with earnings management and, thereby, opportunistic behaviour (e.g. Burgstahler and Dichev 1997; Cazavan-Jeny et al. 2011; Dinh et al. 2015). In contrast to this, a positive relationship between R&D intensity and the capitalisation of R&D outlays, for instance, is regarded as proof of the 'demand hypothesis' or a 'truthful' capitalisation (e.g. Aboody and Lev 1998). Furthermore, Dinh et al. (2015) link firm-specific variables, such as firm size and leverage, to non-opportunistic behaviour, because these variables are 'fundamental', i.e. they determine a company's ability to meet the requirements for a capitalisation (Dinh et al. 2015). Consequently, empirical results of prior literature do not lead to the rejection of either the 'demand hypothesis' or the 'opportunistic behaviour hypothesis'.

Considering this brief review of prior studies' results, empirical accounting literature on capitalising development costs seems to be abundant. However, all of the studies cited above solely address the determinants influencing accounting for development expenses and intangibles in listed companies. Looking at the field of general accounting policy choices, empirical studies exhibit wide differences between the use of accounting choices and discretion in public and private companies (e.g. Penno and Simon 1986; Beatty and Harris 1998; Coppens and Peek 2005; Burgstahler et al. 2006; Givoly et al. 2010; Hope et al. 2013). Differences in this context are assumed to stem from peculiarities in the two groups of companies. Private companies usually show a higher concentration of ownership and in many cases owners are also managers of the firms (Penno and Simon 1986; Chen et al. 2011). Hence, information asymmetries between private companies' owners and managers are said to be rather low. The role of financial accounting as a means of overcoming information imbalances is, therefore, expected to be less important than it is for public companies (Burgstahler et al. 2006). Consequently, managers of private companies are possibly less likely to be engaged in demonstrating opportunistic behaviour when making accounting policy choices.

The same is stipulated in the context of a private company's lending relationships. Non-listed companies' providers of debt capital, especially banks, are assumed to rely less on publicly available accounting information due to a more familiar relationship with their private company borrowers (Nobes 2010) than they would when lending to public companies. While, for example, beating income benchmarks through accounting policy choices thus might be less important for private firms (Penno and Simon 1986; Givoly et al. 2010), their accounting choices are often said to be driven rather by dividend and tax incentives (Ball and Shivakumar 2005; Burgstahler et al. 2006). Nevertheless, it is not possible to draw an unambiguous conclusion from empirical literature as to whether or not the peculiarities of private companies lead to a lower financial reporting quality (e.g. Burgstahler et al. 2006; Givoly et al. 2010). Thus, both the 'demand hypothesis' and

the 'opportunistic behaviour hypothesis' can be considered as applicable to private companies.

Given the structural differences between public and private companies, it seems obvious that previous findings regarding the determinants of the accounting choice for capitalising development costs in public companies may not be unlimitedly transferable to the context of non-listed companies. However, bearing in mind that private companies are of major economic importance especially in Europe (European Commission 2014), it seems evident that further empirical research is needed in order to understand their accounting choices better from both the perspective of standard setters as well as the users of private companies' financial information. As research and development activities are not only conducted by large, public companies but also by private firms (e.g. Ortega-Argilés et al. 2009; Eierle and Haller 2010), it is appropriate to examine the capitalising option for development costs to gain further insights into private companies' accounting behaviour. Likewise, it offers the opportunity to compare our results with the existing empirical evidence on listed companies in order to outline possible similarities and differences in public and private companies' accounting policy choices.

## 3 Accounting for R&D outlays in German private companies

Initiated by the Accounting Law Modernisation Act (ALMA), which came into force on 29 May 2009, the German legislator implemented an accounting option to capitalise development costs in the accounting rules provided by the German Commercial Code (GCC) (Paragraph 248 II GCC), thus breaking with a long tradition of imposing the direct expense of all R&D outlays. Reasons that had been brought forward for this in the past were, for example, that benefits arising from corresponding assets are very risky and a capitalisation of development costs hence contradicts the premise of prudence. Nevertheless, in order to sharpen the focus of financial statements' users on internally generated intangible assets, thus recognising the importance of intangible assets in contemporary business, the legislator decided to extend legal coverage to include capitalisation of development expenses in order to be able to compete with IFRS (Deutscher Bundestag 2008). In specific terms, the advantages of a capitalisation for certain types of firms suffering strongly from high R&D expenses are considered nowadays as outweighing its disadvantages. Furthermore, although financial statements' users are often assumed not to trust accounting information on internally generated intangible assets, the German legislator assumed capitalised development costs to be an important piece of information rather than a source of distrust.

During the legislative process, the initially envisaged mandatory capitalising rule was converted into a capitalising option. The German legislator thus effectively lessened the inter-subjective comparability of financial statements and established further possibilities for earnings management. Nevertheless, this decision was justified by his not wanting to put the high burden of mandatory capitalisation on SMEs, as it may lead to high costs that may not be outweighed by benefits

(Deutscher Bundestag 2008). Rating the capitalising option as being equally successful regarding the achievement of the goals set, he furthermore revealed his presumption of firms' using the capitalising option only if they want to transfer true and useful information on R&D projects to financial statements' users.

The capitalisation of development costs according to the GCC is conditional solely on their meeting the criteria of assets (*Vermögensgegenstände*) according to the conventions of German GAAP. As opposed to IAS 38, it is not tied to the fulfilment of certain criteria (e.g. IAS 38.57). By implication, in the event of choosing to expense all R&D outlays as incurred, companies are not obliged to document the non-fulfilment of any criteria. However, comparable with general constraints in IFRS, the application of the accounting option has to be used consistently under similar circumstances (Paragraph 246 III GCC).

Notably, under German GAAP only companies capitalising development costs have to disclose the total amount of R&D outlays in the notes (Paragraph 285 No. 22 GCC). Companies choosing to expense all R&D outlays as incurred, therefore, do not have to report any figures related to R&D in their financial statements. Nevertheless, if R&D activities are being performed, they have at least to be described in the management report narrative, which has to be published in addition to financial statements (Paragraph 289 II No. 3 GCC).

Stemming from this brief summary of accounting rules according to the GCC and taking into account the special traits of the German economy and legal system, this German setting offers several benefits when aiming to fill the gap in research literature illustrated in Sect. 2. Firstly, as the German legislator implemented an accounting option in accounting rules provided by the German Commercial Code (GCC) with a voluntary capitalisation being conditional solely on capitalised costs meeting the criteria of an asset, German companies complying with the GCC, compared with e.g. IFRS, are relatively free in deciding whether to capitalise or expense development costs. Thus, we expect our study to move closer to clarifying the determinants of capitalising development costs than an examination of a setting where accounting standards solely offer discretion in accounting for development costs.

Secondly, the capitalisation of development costs according to the GCC has no direct impact on taxable income and dividends payable (Paragraph 5 II German Income Tax Act and Paragraph 268 IIX GCC). An indirect tax incentive, therefore, could be derived only by companies trying as far as possible to align financial reporting and reporting for taxation purposes. Hence, incentives for the capitalisation of development costs under German GAAP should stem mainly from informational aspects of accounting. Accordingly, the absence of direct tax and dividend incentives provides an interesting setting within which to examine what else drives accounting choices in private firms.

Finally, in contrast to other countries particularly those run on a common law basis, which are usually dominated by capital markets, private companies in Germany play a significant economic role and are often large in size. Both the financial statements as well as the management report of publicly listed entities in general and of private companies that classify as at least medium-sized according to the GCC (Paragraph 267 I GCC) need to be audited and published (Paragraph 316 I

GCC) in the Electronic Federal Gazette. Germany provides a rather comprehensive database, therefore, for private companies' accounting information. This allows us to employ multivariate statistical methods that, to our knowledge, have so far not been used on a sample of non-listed companies when examining the determinants of development outlays' capitalisation. This also holds for the German case where prior research conducted solely univariate analyses and, except for Eierle and Wencki (2014), examined low numbers of capitalising companies. Using a comparatively comprehensive sample for capitalisers and expensers of development costs, Eierle and Wencki (2014) show that capitalising and expensing companies differ significantly, for example, in regard to the relation of acquired intangibles to total assets, industry, legal form, company's development stage and leverage, finding that capitalising companies on average more often suffer from operative losses before capitalising development costs. Yet their univariate results do not permit an inference on the determinants of capitalising development costs in non-listed firms. Regarding the number of variables by which capitalisers and expensers of development costs differ, it seems appropriate to use further multivariate methods to gain a proper insight into the determinants of this specific accounting option's use in private firms that can be compared to prior research on listed companies.

## 4 Hypothesis development

### 4.1 Relationships with equity investors

Regardless of which motivation, the 'demand hypothesis' or the 'opportunistic behaviour hypothesis', lies behind a capitalisation of development outlays, management will have incentives to capitalise only if information asymmetries between the company and its financial statements' users are sufficiently high. Otherwise, a company's transaction costs will not be decreased by capitalising development expenditure.

In regard to private companies, information asymmetries between shareholders and management are assumed to be rather low (Penno and Simon 1986; Francis et al. 2008). Hence, some authors question the benefits to be derived by management revealing private information through their accounting to equity investors (e.g. Ball and Shivakumar 2005; Katz 2006; Nobes 2010). Following this line, using accounting discretion to obfuscate bad performance for shareholders is not considered to be a worthwhile option for private companies' management (Givoly et al. 2010).

However, information asymmetries between managers and owners may vary considerably between private companies depending on the extent of owners' involvement in management (Bollen 1996; Ang et al. 2000). Furthermore, companies for which shareholders' involvement in management is low can profit from economies of scale compared to providing shareholders and also other stakeholders individually with decision-useful information (Rasmussen 2013). Hence, we assume that owner's involvement in management decreases incentives for a capitalisation of development costs and test for the following relationship:

H1a: *Private companies with owners' high involvement in management are less likely to capitalise development costs.*

Additionally, within the German context, Kaya (2010) argues that differences in the strength of information asymmetries between shareholders and management also depend on a company's legal form due to differences in owners' information rights. In Germany shareholders of a limited liability company (*Gesellschaft mit beschränkter Haftung*) have more comprehensive information rights than the shareholders of a corporation (*Aktiengesellschaft*) (Kaya 2010). Thus information asymmetries between shareholders and management should be more prevalent in corporations than in limited liability companies or partnerships. We thus hypothesise as follows:

H1b: *Private companies operating in the legal form of a corporation are more likely to capitalise development costs.*

### 4.2 Relationships with debt holders

A similar reasoning could generally be applied for the impact of a company's relationships with providers of debt capital. The impact of (long-term) debt capital contracts on earnings management and especially on income increasing accounting policy choices in general has been demonstrated by empirical research on public companies (e.g. Dhaliwal 1988; Malmquist 1990; Beatty and Weber 2003; Missionier-Piera 2004) and reinforced particularly for the discretionary capitalisation of development outlays (Daley and Vigeland 1983; Shehata 1991; Dhaliwal et al. 1999; Wyatt 2005; Cazavan-Jeny and Jeanjean 2006; Tutticci et al. 2007; Oswald 2008; Höllerschmid 2010; Cazavan-Jeny et al. 2011). However, assuming that private companies have closer, more individual relationships with their lenders, these results might not be transferable to them. Private communication channels create lower information asymmetries between management and debt holders (Hope et al. 2013), thus causing a capitalisation of development costs to be rather irrelevant for non-listed companies.

In contrast, several authors state that private companies appear rather opaque to creditors in comparison with public companies (Berger and Udell 1998; Minnis 2011; Serrasqueiro and Macas Nunes 2012). Additionally, Cascino et al. (2013) argue that financial statements are of great importance in more private lending relationships. This is usually the case as financial statements provide information in a standardised way, thus facilitating quick analysis. Moreover, the information contained is audited and may, therefore, be more trustworthy than information submitted via private communication channels. Additionally, Burgstahler et al. (2006) and Givoly et al. (2010) state that private companies must be expected to have incentives to manage their earnings as they may also profit from ameliorating financial accounting numbers in order to avoid violating covenants. We do not expect, therefore, that incentives to capitalise development costs stemming from contracts with lenders will be of minor importance in non-listed companies and test for the following two hypotheses:

H2a: *Private companies strongly relying on bank debt are more likely to capitalise development costs.*

H2b: *Private companies strongly relying on trade credits are more likely to capitalise development costs.*

We distinguish here between two major sources of debt capital, banks and trade creditors, as the information channels and access to additional information of the two might be different (Petersen and Rajan 1997) insofar as the lending period length and lenders' expertise in analysing a company's financial numbers are concerned.

### 4.3 Company's development stage

The benefits resulting from satisfying financial statements' users' information needs or misleading them regarding a company's 'true' performance through capitalising development costs depend on a company's individual situation. The more strained a company's finances are, the higher in general can be the advantages from capitalising development outlays.

Young and/or still growing entities especially suffer from financial constraints, as they are often not able to report a solid profit history or high total assets reflecting their future earnings expectations. Thus information asymmetries between these companies and their contracting parties are particularly high (Fryges et al. 2012), providing strong incentives to capitalise development costs. Additionally, companies that are no longer growing or that grow rather slowly, have weaker incentives to capitalise development costs, as in the long run the annual amortisation of internally generated intangible assets will outweigh the annual capitalised development costs. Accordingly, the positive effect of development costs' capitalisation on reported income no longer exists (Oswald 2008). Furthermore, growing companies are often said to have more volatile earnings, so that income smoothing may be a strategy followed through the discretionary capitalisation of development costs (Dhaliwal et al. 1999; Oswald and Zarowin 2007). Eventually young and growing companies often need to raise substantial amounts of new capital and lack well established capital sources (e.g. Fryges et al. 2012). Thus they may have strong incentives for revealing useful information through capitalising development costs, for earnings management or for trying to mislead investors.

This is also evidenced by previous literature on public companies which finds that growing and less developed companies are more likely to capitalise development outlays (Dhaliwal et al. 1999; Oswald 2008). As this reasoning is also alleged by the German legislator focussing on the case of private firms (Deutscher Bundestag 2008), we do not expect a difference between public and private companies regarding the impact of a company's development stage. We hypothesise, therefore, as follows:

H3a: *Private companies which are growing strongly are more likely to capitalise development costs.*

H3b: *Younger private companies are more likely to capitalise development costs.*

### 4.4 Income smoothing and benchmarking

The incentives for capitalising development outlays may also depend on the volatility of a company's reported income. Since companies with changeable income patterns are usually perceived as more risky, earnings volatility provides an incentive for managers to capitalise development costs for income smoothing purposes, thereby beneficially influencing lenders' and shareholders' risk assessment.

In addition, incentives for capitalising development costs may also be higher for companies with negative reported income. Losses are usually perceived as a sustainably negative signal by financial statements' users,[3] which can have the knock-on effect of increasing a company's transaction costs. The option to capitalise development outlays can be used by management, therefore, to avoid having to report losses. Hence, managers of loss-making and low performing companies should usually have higher incentives to capitalise development costs. However, if reported income is negative, in some cases they may also have incentives to expand losses in order to build up hidden reserves. This behaviour is often referred to as 'big bath accounting' (e.g. Walsh et al. 1991).

However, empirical studies show that a company's earnings volatility and cost patterns are positively associated with a capitalisation of development costs (Elliott et al. 1984; Shehata 1991; Oswald and Zarowin 2007; Oswald 2008). Furthermore, it is demonstrated that public companies try to meet benchmarks through the capitalisation of development costs (Elliott et al. 1984; Oswald 2008; Cazavan-Jeny et al. 2011) and that weak performing companies are more likely to capitalise a higher proportion of R&D outlays (Markarian et al. 2008). Thus, 'big bath accounting' seems to be of minor importance when capitalising development costs and management would rather attempt amelioration of financial numbers through capitalising development outlays.

Regarding accounting policy choices in general, Givoly et al. (2010) and Hope et al. (2013), for example, argue that in the absence of capital market forces and stock compensation in private companies, incentives to meet income benchmarks should be lower. However, incentives for income smoothing and benchmarking may still result from information asymmetries between managers and creditors/investors respectively (Coppens and Peek 2005; Burgstahler et al. 2006). Since in the German setting capitalisation has no impact on taxable income and dividends, we assume that smoothing earnings and meeting benchmarks for information purposes is also important in non-listed companies. We test, therefore, for the following three hypotheses:

H4a: *Private companies which strongly engage in income smoothing are more likely to capitalise development costs.*

[3] This is the case, because equity investors and lenders can be assumed not to make totally rational decisions. Thus negative income numbers from the current period may influence their notion of the company in future periods, as suggested by prospect theory (Tversky and Kahneman 1991, 1992; Burgstahler and Dichev 1997).

H4b: *Private companies with a low profitability ex ante are more likely to capitalise development costs.*

H4c: *Private companies suffering from a negative reported income ex ante are more likely to capitalise development costs.*

### 4.5 Importance of intangibles

Compared with other accounting choices, the voluntary capitalisation of development costs can be assumed to be associated with high direct costs. Direct costs (Lev 1992; Wagenhofer and Ewert 2007) may arise especially from the necessary separation of research and development together with the determination of costs attributable to the internally generated intangible asset in its development phase. It is often argued, therefore, that the existence or implementation of a proper management accounting system or R&D project controlling is a necessary condition for the possibility of choosing between the two accounting alternatives. Hence, direct costs may even be prohibitively high especially for entities that do not have an adequate management accounting system. Companies that strongly engage in research and development are more likely to have such systems, as in these cases implementation costs amortise over a short time. Additionally, in these companies managers usually have the knowledge necessary to account for and monitor capitalised development costs. Accordingly, for these companies direct costs from investments in infrastructure and education related to the capitalisation of development costs should be lower.

Empirical studies investigating the impact of a company's research and development activity on R&D accounting in public companies provide mixed results. While some authors find that companies for which R&D is of high importance are more likely to capitalise development costs (e.g. Shehata 1991; Percy 2000; Tutticci et al. 2007; Givoly and Shi 2008; Ballas and Anagnostopoulou 2014), others obtain results suggesting the reverse (e.g. Wyatt 2005; Cazavan-Jeny and Jeanjean 2006; Oswald 2008; Cazavan-Jeny et al. 2011; Zicke 2014). However, in this context accounting choices in listed companies might not be unlimitedly comparable to private companies. Private firms often suffer from poorly developed management accounting systems and may not be able to measure development costs reliably. In the German case, this argument was even put forward as a reason for implementing an accounting option for development costs instead of a mandatory capitalisation rule. The accounting option to capitalise development costs should, therefore, be of interest primarily to those companies that already have more sophisticated management accounting systems (Deutscher Bundesrat 2008).

As the disclosure of all R&D expenses in the notes depends on the capitalisation of development costs (Paragraph 285 No. 22 GCC), this information is not available for expensing companies. Thus, the impact of R&D intensity on German private companies' accounting choices is not directly examinable. However, we assume that companies holding acquired intangible assets usually have the appropriate knowledge and management accounting systems in place and are, therefore, most likely also to have the expertise and information systems necessary to recognise and

monitor development costs for capitalisation purposes. Thus, companies holding acquired intangible assets may benefit from lower direct costs for investments in infrastructure and education necessary for the capitalisation of development costs compared with those which do not have relevant and comprehensive experience. Accordingly, we test for the following hypothesis:

H5: *Private companies for which acquired intangibles are important are more likely to capitalise development costs.*

### 4.6 Company size

Many authors (e.g. Watts and Zimmerman 1978; Hagerman and Zmijewski 1979; Holthausen and Leftwich 1983; Trombley 1989) suggest that companies increasing in size tend to refrain from making accounting choices that lead to an increase in reported income and/or total assets. The reasoning behind this is often referred to as the influence of political costs. Such costs arise because larger companies are usually more likely to attract the attention of governments, public institutions and regulators (Daley and Vigeland 1983). Examining listed companies, a number of studies find empirical evidence for bigger companies being more likely expensers of R&D costs (Daley and Vigeland 1983; Shehata 1991; Smith et al. 2001; Cazavan-Jeny and Jeanjean 2006; Oswald 2008; Cazavan-Jeny et al. 2011; Jones 2011), thus suggesting the impact of political costs on the capitalising decision. However, as stated by Trombley (1989), political costs can be assumed to be relevant only for the "very largest firms" (Trombley 1989, p. 531) which should mostly be listed companies. Consequently, one would not expect size as an indicator for political costs to be an issue in the case of non-listed companies.

Moreover, larger companies, regardless of whether or not they are listed, naturally have well developed information systems within which there is provision for extracting the information necessary for capitalising development costs easily and at relatively low direct cost (Cerf 1961). Furthermore, in the case of capitalising development costs, both the total amount of R&D expenditure and the capitalised assets are visible to competitors. This information could, therefore, be used to the detriment of the capitalising company (Verrecchia 1983; Wagenhofer 1990; Dye 2001; Wagenhofer and Ewert 2007). The monetary disadvantage resulting from new competitors entering the market represents one form of indirect costs. A second downside, which arises from the capitalising decision, is the risk of future impairments on capitalised assets. Since future benefits resulting from internal development projects often depend on external factors, investments in such activities are generally more risky than investments in tangible assets. The threat of having to impair assets in the future, hence strongly burdening reported income and equity, has, therefore, to be taken into account, when making the capitalising decision. As bigger companies are often more diversified (Trombley 1989), we would expect them to be affected less by indirect costs.

Thus, in the assumed absence of political costs' impact and taking into account the potential influence of direct and indirect costs associated with capitalising

development outlays, we expect the impact of size in private firms to be different from public companies. We, therefore, hypothesise:

H6: *Larger private companies are more likely to capitalise development costs.*

### 4.7 R&D success

R&D success is an important prerequisite for the capitalisation of development outlays. Nevertheless, accounting for R&D relies to a great extent on management's discretion. Thus, even if different companies' development costs fulfil the criteria of an asset, their earnings potential is divergent. Following the idea of the 'demand hypothesis' and the 'opportunistic behaviour hypothesis', there could be incentives for capitalising in the case both of companies with highly successful R&D projects as well as those whose R&D project's earnings potential is below average. Nevertheless, the more successfully a company undertakes R&D, the lower should be the indirect costs of capitalisation, as the higher a project's potential for success the lower the risk of future impairments.

For public companies, Wyatt (2005), for example, finds that strength within a technology area has a positive impact on the proportion of intangibles capitalised over total assets. Additionally, the primary results of Oswald (2008) and Dinh et al. (2015) suggest that companies with R&D projects valued highly by capital markets more frequently choose to capitalise development outlays.[4] As this reasoning is not linked to one of the peculiarities in a comparison of public versus private companies as referred to in Sect. 2, we expect no difference between business types. We test, therefore, for the following hypothesis:

H7: *Private companies with highly successful R&D are more likely to capitalise development costs*

## 5 Research design

### 5.1 Sample selection

In order to carry out our study, we first built a sample (Table 1) of German private companies that capitalised internally generated intangible assets in the year that the ALMA was first applied. We chose to focus on this specific business year, as it offers the opportunity to observe the determinants of development costs' capitalisation without the effect of upcoming industry benchmarks. Furthermore, in this specific situation companies were not yet influenced by financial statements' users' potentially negative perception of capitalised development costs, which could deter companies from capitalising again in the future.

[4] Nevertheless, the results of the three studies, as well as those of the study performed by Oswald and Zarowin (2007), seem to lack robustness for the R&D case, which may be due to the choice of their proxies or in the case of Oswald and Zarowin (2007) and Oswald (2008) even because of endogeneity issues.

**Table 1** Sample Selection

| | # of companies |
|---|---|
| Non-listed companies capitalising development costs in 2009, 2010 or 2011 according to *Dafne Neo* | 1042 |
| Companies whose annual financial statements were not available | (26) |
| Small companies | (356) |
| Companies in liquidation or with incomplete business years and changes in business activities | (16) |
| Companies with no capitalised development costs in the year of ALMA first-time adoption | (202) |
| Companies erroneously disclosing capitalised development costs | (111) |
| Companies with missing data | (40) |
| Hand-collected capitalisers | 2 |
| Final Sample of capitalisers | 293 |
| Sample of expensers conducting R&D according to the management report | 293 |
| Total Sample | 586 |

Initial selection criteria for inclusion in the sample: companies operating in a legal form with limited liability which are either large or medium-sized according to GCC

As the German legislator offered an option for early adoption of all changes made by the ALMA one year in advance and since business years may differ from calendar years, reporting periods in which the adoption of the ALMA may have taken place can end anywhere between 31 December 2009 and 30 November 2011. We first extracted all companies disclosing internally generated intangible assets, therefore, in at least one of the years 2009, 2010 and 2011 from Dafne Neo.[5] Furthermore, we included only companies operating in a legal form where at least one shareholder had limited liability. We excluded companies with unlimited liability from our studies as these companies are generally not required to publish their annual financial statements. Thus, our sample included only companies operating in one of the following legal forms: AG, GmbH, GmbH & Co. KG, SE & Co. KG and GmbH & Co. OHG. This resulted in a total of 1042 companies. For our analyses and for the purpose of plausibility checks, we retrieved the annual statements for all of these companies from the German Electronic Federal Gazette. Due to non-disclosure of annual statements, we had to eliminate 26 companies from our sample. Furthermore, according to the GCC only private companies that can be considered as large or medium-sized are required to disclose capitalised internally generated intangible assets separately in their balance sheets (Paragraph 266 I GCC) and provide disclosures on total R&D expenses in their notes (Paragraph 288 I GCC). Hence, only these companies are suitable for examination under the research question described above. Accordingly, from our sample we had to eliminate an additional 356 companies which qualified as small businesses. Another 16

[5] Dafne Neo is a database provided by Creditreform, which amongst other information includes financial data for German non-listed companies, either obtained from financial statements published in the German Electronic Federal Gazette or ascertained by Creditreform.

companies had to be dropped, because they were either in liquidation, had incomplete business years or recently changed their business activities. From the remaining 644 large and medium-sized companies, we then selected all companies that capitalised development costs in the year of the ALMA's first adoption and that disclosed the corresponding information in accordance with the GCC resulting in a remaining number of 331 companies. As a last step another 40 companies had to be dropped due to missing data and two companies that had initially been wrongly classified in the database as R&D expensing companies could be added. Eventually, we were left with a sample of capitalisers comprising 293 companies.

In order to compare the group of capitalisers with expensing firms, we randomly chose a control sample[6] of 293 additional companies classified as large or medium-sized conducting R&D according to disclosures in their management reports but not reporting any self-generated intangible assets in their balance sheets.[7] Thus, we implicitly excluded companies from the sample which were unlikely to have development costs that could be capitalised, such as banks or insurance companies. By analogy to the capitalising companies in our sample, we included the expensing companies' financial statements for the year in which they first applied the ALMA. Hence the choice of expensing companies is not limited to a specific year. Our final sample hence consisted of 586 private companies with equal numbers of companies and observations for capitalisers and expensers. As we solely wanted to examine the single entities' published financial statements according to German GAAP, we excluded neither parent companies nor subsidiaries.

### 5.2 Empirical model and variable description

To analyse the determinants of development costs' capitalisation in private companies, we ran a logistic regression on the binary variable CAP taking a value of 1, if the company capitalised development costs in the first annual financial statements prepared according to the ALMA, otherwise 0. We estimated the following model:

$$\begin{aligned} CAP_i = {} & \beta_0 + \beta_1 MAN\_SH_i + \beta_2 L\_FORM_i + \beta_3 BANKDEBT_i \\ & + \beta_4 TRADECR_i + \beta_5 GROW_i + \beta_6 AGE_i + \beta_7 ROA_i + \beta_8 BENCH_i \\ & + \beta_9 IMPACT_i + \beta_{10} SIZE_i + \beta_{11} RD\_SUCCESS_i \\ & + \sum_{j=1}^{7} \beta_{j+11} IND_{ji} + \beta_{19} EARLY_i + \varepsilon_i \end{aligned} \quad (1)$$

We included a proxy for owners' involvement directly referring to the ownership structure of a company by including MAN_SH equalling the proportion of

[6] It needs to be taken into account that our results, therefore, cannot be used for predicting a company's likelihood of being a capitaliser. This problem is also referred to as "oversampling" (Zmijewski 1984, p. 67). Nevertheless, we refrain from including all expensing companies in our sample due to the small proportion of companies capitalising development costs.

[7] In Germany companies which are at least medium-sized have to prepare and publish management reports in addition to their financial statements (Paragraph 264 I GCC) where they have to report on significant research and development activities (Paragraph 289 II GCC).

shareholders who are mutually managers of the company (H1a). Furthermore, we used the variable L_FORM, being an indicator variable equalling 1, if the company operates in the legal form of a corporation and being 0 otherwise as a proxy for information asymmetries between shareholders and management (H1b). As possible determinants relating to contracting with lenders tested in H2a and H2b, we computed two variables (BANKDEBT, TRADECR) relating total bank debt and trade credits respectively to total assets.

To test for the influence of a company's development status, we employed the variables GROW and AGE in our model. Company growth (GROW, H3a) was calculated as the one period growth of operating income, i.e. earnings before taxes (EBT), and a company's age (AGE, H3b) in accordance with prior studies (Serrasqueiro and Macas Nunes 2012), was measured as the natural logarithm of the company's age when the ALMA was first applied. In order to test in H4b whether low profitability companies or companies with negative profits are more likely to capitalise intangibles, we included the variable ROA being the company's return on assets in the year prior to the ALMA's first adoption as a measure of profitability. We did not use return on assets in the year of the ALMA's first application as it might be biased by other changes brought about by the ALMA. We included BENCH as a dummy variable set 1 if reported income from ordinary business activity is negative for testing H4c.

The variable IMPACT accounts for the importance of acquired intangibles to the individual company and is used to test H5. It was calculated as a company's acquired intangibles divided by total assets. Company size (SIZE, H6) was measured by the frequently used proxy of the natural logarithm of total assets (e.g. Cazavan-Jeny and Jeanjean 2006; Tutticci et al. 2007; Markarian et al. 2008; Prencipe et al. 2008; Cazavan-Jeny et al. 2011).

Following insights from prior literature regarding the close relationship of patents and the outcome of R&D (OECD 2009), we proxied for R&D success (H7) using information on companies' patenting activities. Prior literature frequently uses citations of US patents to model R&D characteristics (e.g. Hirschey et al. 2001; Wyatt 2005; Matolcsy and Wyatt 2008; Mazzucato and Tancioni 2012), which may to a certain extent allow for incorporating the quality of patents. Owing to the special characteristics of the patenting process in the German Patent and Trademark Office (GPTO) where citations are not mandatory when applying for a patent (Paragraph 34 VII German Patent Act), we had to choose a different approach. In order to proxy for R&D success resulting in strong, valuable proprietary rights regarding the outcome of R&D, therefore, for each company we calculated the number of active patents in relation to total assets (RD_SUCCESS).[8]

Furthermore, income smoothing incentives as in H4a were tested for by SMOOTH, being computed as the standard deviation of a company's operating income, i.e. earnings before taxes (EBT), divided by the standard deviation of a company's operating cash flow multiplied by (−1) (Burgstahler et al. 2006). Standard deviations were calculated on the basis of four business years. As this data is not available for new companies with less than four years' history, we used a

[8] Further measures for R&D success will be discussed as part of the robustness checks in Sect. 7.

reduced sample of 367 companies, comprising 225 capitalisers and 142 expensers, for the model 2 test. As we assume a company's age (AGE) to have an impact on the capitalising decision, we refrained from using just the reduced sample.

$$\begin{aligned} CAP_i = {} & \beta_0 + \beta_1 MAN\_SH_i + \beta_2 L\_FORM_i + \beta_3 BANKDEBT_i \\ & + \beta_4 TRADECR_i + \beta_5 GROW_i + \beta_6 AGE_i + \beta_7 ROA_i + \beta_8 SMOOTH_i \\ & + \beta_9 BENCH_i + \beta_{10} IMPACT_i + \beta_{11} SIZE_i + \beta_{12} RD\_SUCCESS_i \\ & + \sum_{j=1}^{7} \beta_{j+12} IND_{ji} + \beta_{20} EARLY_i + \varepsilon_i \end{aligned} \quad (2)$$

Control variables were included in both models for a company's business sector (IND) and for the voluntary early adoption of the ALMA (EARLY). The definitions and measurement of all variables included in the models above are specified in Table 2.

Note that for each company the reference year is that of the ALMA's first application; thus prior periods are company specific business years before the adoption of changes made by the ALMA. We computed all variables relating to profit or loss and balance sheet (BANKDEBT, TRADECR, GROW, SMOOTH, ROA, BENCH, SIZE, IMPACT) before capitalisation of development costs, i.e. 'as if expensed' (aie) numbers.

All patent related data was collected from a public database provided by the GPTO (DPMAregister). As this database is updated on almost a daily basis, we were unable to obtain data matching exactly the company's specific year of the ALMA's first application. However, we do not expect our results to be biased by this time lag as applying for a patent usually takes a while. We obtained all financial statements related data from Dafne Neo initially. Missing data was supplemented where possible by data collected from annual statements published in the German Electronic Federal Gazette.

### 5.3 Sample characteristics

Table 3 presents the distribution of capitalisers in the eight business sectors based on an author-adjusted version of the Fama/French 12 industry classification (Fama and French 2015).[9] It can be observed that there do not seem to be any industry specific differences regarding a private company's decision to capitalise development costs as Pearson's Chi squared leads to the assumption of no significant link between the capitalising decision (CAP) and a company's business sector (IND1–IND8). This contrasts, for example, with the findings of Cazavan-Jeny et al. (2011) for listed companies in France, who note in their sample that particularly companies from non-R&D-intensive businesses, such as construction, trade and services, are capitalisers (Cazavan-Jeny et al. 2011).

Table 4, Panel A reports descriptive statistics for all metrically scaled variables as well as the test statistic (U) and corresponding p values for a Mann–Whitney

[9] We shortened the original 12 industries to 8 due to very low numbers of observations in certain business sectors.

**Table 2** Description and measurement of variables

| Hypothesis (expected influence on $CAP_i$) | Variable | Description | Measurement |
|---|---|---|---|
| Dependent variable | | | |
| | $CAP_i$ | Indicator variable coded 1, if company i capitalises development costs in the year of ALMA first-time adoption, 0 otherwise | |
| Independent variables | | | |
| 1a (–) | $MAN\_SH_i$ | # of shareholders being mutually managers divided by total # of shareholders for company i | $\frac{\#\text{shareholders being managers}_i}{\#\text{shareholders}_i}$ |
| 1b (+) | $L\_FORM_i$ | Indicator variable coded 1, if company i operates in the legal form of a corporation, 0 otherwise | |
| 2a (+) | $BANKDEBT_i$ | Bank debt scaled by total assets before R&D capitalisation for company i | $\frac{\text{bank debt}_i}{(\text{total assets (aie)})_i}$ |
| 2b (+) | $TRADECR_i$ | Trade credits scaled by total assets before R&D capitalisation for company i | $\frac{\text{trade credits}_i}{(\text{total assets (aie)})_i}$ |
| 3a (+) | $GROW_i$ | One year growth of company i's EBT before R&D capitalisation | $\frac{(\text{EBT (aie)}_i - \text{EBT prior year}_i)}{\lvert\text{EBT prior year}_i\rvert}$ |
| 3b (–) | $AGE_i$ | Natural logarithm of the age of company i when first-time adopting the ALMA | $\ln(\text{year of ALMA adoption}_i - \text{year of founding}_i)$ |
| 4a (+) | $SMOOTH_i$ | Standard deviation (SD) of EBT before R&D capitalisation divided by standard deviation of operating cash flow for company i, computed both over four business years multiplied by (−1) | $\frac{\text{SD}\left(\text{EBT (aie)}_{it}\right)}{\text{SD}\left(\text{operating cash flow (aie)}_{it}\right)}(-1)$ with operating cash flow $(\text{aie})_{it}$ = net income $(\text{aie})_{it}$ + depreciation and amortisation $(\text{aie})_{it}$ + Δ $\text{provisions}_{it}$ + Δ $\text{trade credits}_{it}$ – Δ $\text{inventories}_{it}$ – Δ $\text{trade receivables}_{it}$ |

**Table 2** continued

| Hypothesis (expected influence on $CAP_i$) | Variable | Description | Measurement |
|---|---|---|---|
| 4b (–) | $ROA_i$ | Company i's return on assets (ROA) in the year before the ALMA first-time adoption | $\frac{EBIT_i}{\frac{1}{2}(\text{total assets (aie)}_i + \text{total assets prior year}_i)}$ |
| 4c (+) | $BENCH_i$ | Indicator variable coded 1, if company i reports a negative income from ordinary business activities before R&D capitalisation, 0 otherwise | |
| 5 (+) | $IMPACT_i$ | Company i's intangible assets without capitalised R&D scaled by total assets before R&D capitalisation | $\frac{\text{intangible assets (aie)}_i}{\text{total assets (aie)}_i}$ |
| 6 (+) | $SIZE_i$ | Size of company i before R&D capitalisation | $\ln(\text{total assets (aie)}_i)$ |
| 7 (+) | $RD\_SUCCESS_i$ | Number of active patents held by company i scaled by total assets before R&D capitalisation | $\frac{\#\text{ of active patents}_i}{\text{total assets(aie)}_i}$ |
| Control variables | | | |
| | $IND_{ji}$ | Indicator variable coded 1, if company i belongs to industry j, 0, if it belongs to industry 8, with | |
| | | j = 1: Consumer Durables (Fama/French 12 industry 1) | |
| | | j = 2: Consumer NonDurables (Fama/French 12 industry 2) | |
| | | j = 3: Manufacturing (Fama/French 12 industry 3) | |
| | | j = 4: Chemicals and Allied Products (Fama/French 12 industry 5) | |
| | | j = 5: Business Equipment (Fama/French 12 industry 6) | |
| | | j = 6: Wholesale, Retail, and Some Services (Fama/French 12 industry 9) | |
| | | j = 7: Healthcare, Medical Equipment, and Drugs (Fama/French 12 industry 10) | |
| | | j = 8: Other (Fama/French 12 industries 4, 7, 8, 11 and 12) | |
| | $EARLY_i$ | Indicator variable coded 1, if company i voluntarily applies the ALMA early, 0 otherwise | |

All numbers labelled as aie ('as if expensed') are computed neglecting capitalised R&D

**Table 3** Descriptive statistics by industries

| | # of expensers | # of capitalisers | N | % | Pearson's Chi squared |
|---|---|---|---|---|---|
| IND1 (consumer durables) | 14 | 14 | 28 | 4.78 | 0.000 (1.000) |
| IND2 (consumer nondurables) | 11 | 12 | 23 | 3.92 | 0.045 (0.832) |
| IND3 (manufacturing) | 133 | 120 | 253 | 43.17 | 1.175 (0.278) |
| IND4 (chemicals and allied products) | 12 | 10 | 22 | 3.75 | 0.189 (0.664) |
| IND5 (business equipment) | 35 | 48 | 83 | 14.16 | 2.372 (0.124) |
| IND6 (wholesale, retail, and some services) | 23 | 24 | 47 | 8.02 | 0.023 (0.879) |
| IND7 (healthcare, medical equipment, and drugs) | 9 | 4 | 13 | 2.22 | 1.967 (0.161) |
| IND8 (other) | 56 | 61 | 117 | 19.97 | 0.267 (0.605) |
| Total | 293 | 293 | 586 | 100.00 | 5.087 (0.649) |

The test statistic according to Pearson of a Chi squared-test is reported in the last column, level of significance (p value) in parentheses

rank-sum test for equality of means.[10] Panel B shows a contingency table for the two dichotomous variables (L_FORM, BENCH) including a Kolmogorov–Smirnov test for equality of means regarding the two groups of capitalisers (CAP = 1) and expensers (CAP = 0). It can be observed that extreme values are noticeably high for GROW and SMOOTH. Unlike other studies on public companies (e.g. Tutticci et al. 2007; Cazavan-Jeny et al. 2011), we include and verify all extreme values.

Table 4 shows that private companies capitalising and expensing differ significantly in respect of all independent variables except for L_FORM, MAN_SH and RD_SUCCESS.

Bivariate correlations according to Spearman's Rho[11] (Table 5) confirm these findings for MAN_SH and RD_SUCCESS but provide evidence for a correlation between CAP and L_FORM, contrasting the results from the Kolmogorov–Smirnov test for equality of means. All correlations show the predicted signs, except for company growth (GROW) and company size (SIZE) which are negatively correlated with the capitalising decision (CAP), thus contradicting the relationship predicted in H3a and H6.

Overall it can be seen that none of the bivariate correlations exceed an absolute value of 0.5, so that in the univariate context collinearity does not seem to be an issue. Additionally, further tests provided no evidence for multicollinearity.[12]

[10] We did not apply a *t* test as all independent variables except for AGE are not normally distributed. To test for a potential normal distribution we ran a Kolmogorov–Smirnov test (not reported), resulting in p = 0.645 for AGE, all other p values <0.000.

[11] As all variables except for AGE are not normally distributed, we use Spearman's Rho instead of Pearson correlations.

[12] We computed the variance inflation factor (VIF) for each independent variable resulting in VIF taking no value above 1.352.

**Table 4** (A) Descriptive statistics of the metrically scaled variables, (B) descriptive statistics of the nominally scaled variables

| | CAP = 0 | | | CAP = 1 | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Minimum<br>Maximum | Mean<br>Median | N<br>SD | Minimum<br>Maximum | Mean<br>Median | N<br>SD | Minimum<br>Maximum | Mean<br>Median | N<br>SD | Mann–Whitney-*U* |
| *Panel A* | | | | | | | | | | |
| MAN_SH | 0.000 | 0.291 | 293 | 0.000 | 0.252 | 293 | 0.000 | 0.272 | 586 | 40,938.0 (0.284) |
| | 1.000 | 0.000 | 0.373 | 1.000 | 0.000 | 0.347 | 1.000 | 0.000 | 0.361 | |
| BANKDEBT | 0.000 | 0.133 | 293 | 0.000 | 0.211 | 293 | 0.000 | 0.172 | 586 | 31,158.0 (0.000) |
| | 2.087 | 0.003 | 0.214 | 0.725 | 0.170 | 0.204 | 2.087 | 0.078 | 0.213 | |
| TRADECR | 0.000 | 0.077 | 293 | 0.000 | 0.116 | 293 | 0.000 | 0.096 | 586 | 34,478.0 (0.000) |
| | 0.830 | 0.048 | 0.099 | 0.779 | 0.077 | 0.130 | 0.830 | 0.059 | 0.117 | |
| GROW | −170.909 | −0.093 | 293 | −21,647.455 | −76.235 | 293 | −21,647.455 | −38.164 | 586 | 32,924.0 (0.000) |
| | 21.842 | 0.182 | 10.780 | 2060.780 | −0.211 | 1273.521 | 2060.780 | 0.070 | 900.584 | |
| AGE | 0.693 | 3.136 | 293 | 0.693 | 2.814 | 293 | 0.693 | 2.975 | 586 | 35,008.5 (0.000) |
| | 5.220 | 3.045 | 0.976 | 4.963 | 2.833 | 0.904 | 5.220 | 2.970 | 0.954 | |
| SMOOTH | −16.485 | −1.058 | 142 | −8.860 | −0.721 | 225 | −16.485 | −0.851 | 367 | 13,054.0 (0.003) |
| | −0.039 | −0.621 | 1.731 | 0.000 | −0.469 | 0.895 | 0.000 | −0.531 | 1.293 | |
| ROA | −0.862 | 0.103 | 293 | −1.746 | 0.029 | 293 | −1.746 | 0.066 | 586 | 30,683.0 (0.000) |
| | 1.085 | 0.083 | 0.187 | 0.591 | 0.042 | 0.171 | 1.085 | 0.059 | 0.183 | |
| IMPACT | 0.000 | 0.019 | 293 | 0.000 | 0.049 | 293 | 0.000 | 0.034 | 586 | 27,862.0 (0.000) |
| | 0.528 | 0.003 | 0.056 | 0.713 | 0.011 | 0.115 | 0.713 | 0.006 | 0.091 | |
| SIZE | 7.624 | 9.804 | 293 | 4.888 | 9.593 | 293 | 4.888 | 9.698 | 586 | 38,402.0 (0.027) |
| | 14.998 | 9.538 | 1.171 | 13.136 | 9.386 | 1.052 | 14.998 | 9.460 | 1.117 | |

**Table 4** continued

| | CAP = 0 | | | CAP = 1 | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Minimum<br>Maximum | Mean<br>Median | N<br>SD | Minimum<br>Maximum | Mean<br>Median | N<br>SD | Minimum<br>Maximum | Mean<br>Median | N<br>SD | Mann–Whitney-*U* |
| RD_SUCCESS | 0.000<br>0.004 | 0.000<br>0.000 | 293<br>0.000 | 0.000<br>0.005 | 0.000<br>0.000 | 293<br>0.001 | 0.000<br>0.005 | 0.000<br>0.000 | 586<br>0.001 | 40,073.0 (0.126) |

| | CAP = 0<br>N | CAP = 1<br>N | Total<br>N | Kolmogorov–Smirnov-Z |
|---|---|---|---|---|
| *Panel B* | | | | |
| L_FORM = 0 | 282 | 267 | 548 | 0.620 (0.837) |
| L_FORM = 1 | 11 | 26 | 38 | |
| BENCH = 0 | 245 | 145 | 390 | 4.131 (0.000) |
| BENCH = 1 | 48 | 148 | 196 | |

SD is the standard deviation of the variable. The U-statistic of a Mann–Whitney rank sum test (grouping variable = CAP) is reported in the last column, level of significance (p value) in parentheses. All numbers labelled as aie ('as if expensed') are computed neglecting capitalised R&D. CAP is an indicator variable coded 1, if a company capitalises development costs in the year of ALMA first-time adoption, 0 otherwise. MAN_SH is the # of shareholders being mutually managers divided by the total # of shareholders. BANKDEBT is company's bank debt divided by total assets (aie). TRADECR is company's trade credits divided by total assets (aie). GROW is the 1 year growth of the company's EBT (aie). AGE is the natural logarithm of the age of the company when first-time adopting the ALMA. SMOOTH is the standard deviation of EBT (aie) divided by the standard deviation of operating cash flow for company i, computed both over four business years multiplied by (−1). ROA is company's return on assets in the year before the ALMA first-time adoption. IMPACT is company's intangible assets without capitalised R&D scaled by total assets (aie). SIZE is the natural logarithm of total assets (aie). RD_SUCCESS is the # of active patents held by the company divided by total assets (aie)

The Z-statistic of a Kolmogorov–Smirnov test (grouping variable = CAP) is reported in the last column, level of significance (p value) in parentheses. All numbers labelled as aie ('as if expensed') are computed neglecting capitalised R&D. CAP is an indicator variable coded 1, if a company capitalises development costs in the year of ALMA first-time adoption, 0 otherwise. L_FORM is an indicator variable coded 1, if the company operates in the legal form of a corporation, 0 otherwise. BENCH is an indicator variable coded 1, if the company reports negative income from ordinary business activities (aie), 0 otherwise

**Table 5** Correlation matrix

| | N | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) CAP | 586 | 1.000 | | | | | | | | | | | | |
| (2) MAN_SH | 586 | −0.044 (0.285) | 1.000 | | | | | | | | | | | |
| (3) L_FORM | 586 | 0.105 (0.011) | −0.019 (0.647) | 1.000 | | | | | | | | | | |
| (4) BANKDEBT | 586 | 0.243 (0.000) | 0.214 (0.000) | −0.053 (0.203) | 1.000 | | | | | | | | | |
| (5) TRADECR | 586 | 0.171 (0.000) | −0.034 (0.416) | −0.061 (0.141) | 0.064 (0.123) | 1.000 | | | | | | | | |
| (6) GROW | 586 | −0.202 (0.000) | 0.048 (0.284) | −0.054 (0.192) | −0.072 (0.082) | −0.010 (0.801) | 1.000 | | | | | | | |
| (7) AGE | 586 | −0.160 (0.000) | 0.195 (0.000) | −0.126 (0.002) | 0.080 (0.054) | −0.097 (0.019) | 0.107 (0.010) | 1.000 | | | | | | |
| (8) SMOOTH | 367 | 0.154 (0.003) | 0.158 (0.002) | −0.009 (0.864) | 0.171 (0.001) | 0.037 (0.477) | −0.043 (0.412) | −0.101 (0.053) | 1.000 | | | | | |
| (9) ROA | 586 | −0.247 (0.000) | 0.041 (0.324) | 0.064 (0.124) | −0.108 (0.009) | −0.130 (0.002) | −0.273 (0.000) | 0.010 (0.808) | 0.044 (0.400) | 1.000 | | | | |
| (10) BENCH | 586 | 0.362 (0.000) | −0.071 (0.086) | 0.054 (0.193) | 0.138 (0.001) | 0.110 (0.008) | −0.461 (0.000) | −0.104 (0.012) | −0.145 (0.005) | −0.421 (0.000) | 1.000 | | | |
| (11) IMPACT | 586 | 0.304 (0.000) | −0.119 (0004) | 0.096 (0.020) | 0.046 (0.263) | 0.113 (0.006) | −0.062 (0.132) | −0.207 (0.000) | 0.054 (0.305) | −0.051 (0.222) | 0.112 (0.007) | 1.000 | | |
| (12) SIZE | 586 | −0.091 (0.027) | −0.284 (0.000) | −0.048 (0.248) | −0.179 (0.000) | 0.088 (0.034) | 0.009 (0.831) | 0.041 (0.320) | −0.157 (0.003) | −0.012 (0.766) | −0.002 (0.953) | 0.024 (0.561) | 1.000 | |

**Table 5** continued

| | N | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (13) RD_SUCCESS | 586 | 0.063 (0.126) | −0.002 (0.958) | −0.109 (0.008) | 0.100 (0.015) | 0.039 (0.349) | 0.084 (0.042) | 0.051 (0.221) | −0.109 (0.037) | −0.103 (0.013) | 0.054 (0.190) | 0.179 (0.000) | 0.132 (0.001) | 1.000 |

Correlation coefficients according to Spearman (Spearman's Rho), level of significance (p value) in parentheses. All numbers labelled as aie ('as if expensed') are computed neglecting capitalised R&D. CAP is an indicator variable coded 1, if a company capitalises development costs in the year of ALMA first-time adoption, 0 otherwise. MAN_SH is the # of shareholders being mutually managers divided by the total # of shareholders. L_FORM is an indicator variable coded 1, if the company operates in the legal form of a corporation, 0 otherwise. BANKDEBT is company's bank debt divided by total assets (aie). TRADECR is company's trade credits divided by total assets (aie). GROW is the 1 year growth of company's EBT (aie). AGE is the natural logarithm of the age of the company when first-time adopting the ALMA. SMOOTH is the standard deviation of EBT (aie) divided by the standard deviation of operating cash flow for company i, computed both over four business years multiplied by (−1). ROA is company's return on assets in the year before the ALMA first-time adoption. BENCH is an indicator variable coded 1, if the company reports negative income from ordinary business activities (aie), 0 otherwise. IMPACT is company's intangible assets without capitalised R&D scaled by total assets (aie). SIZE is the natural logarithm of total assets (aie). RD_SUCCESS is the # of active patents held by the company divided by total assets (aie)

## 6 Empirical results

### 6.1 Determinants of a private company's decision to capitalise development costs

In order to investigate the determinants of capitalising development costs in the multivariate context, we ran the logistic regressions of model 1 and 2 as specified above. Regression results of model 1 are based on the full sample of 586 companies, whereas evidence for model 2 is based on a reduced sample of 367 observations due to missing data for SMOOTH. The results of both models are presented in Table 6.

Based on model 1, we do not observe a significant impact on the capitalising decision resulting from owners' involvement (MAN_SH). Thus we cannot accept H1a. Private companies operating in the legal form of a corporation grant owners less comprehensive information rights than other legal forms and are, therefore, associated with high information asymmetries between equity investors and managers. We find that they more frequently capitalise development costs and accordingly accept H1b.

As a company's legal form might not solely proxy for information asymmetries, we tentatively infer overall that the incentives for strategic accounting choices out of agency conflicts with shareholders are rather weak in the case of private companies as is also assumed by Penno and Simon (1986) as well as Francis et al. (2008).

In contrast to this, based on model 1 we find that both debt contracts with banks (BANKDEBT) as well as trade credits (TRADECR) positively influence a non-listed company's likelihood of capitalising development costs. We accept H2a and H2b, therefore, and show that in private companies it is leverage which drives the capitalising decision. Hence, in this regard there seems to be no difference between private and public firms.

Considering the impact of a private company's development stage on its accounting choice, evidence from model 1 shows that younger private companies (AGE) have a significantly greater tendency to capitalise development costs. However, we find no evidence for the influence of company growth (GROW) on management's decision to capitalise development costs in the absence of capital market effects. Hence, we accept H3b, but reject H3a. Additionally, the results lead us to assume that those private companies with a negative return on assets (ROA) use the option to capitalise potentially in order to improve such performance indicators and, therefore, we consider H4b to be confirmed. As the sign on the coefficient of BENCH is in line with H4c and its influence on CAP is statistically significant, we find proof for the overall hypothesis that private companies which can extract high benefits from an amelioration of reported income are more likely to capitalise development costs. Hence, in regard to these determinants there also seems to be no difference between private and public companies.

Moreover, the variable IMPACT seems to have a significant influence on a company's decision to capitalise development costs. As predicted in H5, we find non-listed companies, for which acquired intangibles are highly important, more

**Table 6** Determinants of capitalising development costs

| | Hypothesis | Expected sign | Model 1 | | Model 2 | |
|---|---|---|---|---|---|---|
| | | | β | p value | β | p value |
| Constant | | | 0.559 | 0.584 | 2.112 | 0.119 |
| MAN_SH | 1a | (−) | −0.210 | 0.469 | −0.110 | 0.786 |
| L_FORM | 1b | (+) | 0.907 | 0.037** | 0.912 | 0.233 |
| BANKDEBT | 2a | (+) | 1.764 | 0.001*** | 1.739 | 0.022** |
| TRADECR | 2b | (+) | 2.892 | 0.002*** | 0.480 | 0.680 |
| GROW | 3a | (+) | −0.001 | 0.277 | −0.002 | 0.598 |
| AGE | 3b | (−) | −0.195 | 0.082* | −0.142 | 0.402 |
| SMOOTH | 4a | (+) | | | 0.454 | 0.011** |
| ROA | 4b | (−) | −1.296 | 0.054* | −2.941 | 0.010** |
| BENCH | 4c | (+) | 1.235 | 0.000*** | 1.191 | 0.000*** |
| IMPACT | 5 | (+) | 4.029 | 0.007*** | 1.411 | 0.482 |
| SIZE | 6 | (+) | −0.121 | 0.204 | −0.163 | 0.199 |
| RD_SUCCESS | 7 | (+) | 272.633 | 0.243 | 826.146 | 0.047** |
| Controlling for industry | | | Yes | | Yes | |
| Controlling for early adoption | | | Yes | | Yes | |
| $R^2$ (Nagelkerke) | | | 0.366 | | 0.420 | |
| $R^2$ (Cox-Snell) | | | 0.274 | | 0.310 | |
| Correctly classified | | | 73.4 % | | 77.1 % | |
| # of observations | | | 586 | | 367 | |

All numbers labelled as aie ('as if expensed') are computed neglecting capitalised R&D. CAP is an indicator variable coded 1, if a company capitalises development costs in the year of ALMA first-time adoption, 0 otherwise. MAN_SH is the # of shareholders being mutually managers divided by the total # of shareholders. L_FORM is an indicator variable coded 1, if the company operates in the legal form of a corporation, 0 otherwise. BANKDEBT is company's bank debt divided by total assets (aie). TRADECR is company's trade credits divided by total assets (aie). GROW is the one year growth of company's EBT (aie). AGE is the natural logarithm of the age of the company when first-time adopting the ALMA. SMOOTH is the standard deviation of EBT (aie) divided by the standard deviation of operating cash flow for company i, computed both over four business years multiplied by (−1). ROA is company's return on assets in the year before the ALMA first-time adoption. BENCH is an indicator variable coded 1, if the company reports negative income from ordinary business activities (aie), 0 otherwise. IMPACT is company's intangible assets without capitalised R&D scaled by total assets (aie). SIZE is the natural logarithm of total assets (aie). RD_SUCCESS is the # of active patents held by the company divided by total assets (aie)

*** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %; dependent variable CAP

likely to be capitalisers than expensers of development costs. We tentatively infer, therefore, that companies with lower direct costs for investment in infrastructure and education related to the capitalisation of development costs have a higher tendency to capitalise. However, we find no significant influence of company size (SIZE) on management's decision to capitalise development costs. While we fail to prove H6, we find no evidence for the potential influence of political costs either, as has been documented for listed companies in prior studies (Daley and Vigeland 1983; Shehata 1991; Smith et al. 2001; Cazavan-Jeny and Jeanjean 2006; Oswald

2008; Cazavan-Jeny et al. 2011; Jones 2011). Consequently, we indirectly confirm the hypothesis of Trombley (1989) stating that political costs are of relevance only for the "very largest firms" (Trombley 1989, p. 531).

Lastly, in line with our univariate results, the results for model 1 do not provide evidence that companies with successful R&D projects (RD_SUCCESS) are more likely to capitalise development costs, so we consider H7 to be rejected. Regarding private companies, we cannot confirm, therefore, the primary findings of Wyatt (2005) and Oswald (2008) for listed companies showing that the characteristics and market value of a company's R&D projects determine management's decision to capitalise development outlays.

Running the logistic regression on model 2, we included the variable SMOOTH, being an indicator for a company's overall income smoothing behaviour. Inferring from the positive coefficient of SMOOTH, we are able to show that private companies which smooth income generally use the capitalisation of development costs and associated discretion more frequently. Hence we confirm H4a. Comparing this result with prior findings on public companies showing that they use discretion in accounting for R&D and intangibles for income smoothing purposes (Elliott et al. 1984; Shehata 1991; Oswald and Zarowin 2007; Oswald 2008), we infer that there seem to be no substantial differences between private and public companies in this regard. Model 2 confirms the results of model 1 in respect of the variables BANKDEBT, ROA and BENCH. We thus substantiate the finding that private firms—similar to public businesses—capitalise development costs, especially if they suffer from high leverage through bank debt and if they are in situations where accounting numbers must be improved to compensate for poor profitability and reported income.

Nevertheless, we find no proof for the influence of L_FORM, TRADECR, AGE and IMPACT in model 2. Additionally, contrasting with our results from model 1, RD_SUCCESS seems to have a significantly positive influence on the likelihood of being a capitaliser of development costs. The differing significances of variables may be explained by the characteristics of the reduced sample. Comparing the companies included in the sample for the test of model 2 but with those companies excluded, we find by a Mann–Whitney rank sum test (not reported) that the two groups differ significantly e.g. in respect of TRADECR, AGE, IMPACT and RD_SUCCESS. The necessity of needing to use four business years for the calculation of SMOOTH led us to exclude very young companies from the sample used for the test of model 2. Furthermore, drawing a conclusion from Spearman correlations reported in Table 5, we find that these variables correlate weakly but significantly with AGE. Hence in the absence of very young firms, those variables are likely to have a different effect. However, this reasoning cannot be brought forward for L_FORM based on a Kolmogorov–Smirnov test as the median value of L_FORM is the same in both groups (included/excluded companies).

### 6.2 Impact of R&D success

Following from our results presented above, we find no clear evidence suggesting that private companies would rather use the capitalising option if the outcome of

their R&D is highly successful. Yet the logistic regression of models 1 and 2 does not allow us explicitly to draw conclusion on whether or not R&D success is causal for a capitalisation of development costs.

In order to examine the impact of R&D success further, we applied a pairwise matching technique, resulting in pairs of companies, differing solely in respect of their R&D success. For this purpose, we introduced an indicator variable, taking the value of 1 if a company's value for RD_SUCCESS lies above the median value of 0 and otherwise 0. Henceforth, this is referred to as the treatment variable RD_SUCCESS_DUMMY. Applying propensity score matching based on all independent variables as well as all control variables, we obtained two samples of matched pairs, samples 2 and 3 with 248 and 124 observations, i.e. 124 and 62 matched pairs respectively, differing solely through the inclusion of SMOOTH as a matching variable.[13] Table 7, Panel A presents the results of a Kolmogorov–Smirnov test for inequality of means, showing no significant differences in the median value of our treatment variable RD_SUCCESS_DUMMY for samples 2 and 3.

Furthermore, we ran our logistic regressions for a company's decision to capitalise development costs (CAP) on independent and control variables. Our results, as specified here in Panel B of Table 7, indicate that if a private company's other characteristics are as similar as possible, its R&D success has no impact on the likelihood of that company being a capitaliser of development costs regardless of whether SMOOTH is included (Sample 3) or not (Sample 2). Hence, we find no evidence that primarily private companies with strong R&D projects take advantage of the capitalisation option. We cannot infer, therefore, that the 'demand hypothesis' as a rationale when accounting for R&D prevails more in our sample than the 'opportunistic behaviour hypothesis'.

## 7 Robustness checks and sensitivity tests

### 7.1 Contracts with equity investors

Our primary results reported in Table 6 have led to the rejection of H1a. In order to substantiate these findings and check for a potential lack of accuracy in our proxy for owners' involvement (MAN_SH), we ran three additional models replacing MAN_SH by three other proxy variables. We would expect companies with a higher number of equity investors (NUM_SH), only external managers (EXTERNAL_SH) and a higher proportion of shareholders situated outside of Germany

[13] We used a maximum value for the distance between propensity scores of matched pairs of 0.001 in order to guarantee a high degree of accuracy from our matching procedure and excluded correlations between the treatment variable (RD_SUCCESS_DUMMY) and matching variables as far as possible. As we were not able to eliminate all correlations between the treatment variable and matching variables, we ran the matching procedure again, using a maximum value for the distance between propensity scores of matched pairs of 0.0005 (not reported), leading to an amelioration of the matching accuracy. However, this shows no different results regarding the impact of RD_SUCCESS_DUMMY. We refrained from conducting an even more accurate matching, due to our small sample size.

**Table 7** Matched samples: (A) Kolmogorov–Smirnov test, (B) multivariate logistic regression

| | Sample 2 | Sample 3 |
|---|---|---|
| *Panel A* | | |
| Kolmogorov–Smirnov-Z | 0.508 | 0.751 |
| p value | 0.959 | 0.626 |
| # of observations | 248 | 124 |

| | Sample 2 | | Sample 3 | |
|---|---|---|---|---|
| | β | p value | β | p value |
| *Panel B* | | | | |
| Constant | −1.110 | 0.578 | 2.232 | 0.567 |
| MAN_SH | 0.149 | 0.761 | 0.872 | 0.283 |
| L_FORM | −0.578 | 0.487 | −18.326 | 0.998 |
| BANKDEBT | 3.014 | 0.001*** | −0.483 | 0.736 |
| TRADECR | 0.769 | 0.563 | 1.573 | 0.593 |
| GROW | −0.039 | 0.263 | −0.017 | 0.690 |
| AGE | −0.242 | 0.182 | −0.749 | 0.033** |
| SMOOTH | | | 0.438 | 0.385 |
| ROA | −1.745 | 0.120 | −7.616 | 0.007*** |
| BENCH | 1.052 | 0.012** | 0.687 | 0.384 |
| IMPACT | 17.842 | 0.008*** | −0.481 | 0.936 |
| SIZE | 0.059 | 0.757 | 0.015 | 0.966 |
| RD_SUCCESS_DUMMY | 0.396 | 0.217 | 0.611 | 0.249 |
| Controlling for industry | Yes | | Yes | |
| Controlling for early adoption | Yes | | Yes | |
| $R^2$ (Nagelkerke) | 0.385 | | 0.555 | |
| $R^2$ (Cox-Snell) | 0.289 | | 0.404 | |
| Correctly classified | 74.2 % | | 81.5 % | |
| # of observations | 248 | | 124 | |

Sample 2 is a matched sample where RD_SUCCESS_DUMMY is the treatment variable and all independent variables of model 1 except for RD_SUCCESS are matching variables. Sample 3 is a matched sample where RD_SUCCESS_DUMMY is the treatment variable and all independent variables of model 2 except for RD_SUCCESS are matching variables

All numbers labelled as aie ('as if expensed') are computed neglecting capitalised R&D. CAP is an indicator variable coded 1, if a company capitalises development costs in the year of ALMA first-time adoption, 0 otherwise. MAN_SH is the # of shareholders being mutually managers divided by the total # of shareholders. L_FORM is an indicator variable coded 1, if the company operates in the legal form of a corporation, 0 otherwise. BANKDEBT is company's bank debt divided by total assets (aie). TRADECR is company's trade credits divided by total assets (aie). GROW is the one year growth of company's EBT (aie). AGE is the natural logarithm of the age of the company when first-time adopting the ALMA. SMOOTH is the standard deviation of EBT (aie) divided by the standard deviation of operating cash flow for company i, computed both over four business years multiplied by (−1). ROA is company's return on assets in the year before the ALMA first-time adoption. BENCH is an indicator variable coded 1, if the company reports negative income from ordinary business activities (aie), 0 otherwise. IMPACT is company's intangible assets without capitalised R&D scaled by total assets (aie). SIZE is the natural logarithm of total assets (aie). RD_SUCCESS_DUMMY is an indicator variable coded 1, if the company's value for RD_SUCCESS lies above the median value, 0 otherwise

*** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %; dependent variable CAP

(SH_ABORAD), to have a higher tendency towards a capitalisation of development costs.[14] As can be derived from Table 8, Panel A (Model 3–5), for none of these variables is the coefficient significantly different from zero, which leads us to substantiate the rejection of H1a. The results again provide evidence that overall agency conflicts are of minor importance in the capitalising decision of private companies, possibly due to lower principal agent conflicts between managers and shareholders. Descriptive statistics for NUM_SH and MAN_SH (not reported) show that the maximum total number of shareholders is 65, the value for the 3rd quartile equalling only 3 and on average 27 % of equity investors are involved in management. Thus compared with public companies, private companies seem to suffer from rather low information asymmetries between equity investors and management as has also been shown, for instance, by Eierle and Haller (2010).

### 7.2 Company's development stage

In order to check for the robustness of our earlier finding that a company's growth does not determine the capitalising decision in private companies, we applied a different proxy using the one-year growth rate of the company's total assets without capitalised development costs (GROW_2) (Table 8, Panel A, Model 6).[15] However, we find no significant influence of GROW_2 on CAP either and again reject H3a.[16]

### 7.3 R&D success

To check the sensitivity of results obtained for the possible influence of company's R&D success on the likelihood of a non-listed company being a capitaliser, we ran three additional regressions on the full sample of 586 companies, incorporating different proxies for R&D success (RD_SUCCESS_2, RD_SUCCESS_3, RD_SUCCESS_4). RD_SUCCESS_2, thereby, equals the number of active patents held by the company divided by the number of patent applications from the company over the last 20 years; RD_SUCCESS_3 is the maximum age of active patents and RD_SUCCESS_4 is calculated as the number of active patents held by the company divided by the minimum of 20 years and the age of the company.[17] All three variables thus account for the strength of a company's patents i.e. its proprietary

[14] As L_FORM significantly correlates neither with NUM_SH, EXTERNAL_SH nor SH_ABROAD, we keep L_FORM in all three models.

[15] Prior studies have frequently used growth of sales in order to proxy for company growth which, due to non-negativity of sales, allows calculation of growth rates over more than 1 year. Considering our sample companies, we cannot use sales as this is information that medium-sized German companies do not have to disclose in their statements of profit or loss, but are allowed to sum sales, cost of sales and other operating income up to gross profit (Paragraph 276 GCC).

[16] All proxies for company growth capture only underlying effects in the short run and may for this reason not be significant. In any event, we refrained from calculating growth using more than the period of two years as this would reduce our sample size and lead us to eliminate especially young companies which are said to derive significant benefits from capitalising development costs (Deutscher Bundestag 2008).

[17] At most we divide by 20 years, because this is the maximum possible duration of a patent in Germany. Hence all patents being applied for in the last 20 years could be still active.

**Table 8** (A) Sensitivity tests (I), (B) sensitivity tests (II), (C) sensitivity tests (III)

| | Model 3 | | Model 4 | | Model 5 | | Model 6 | |
|---|---|---|---|---|---|---|---|---|
| | β | p value | β | p value | β | p value | β | p value |
| *Panel A* | | | | | | | | |
| Constant | 0.294 | 0.768 | 0.407 | 0.682 | 0.325 | 0.744 | 0.550 | 0.590 |
| MAN_SH | | | | | | | −0.214 | 0.459 |
| NUM_SH | 0.041 | 0.206 | | | | | | |
| EXTERNAL_SH | | | 0.106 | 0.622 | | | | |
| SH_ABROAD | | | | | −0.238 | 0.476 | | |
| L_FORM | 0.886 | 0.043** | 0.913 | 0.036** | 0.896 | 0.039** | 0.886 | 0.042** |
| BANKDEBT | 1.700 | 0.001*** | 1.744 | 0.001*** | 1.644 | 0.001*** | 1.749 | 0.001*** |
| TRADECR | 2.888 | 0.002*** | 2.853 | 0.002*** | 2.798 | 0.002*** | 2.858 | 0.002*** |
| GROW | −0.001 | 0.249 | −0.001 | 0.276 | −0.001 | 0.237 | | |
| GROW_2 | | | | | | | 0.002 | 0.793 |
| AGE | −0.218 | 0.050* | −0.197 | 0.080* | −0.216 | 0.052* | −0.185 | 0.095* |
| ROA | −1.333 | 0.048** | −1.305 | 0.053* | −1.344 | 0.046** | −1.278 | 0.057* |
| BENCH | 1.237 | 0.000*** | 1.243 | 0.000*** | 1.262 | 0.000*** | 1.260 | 0.000*** |
| IMPACT | 4.051 | 0.006*** | 4.046 | 0.007*** | 4.018 | 0.007*** | 4.092 | 0.005*** |
| SIZE | −0.102 | 0.271 | −0.117 | 0.223 | −0.091 | 0.338 | −0.123 | 0.199 |
| RD_SUCCESS | 267.457 | 0.252 | 279.345 | 0.231 | 266.670 | 0.251 | 267.131 | 0.251 |
| Controlling for industry | Yes | | Yes | | Yes | | Yes | |
| Controlling for early adoption | Yes | | Yes | | Yes | | Yes | |
| $R^2$ (Nagelkerke) | 0.368 | | 0.365 | | 0.366 | | 0.364 | |
| $R^2$ (Cox-Snell) | 0.276 | | 0.274 | | 0.274 | | 0.273 | |

**Table 8** continued

| | Model 3 | | Model 4 | | Model 5 | | Model 6 | |
|---|---|---|---|---|---|---|---|---|
| | β | p value | β | p value | β | p value | β | p value |
| Correctly classified | 72.7 % | | 73.0 % | | 73.0 % | | 72.4 % | |
| # of observations | 586 | | 586 | | 586 | | 586 | |

| | Model 7 | | Model 8 | | Model 9 | |
|---|---|---|---|---|---|---|
| | β | p value | β | p value | β | p value |
| *PANEL B* | | | | | | |
| Constant | 0.706 | 0.493 | 0.837 | 0.430 | 0.993 | 0.352 |
| L_FORM | 0.957 | 0.029** | 0.943 | 0.031** | 0.893 | 0.041** |
| EXTERNAL_SH | −0.228 | 0.431 | −0.0220 | 0.447 | −0.223 | 0.443 |
| BANKDEBT | 1.761 | 0.001*** | 1.769 | 0.001*** | 1.806 | 0.001*** |
| TRADECR | 2.932 | 0.002*** | 2.899 | 0.002*** | 2.831 | 0.002*** |
| GROW | −0.001 | 0.273 | −0.001 | 0.297 | −0.001 | 0.293 |
| AGE | −0.191 | 0.088* | −0.0201 | 0.074* | −0.189 | 0.091* |
| ROA | −1.353 | 0.044** | −1.347 | 0.045** | −1.328 | 0.048** |
| BENCH | 1.239 | 0.000*** | 1.241 | 0.000*** | 1.242 | 0.000*** |
| IMPACT | 3.967 | 0.008*** | 3.882 | 0.009*** | 4.022 | 0.008*** |
| SIZE | −0.140 | 0.153 | −0.0149 | 0.138 | −0.164 | 0.104 |
| RD_SUCCESS_2 | 0.258 | 0.345 | | | | |
| RD_SUCCESS_3 | | | 0.000 | 0.344 | | |
| RD_SUCCESS_4 | | | | | 0.023 | 0.162 |
| Controlling for industry | Yes | | Yes | | Yes | |
| Controlling for early adoption | Yes | | Yes | | Yes | |
| $R^2$ (Nagelkerke) | 0.365 | | 0.365 | | 0.366 | |

**Table 8** continued

| | Model 7 | | Model 8 | | Model 9 | |
|---|---|---|---|---|---|---|
| | β | p value | β | p value | β | p value |
| $R^2$ (Cox-Snell) | 0.273 | | 0.274 | | 0.275 | |
| Correctly classified | 73.2 % | | 72.9 % | | 72.9 % | |
| # of observations | 586 | | 586 | | 586 | |

| | Model 10 | | Model 11 | | Model 12 | | Model 13 | |
|---|---|---|---|---|---|---|---|---|
| | β | p value | β | p value | β | p value | β | p value |
| *PANEL C* | | | | | | | | |
| Constant | 2.223 | 0.099* | 2.415 | 0.087* | 2.649 | 0.061* | 0.471 | 0.780 |
| MAN_SH | −0.053 | 0.896 | −0.006 | 0.989 | −0.011 | 0.979 | 0.161 | 0.647 |
| L_FORM | 0.851 | 0.251 | 0.967 | 0.210 | 0.924 | 0.219 | 0.476 | 0.384 |
| BANKDEBT | 1.772 | 0.020** | 1.888 | 0.015** | 1.822 | 0.019** | 1.599 | 0.007*** |
| TRADECR | 0.777 | 0.502 | 0.482 | 0.684 | 0.747 | 0.528 | 2.530 | 0.034** |
| GROW | −0.002 | 0.553 | −0.002 | 0.577 | −0.002 | 0.556 | −0.002 | 0.166 |
| AGE | −0.166 | 0.324 | −0.160 | 0.372 | −0.186 | 0.298 | −0.503 | 0.002*** |
| SMOOTH3 | 0.260 | 0.049** | | | | | | |
| SMOOTH_2 | | | 0.453 | 0.021** | | | | |
| SMOOTH3_2 | | | | | 0.283 | 0.036** | | |
| ROA | −2.916 | 0.010** | −3.085 | 0.008*** | −2.938 | 0.012** | −1.550 | 0.121 |
| BENCH | 1.092 | 0.001*** | 1.193 | 0.000*** | 1.153 | 0.000*** | 1.648 | 0.000*** |
| IMPACT | 1.435 | 0.475 | 1.730 | 0.396 | 1.604 | 0.431 | 9.749 | 0.059* |
| SIZE | −0.175 | 0.162 | −0.204 | 0.120 | −0.230 | 0.078* | −0.045 | 0.801 |
| RD_SUCCESS | 744.814 | 0.067* | 752.015 | 0.094* | 662.101 | 0.135 | 176.376 | 0.546 |
| Controlling for industry | Yes | | Yes | | Yes | | Yes | |

**Table 8** continued

| | Model 10 | | Model 11 | | Model 12 | | Model 13 | |
|---|---|---|---|---|---|---|---|---|
| | β | p value | β | p value | β | p value | β | p value |
| Controlling for early adoption | Yes | | Yes | | Yes | | Yes | |
| $R^2$ (Nagelkerke) | 0.412 | | 0.405 | | 0.406 | | 0.436 | |
| $R^2$ (Cox-Snell) | 0.304 | | 0.301 | | 0.302 | | 0.327 | |
| Correctly classified | 74.9 % | | 75.2 % | | 75.5 % | | 74.9 % | |
| # of observations | 367 | | 343 | | 343 | | 363 | |

All numbers labelled as aie ('as if expensed') are computed neglecting capitalised R&D. CAP is an indicator variable coded 1, if a company capitalises development costs in the year of ALMA first-time adoption, 0 otherwise. MAN_SH is the # of shareholders being mutually managers divided by the total # of shareholders. NUM_SH is the # of shareholders. EXTERNAL_SH is an indicator variable coded 1, if a company is solely owned by shareholders who are not mutually managers, 0 otherwise. SH_ABROAD is the # of shareholders abroad divided by the total # of shareholders. L_FORM is an indicator variable coded 1, if the company operates in the legal form of a corporation, 0 otherwise. BANKDEBT is company's bank debt divided by total assets (aie). TRADECR is company's trade credits divided by total assets (aie). GROW is the 1 year growth of company's EBT (aie). GROW_2 is the 1 year growth of the company's total assets (aie). AGE is the natural logarithm of the age of the company when first-time adopting the ALMA. SMOOTH_2 is the standard deviation of EBT (aie) scaled by total assets (aie) divided by the standard deviation of operating cash flow scaled by total assets (aie) for company i, computed both over four business years multiplied by (−1). SMOOTH3 is the standard deviation of EBT (aie) divided by the standard deviation of operating cash flow for company i, computed both over three business years, excluding the year of the ALMA first-time adoption, multiplied by (−1). SMOOTH3_2 is the standard deviation of EBT (aie) scaled by total assets (aie) divided by the standard deviation of operating cash flow scaled by total assets (aie) for company i, computed both over three business years, excluding the year of the ALMA first-time adoption, multiplied by (−1). ROA is company's return on assets in the year before the ALMA first-time adoption. BENCH is an indicator variable coded 1, if the company reports negative income from ordinary business activities (aie), 0 otherwise. IMPACT is company's intangible assets without capitalised R&D scaled by total assets (aie). SIZE is the natural logarithm of total assets (aie). RD_SUCCESS is the # of active patents held by the company divided by total assets (aie). RD_SUCCESS_2 is the # of active patents held by the company divided by the # of patent applications of the company over the last 20 years. RD_SUCCESS_3 is the maximum age of active patents held by the company. RD_SUCCESS_4 is the # of active patents held by the company divided by the minimum of 20 years and the age of the company

*** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %; dependent variable CAP

rights towards the outcome of the R&D process, but in line with our initial findings show no significant impact on the capitalising decision (Table 8, Panel B, Model 7–9).

### 7.4 Incentives for income smoothing

In model 2 we used an income smoothing indicator (SMOOTH) in order to account for a company's overall tendency towards income smoothing, but our results might be biased because SMOOTH included the year of the ALMA's first adoption. In order to eliminate any bias in the variable resulting from other changes made by the ALMA, we computed the same income smoothing indicator over three business years, excluding the company-specific year in which the ALMA was first applied (SMOOTH3). However, this led to no difference in our accepting H4a (Table 8, Panel C, Model 10). Furthermore, we used a second income smoothing indicator being computed as the ratio of the standard deviation of EBT scaled by total assets and the standard deviation of the operating cash flow scaled by total assets. We computed standard deviations over four years including the year of the ALMA's first adoption and over three years excluding this specific year, again resulting in a significant positive influence of both variables (SMOOTH_2, SMOOTH3_2) on CAP (Table 8, Panel C, Model 11 and 12).

### 7.5 Potential impact of group accounting policies

In addition to the preparation of financial statements for the single entity, companies which are subsidiaries usually have to reconcile their financial statements in accordance with the group's accounting policy for consolidation purposes. Subsidiaries may, therefore, have incentives to align their financial statements as far as possible with the group's accounting policy in order to reduce reconciliation costs. To test whether or not our results are biased because 223 of the sample companies are subsidiaries, we excluded all subsidiaries from the sample and ran model 1 again. The regression results for this subsample (Table 8, Panel C, Model 13) still show that BANKDEBT, TRADECR, AGE, BENCH and IMPACT significantly impact the capitalising decision in line with our hypotheses. ROA and L_FORM for this reduced sample become insignificant, which might be explained by the small sample size. Nevertheless, overall we conclude that the determinants of capitalising development costs in our sample of German private companies is not significantly driven by the company's being part of a group.

## 8 Summary and discussion

This paper focuses on the determinants of voluntarily capitalising development costs according to German GAAP in private companies. As prior literature suggests that accounting choices and earnings management behaviour in non-listed companies may be different from listed companies, previous findings regarding the determinants of accounting for development costs in publicly listed companies

may not be directly transferable to the context of private companies. Since the voluntary capitalisation of development costs in Germany is not linked to taxable income and dividends payable, the absence of such incentives gives us an opportunity to investigate what other influences drive private companies' accounting choice.

Using data from 586 large and medium-sized private companies preparing their financial statements in accordance with German GAAP, we ran a logistic regression of companies' choices to capitalise development costs on different variables that have also partly been tested for in the case of public companies. Overall we find that in part private companies' determinants are comparable with those of public companies. Although published financial information is often assumed to be of minor importance in private companies' lending relationships, we are able to show that—as with public companies—those which are highly leveraged use the capitalising option more frequently. Furthermore, companies which are young, generally highly engaged in income smoothing and suffering from low performance or negative earnings, capitalise development costs in order to ameliorate accounting numbers. Hence, in the absence of tax and dividend incentives, private companies do not differ from listed companies in respect of these determinants when making accounting choices.

Nevertheless, our results show that owner-related agency conflicts and resulting costs with equity investors do not determine a private company's accounting choice, thereby substantiating the notion of those conflicts being rather weak in private companies. Furthermore, in contrast to prior findings for listed companies, we find no substantive evidence for growth and size influencing private companies' accounting behaviour. Thus, in the context of non-listed companies political costs seem to be a minor issue. Additionally, we are able to show that private companies with lower direct costs for investments in infrastructure and education related to the capitalisation of development costs are more likely to capitalise development outlays. Hence, in the case of private companies direct costs seem to impact the capitalising decision.

Finally, our results suggest that R&D success, proxied for by a patent based indicator, has no significant influence on a company's likelihood to capitalise development costs. Substantiating this finding by using propensity score matching, it cannot be assumed that the accounting option to capitalise development costs provided by the GCC is used solely by companies that intend to inform their financial statements' users about R&D projects with a high potential for success or companies opportunistically capitalising development costs.

Our study thus firstly contributes to the question of determinants for capitalising development costs in private companies and, thereby, complements the findings of prior studies on listed companies. Furthermore, it contributes to the as yet poorly developed literature on accounting policy choices in private companies generally and provides empirical evidence demonstrating that in the absence of tax and dividend incentives, accounting choices in private firms become more similar to those in publicly listed companies. Accordingly, our study provides useful insights into accounting policy choices in private companies and may equally be of interest for standard setters and financial statements' users.

It has to be taken into account that we examined private companies' management's decision to capitalise only on first adoption of the ALMA. Hence, our results cannot be transferred unlimitedly to the general context of accounting choice, as in the long run industry benchmarks may develop and further companies, who did not have development costs fulfilling the criteria of an asset when adopting the ALMA, may in the future choose to capitalise. Nevertheless, the year of the ALMA's first application provides a setting in which management's decision is not influenced by benchmarking considerations. Moreover, companies were not yet influenced by financial statements' users' potentially negative perception of capitalised development costs which might cause companies to refrain from capitalising again at some point. Thus we are able to gain an insight into management's accounting choices in this special setting. However, developing benchmarks for the capitalising decision remains a potential field of research for future studies.

Moreover, we have to consider the limitations of this study resulting from our choice of proxies for R&D success. Patent indicators may be a good indicator for R&D success in a setting where companies believe that their intellectual property is secured best if it is patented. However, there may be strategies where companies would prefer to protect the outcome of their R&D by keeping it secret. Furthermore, it needs to be considered that not all patents show the same quality (e.g. Mazzucato and Tancioni 2012). However, owing to the peculiarities of the German patenting process we cannot incorporate a quality indicator such as citations into our proxy.

Our results suggest that a company being a subsidiary has no substantial impact on the determinants of capitalising development costs. This may be considered unexpected as well integrated subsidiaries could be assumed to be mandated to use group-wide established accounting policies thereby assuring an efficient consolidation process. Hence it is surprising that results on the total sample remain robust even if subsidiaries are excluded. The question of group integration and accounting choices could, therefore, be explored in further studies.

This study furthermore explores the determinants of capitalising development outlays based solely on an empirical archival study. Further insights on the motives of private companies might be gained through surveys or interviews.

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