

DEPARTEMENT TOEGEPASTE ECONOMISCHE WETENSCHAPPEN

ONDERZOEKSRAPPORT NR 9822

ON THE DISCLOSURE AND CAPITALIZATION OF RESEARCH AND DEVELOPMENT SPENDING

SOME EMPIRICAL OBSERVATIONS FOR FLANDERS

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Some empirical observations for Flanders

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Abstract

In the US, FASB NR 2 demands the full expensing of R&D costs because they would not contribute to future earnings. In Europe, however, article 37 of the Fourth European Directive allows companies to capitalize their costs of R&D as an intangible asset or to expense them immediately in their income statement. The paper exploits this difference and tries to analyze empirically which factors determine the reporting choice made by firms in Europe.

More specifically, we analyze the capitalization as well as the disclosure decision of 321 Flemish firms, who are actively performing R&D activities. Company information from their financial statements is combined with privately held data on the size and nature of their R&D-activities. The disclosure decision is analyzed separately from the capitalization decision. Only 30 % of the 321 R&D active firms in the sample disclosed the amount of R&D spent in their financial statements. About 70 % of those firms disclosing choose to capitalize.

The empirical results show that the disclosure decision is determined by the R&D characteristics as well as by the financial performance of the firm. The probability that a firm discloses its R&D-expenses is increasing with its R&D intensity, the existence of an R&D-department and cooperation with universities or other firms. The current as well as the long term financial performance are also relevant for the disclosure decision. Once the firm has decided to disclose its R&D-expenses, the decision to capitalize these expenses is mainly determined by the financial performance. If firms can not repay part of their debt and if stakeholders do not receive a sufficiently high income, firms are more likely to capitalize their R&D costs. When the group of capitalizing firms is compared to the group of expensing firms, whether disclosing or not, our results suggest that the R&D intensity, at least in highly innovative industries, and the financial performance determine the capitalization of R&D expenses. Our results suggest that the expenses of successful R&D activities are more likely to be capitalized as an asset in the balance sheet.

Key words: R&D, disclosure, capitalization

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1. Introduction

Article 37 of the Fourth European Directive and article 25 of the Belgian accounting law allow companies to capitalize their costs of research and development (R&D) as an intangible asset and amortize these costs over future years or to expense them immediately in their income statement. This flexibility contrasts with the situation in the US where a decision of the FASB in 1974 (FASB NR 2) requires the full expensing of R&D outlays in financial reports of public corporations. This difference in approach underlines the importance of the ongoing discussion on whether or not capitalization of R&D spending should be allowed (Perry et al. (1994), Lev et al (1996)).

There are basically two kinds of arguments why firms should be allowed to capitalize their R&D-expenditures. First, there exists evidence for the fact that US firms, who are not allowed to capitalize, adjust their R&D-expenditures to help achieve budget targets (Perry et al. (1994)). Since R&D is a critical factor for the competitiveness of an industry, this may well limit the innovative capacity of an economy. Perry et al. (1994) therefore conclude that accounting standard setters should allow the capitalization of R&D assets¹.

Second, the “true and fair view” of the financial statements would be better served if capitalization is allowed. The evidence presented in Lev et al. (1996) for example indicates that the correlation between R&D-expenditures and earnings in subsequent years is, in general, both statistically significant and economically meaningful. On average, a one dollar increase in R&D-expenses leads to a two dollar increase in profit over a seven-year period and a five dollar increase in market value. The average duration of R&D-benefits is 6 to 7 years, where the contribution of the current earnings is highest for the one, two and three year lagged R&D-expenditures. These findings contradict the presumed absence of a relation between R&D-expenditures and subsequent benefits on which the FASB restriction in the US is based.

The market value of R&D-in-process is also relevant to capital market investors. The positive and significant stock returns and market-to-book values following the disclosure of the estimated fair value of R&D and technology-in-process are therefore another argument in favor of disclosing through capitalization (Deng et al. (1997)).

In this paper we analyze the capitalization decision of more than 300 R&D-active Belgian, i.c.Flemish, firms. Analyzing firms which have the flexibility to either capitalize their R&D-expenditures or to expense them in their income statements may contribute to the ongoing debate in the US and other countries where firms don't have this flexibility. It allows to investigate which firms, when given the option, will decide to capitalize these expenses. Moreover, we will not only look at the capitalization decision of these firms, but also at their disclosure decision. Before firms

¹This is not to say that if the capitalization of R&D costs were allowed, there would be no such problem since in that case not the R&D budgets but the amount capitalized could be used as a tool to smooth earnings.

can capitalize their R&D-expenses, these need to be disclosed as such in the income statements. R&D-performing firms have the option indeed not to disclose these expenditures, which implies of course that they cannot capitalize them, but to book them as regular expenses. In the scarce literature related to the subject, no attention has been paid to this disclosure decision, probably because the idea was that firms which disclose their expenditures, do so in order to be able to capitalize them. In our sample however, about 30 % of the firms which disclosed their R&D-expenditures didn't capitalize these expenses. This finding supports the idea that the disclosure decision needs to be analyzed separately. By disentangling the disclosure from the capitalization decision, we can find out whether or not the same factors drive both the capitalization as well as the disclosure decision.

We do so by combining data from an R&D-questionnaire as well as from the income statements of 321 Flemish companies active in R&D. We try to explain why some of these firms prefer to disclose their R&D-expenses while others don't. A second question is why some of the firms who disclose their R&D-expenses prefer to capitalize these expenses while others expense them immediately.

In what follows we first discuss the scarce literature related to this subject. Subsequently we give a brief description of the data used to explore the reporting decisions of R&D-performing firms. Next the results of a logit-model explaining both the disclosure and capitalization decision are reported. The results seem to support the idea that the disclosure decision is driven by both the R&D-characteristics as well as the financial situation of the firms while the capitalization decision is mainly influenced by the latter type of variables. Since the topic, despite its importance, is relatively unexplored, the paper by presenting some first results, hopes to incite further research.

2. A Discussion of the Related Literature

The disclosure and capitalization of R&D-spending has not been extensively discussed in the literature. While the disclosure decision has never been distinguished from the capitalization decision, the capitalization decision has been merely looked at in empirical work. In addition, only accounting variables are used to distinguish between capitalization versus non-capitalization. An example is the work by Ball and his colleagues (Ball et al. (1991)). In their survey for the UK they asked firms why they capitalize their R&D-expenditures. The most frequently given answers are: the increased fund raising ability, the influence on profits and a strong confidence in the real benefits of R&D. The influence on the fund raising ability is more important for small high technology firms than for large firms. Firms expensing their R&D-costs do so for reasons of prudence and fear of external judgments. The paper by Daley et al. (1983), using US data from

financial statements before 1974, shows that firms capitalizing their R&D-expenses are more highly leveraged, use more public debt, are closer to dividend restrictions, and are smaller than firms which expensed R&D-costs.

The choice of reporting methods is mainly explained in the literature by the contracting and the signalling theory as well as by the income smoothing hypothesis. Firms choose income increasing accounting methods, such as linear depreciation, FIFO and the capitalization of R&D-expenses, to avoid the violation of debt covenants. However, firms can also prefer to expense their R&D-costs to avoid too high reported profits (political visibility argument) or wage claims from the employees (Hagerman et al. (1979), Zmijewski et al. (1981), Healy (1985), Begley (1990), Watts et al. (1990), Defond et al. (1994)). The reporting choice can also be used as a signal (Spence (1973), Hughes et al. (1988)). If firms want to convince investors and debt holders about the future success of their R&D-activities, they will show these costs as an intangible asset in their balance sheet.

Finally, earnings' management can also influence reporting choices made. Asset write-offs can be done to reflect declines in the value of assets or to manipulate earnings. Francis et al. (1996) show that the second motive plays a substantial role in explaining the write-offs of discretionary items, such as goodwill and restructuring charges. In countries where R&D expenses can be capitalized, the amount of R&D capitalized and not the amount spent is probably a tool for earnings' management.

But even if we take into account the contracting as well as the signalling literature, no attention has ever been paid to the disclosure decision nor to the influence of the specific nature of R&D-activities on the reporting decision made. Further, the disclosure decision has never been distinguished from the capitalization decision, implicitly assuming that both decisions coincide. But at least for our sample of Flemish firms, which we will discuss in the next paragraph, it turned out that nearly 1 out of each 3 firms which disclosed its R&D-expenditures didn't capitalize these expenditures. So there seem to be quite a lot of firms which disclose their R&D-expenditures for other reasons than to be able to capitalize these expenses. Who are these firms and why do they do so? One advantage of disclosure is the fact that it informs all stakeholders (shareholders, creditors, the government, ...) about the R&D-activities of the firm which may result in long term benefits making it easier to attract funds or to find suitable partners for know-how transfers. On the other hand, also competitors receive this information which may imply a strategic disadvantage if it induces competitors to pull up their R&D-commitments.

The reporting choice of R&D performing firms may be influenced by the specific nature of R&D-activities. Firstly, given its highly risky nature, it is difficult to value R&D compared to other assets like for instance buildings and inventories. Secondly, different types of R&D-activities with a different visibility can be distinguished: research or development, process or product innovation,

basic or applied research. Thirdly, the organization of the R&D-activities, influencing its visibility, like for instance the existence of a separate R&D-department or cooperation agreements with other firms or research institutes, can also be important for the reporting decision. Finally, firms can invest in R&D on a permanent basis or only occasionally. In what follows we will therefore not only distinguish between the disclosure and the capitalization decision but we will also take into account in both decisions the information we have about the nature and organization of the R&D-activities of the firms involved.

3. The Sample

The study uses data from basically 2 sources, the combination of which offers a unique opportunity to study the disclosure and capitalization decision. A first source are the results of a questionnaire which was organized by IWT to estimate the R&D-expenditures by private firms in Flanders in 1992 and 1993, as part of Belgian statistical information required by the OECD. 321 firms reported R&D- and/or innovation expenditures, a sample biased in favor of large firms performing R&D-activities on a permanent basis. Besides some general firm characteristics (turnover, employment, ownership, NACE-sector, export intensity) and their R&D-expenditures as such, information was also collected on the allocation of their R&D-expenses between research versus development activities or process versus product R&D, on how the R&D-activities were financed (internal or external sources), where they took place (intra versus extra muros) and on their cooperative behavior regarding their R&D-activities².

This firm level information on R&D-activities for 1993 was linked to the financial statements of these firms. For every company the notes to their financial statements were checked to verify, first, whether or not the firms which were all engaged in R&D during this period, disclosed their R&D-expenses and, second, whether or not they capitalized these expenses. We were able to collect this information for 321 firms. As indicated in Figure 1, about 70 % of these firms didn't disclose their R&D-expenses in their income statements. So a large majority of R&D-performing firms in this sample did not identify in there income statements these expenses to be related to R&D. Consequently, they could not make use of the possibility to capitalize their R&D-expenditures³. Only 94 firms or nearly 30 % disclosed their expenses. Of these 94 firms, 65 or

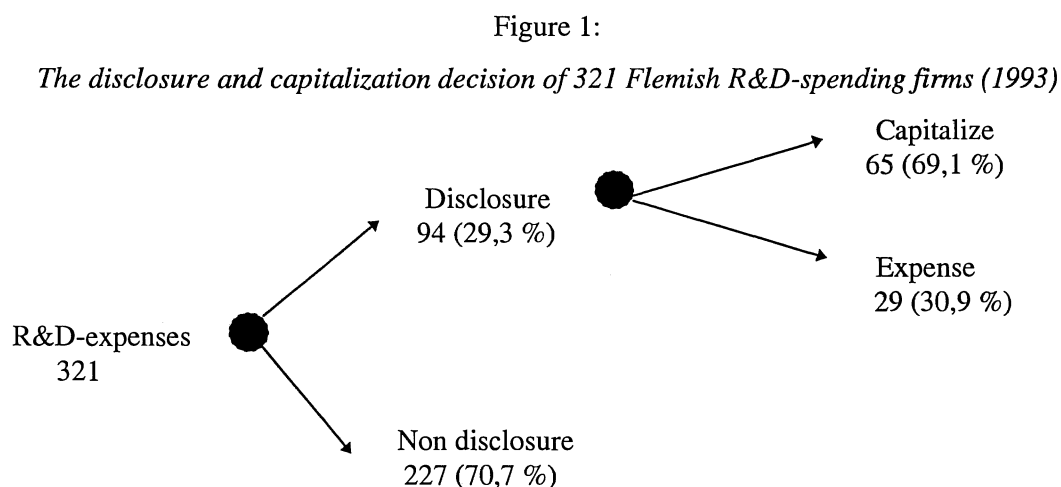
² For more details regarding the set-up of this questionnaire as well a presentation and interpretation of the results, see Veugelers et al. (1995) and Veugelers (1997).

³ This figure of non-disclosures may be even higher for the population of R&D-performing firms. The reason is that the sample is biased, like we indicated before, in favour of large firms performing R&D-activities on a permanent basis. These firms, as we will show later on in the paper, have a higher probability to disclose and capitalise their R&D-expenditures.

69,1% capitalized their expenses, while the other 29 firms didn't. The latter firms therefore disclosed their R&D-expenditures for other reasons than to be able to capitalize these expenses. Their number supports the idea that the disclosure decision deserves separate attention.

The numbers in Figure 1 are different from those in Herrman and Thomas (1995). In their study on the harmonization of accounting measurement practices in the European Community, they reported that half of the firms disclosed information about their R&D-expenditures⁴. But only about 23 % of the firms which disclosed their R&D-expenses, capitalized them. So a large majority of the disclosing companies record R&D-costs as an expense in the income statements. When comparing the different countries, they note however that companies from Belgium and Portugal favor disclosing/capitalizing R&D-costs.

For all these 321 firms, additional financial and accounting information was withdrawn from their financial statements. These data were merged with the information about their R&D-expenses and -profile.



4. Hypotheses

When formulating our hypotheses concerning the disclosure and capitalization behavior of R&D-performing firms, we will distinguish between "accounting" and "R&D" variables. "Accounting" variables are related to the financial position of the firm and already received attention in the empirical literature we discussed with respect to the capitalization decision. Ignored in this literature are the "R&D" variables which we will include in our analysis. These variables are related to the absolute as well as the relative importance of the R&D-activities and to the organization of these activities. We expect these "R&D" variables to be important especially when analyzing the disclosure decision. It should be stressed that we will consider the impact of the

same set of variables when analyzing the disclosure as well as the capitalization decision. This allows to explicitly identify which type of factors is of greater importance in explaining the disclosure decision as opposed to the capitalization decision.

4.1. Financial performance

Factors which are related to the financial position of the firm may have an impact on both the disclosure as well as the capitalization decision in many different ways. In what follows we will pay attention to the potential impact of the performance of the firm and the incentive to smooth income.

Related to the performance of the firm, research has been done on the relationship between the type of private information and the disclosure decision. Research on management earnings' forecasts (Lev et al. (1990), Lang et al. (1993)) shows that firms are more likely to disclose private information the more favorable this information. But according to Skinner (1994), earnings information is more likely to be released if the news is bad in order to reduce the probability of litigation. Whether a firm performs R&D-activities or not cannot be classified in terms of good versus bad news. But firms which perform badly may want to disclose their R&D-expenses to explain their worse performance to their shareholders and creditors. By disclosing their R&D-investments they may try to convince these stakeholders that the situation will be better in the future when these R&D-investments pay off. Following the same type of reasoning, one might also expect firms which perform worse to capitalize more since the capitalization of R&D-expenses can be used as an income increasing accounting method. As a consequence, we can summarize the expected impact of the performance of the firm on the disclosure as well as on the capitalization decision as follows: firms which perform badly are more likely to disclose and capitalize their R&D-expenses.

In our empirical analysis we used several variables to measure the performance of the firms: their current as well as their debt/equity ratio, their return on assets and on equity. We also introduced something like a short as well as a long term performance measure. In the short run firms do not have an incentive to disclose when the stakeholders of the firm (debt and equity holders) receive a sufficiently high income. For the shareholders we assumed that they will be dissatisfied if their return on investment was less than 8%. While this cut-off criterion will always be arbitrarily to a certain extent, the idea is that on top of a 3% risk free interest rate, investors

⁴ Herrmann et al. (1995) only considered large firms which may be an explanation for the higher percentage of firms disclosing their R&D-expenses since large firms are more likely to disclose (see *infra*).

want a risk premium of 5%⁵. Creditors are assumed to be dissatisfied if debts can't be repaid. This is certainly the case if the operational cash flow of a firm (cash flow + changes in working capital) is negative^{6,7}. In the analysis we introduce this idea by the variable "stake". "Stake" refers to the situation of the stakeholders of the firm, more precisely the situation of the shareholder as well as of the creditors. This dummy-variable gets the value 0 if both parties are dissatisfied. The dummy gets 1 in all other circumstances.

As a long term performance measure we constructed the variable "finhealth" which represents the financial health of the firm from a long term perspective. It is a dummy variable which gets the value 1 if the sum of the equity of the firm and its long term debt is larger than its fixed assets. If this is the case, the firm is considered to be financially healthy. If the sum is smaller than its fixed assets, problems may arise for the reimbursement of short term debts since fixed assets, which are a long term engagement, are partially financed by short term debt. When the short term debt has to be repaid, the firm might be unable to do so because the cash from debt has been invested in long term assets. Losses from previous years as well as a decrease in the amount of equity are mostly responsible for this situation.

Another hypothesis related to the financial situation of the firm is the income smoothing hypothesis. There exists evidence that in countries where the capitalization of assets is not allowed, firms smooth their income by the amount of R&D-expenditures (Grinaker and Perry (1994)). This is an important observation since if firms cut their R&D-budgets to reach the expected earnings, this may well limit the innovative capacity of an economy. If we find that the disclosure and the capitalization decision are influenced by the change in reported income, it could indicate that firms use the amount capitalized and not the real amount of R&D-expenses as a smoothing instrument. In Flanders (but the same is true for many other countries in Europe), earnings' forecasts are not readily available. Therefore we constructed the variable "profgrowth", making use of the previous year's earnings as expected earnings (corrected for the amount capitalized and the depreciation costs of the R&D-expenses) which were subsequently subtracted from the current year earnings. The expected impact of this variable on the disclosure and capitalization decision is summarized as follows: when profits increase, firms are less likely to disclose and capitalize their R&D-expenses.

⁵ The results we will report later on in the paper are stable however for all returns on equity between 6 % and 11 %. The average return on equity in the sample is 6.5%.

⁶ Even if a firm cannot repay her debt which matures, the debtholders are more prepared to negotiate a new repayment schedule when at least the interest charges can be paid.

⁷ Another possibility was to assume that creditors won't be pleased with the performance of the firm if not all long term debts which mature can be repaid. However, in 1993 interest rates were low and decreasing. Therefore firms preferred to repay their long term debts and to replace them with short term debts. Under these circumstances, the introduction of the repayment capacity would result in an overestimation of firms in financial difficulties.

4.2. R&D profile

We now turn to a discussion of the impact of the R&D-profile of the firms involved in the sample on their disclosure and capitalization decision. The impact on the disclosure decision is discussed separately from the impact on the capitalization decision.

With respect to the disclosure decision, the impact of the R&D-variables which we will look at can be stated in terms of a fundamental trade-off which exists when disclosing. The advantage of disclosure is the fact that it informs all stakeholders (shareholders, creditors, the government, ...) about the R&D-activities of the firm which may result in long term benefits, through easier fund raising or partner search. On the other hand, also competitors receive this information. The Industrial Organization literature stresses that information on commitment to R&D activities may stimulate or discourage R&D spending by other firms in the industry depending on the strategic substitutability or complementarity between products and the size of spillovers, see De Bondt (1997). When firms are marketing substitute products and technology leakage can be minimized, competitors will limit own R&D when a firm can signal commitment to its own R&D. In all other circumstances, competitors will pull up their R&D. One could therefore expect that if it is important to inform stakeholders, while circumstances are such that the strategic value of this information is limited and/or competitors know about the R&D-activities of the firm anyway, chances are higher that firms will disclose their R&D-expenses. On the other hand, when the disclosure of information would imply a strategic disadvantage while it is less important to inform stakeholders, disclosure is less likely. The idea of this trade-off can also be related with the concept of proprietary costs, as developed in Verrechia (1983)). A proprietary cost is any possible reduction in future cash flows attributable to the disclosure decision since the release of information may be relevant to competitors or employees, who might raise their wage demands. This implies that firms are more likely to disclose when the proprietary costs of disclosure are low. This trade-off approach can be summarized as follows: firms are more likely to disclose when the informative value of disclosure for the stakeholders is high while the strategic value of disclosure for competitors is low.

We used a number of variables to draw a R&D-profile of the firms in our sample, distinguishing between variables describing the absolute as well as the relative importance of their R&D-activities and variables which are related to the orientation and the organization of the R&D-activities. We expect that variables which indicate the importance of the R&D-activities to the firm, have a positive impact on the probability of disclosure. Firms which spend a lot on R&D or employ a large number of R&D personnel, in absolute terms as well as in relative terms, are more

likely to disclose these expenses since they need more funding and because competitors are more likely to know about their R&D-activities anyway.

The other R&D-variables included in our analysis are related to the way the R&D-activities are financed, whether they are research versus development oriented, whether they are process versus product oriented, where they take place, whether or not they take place in cooperation with other partners and whether or not the firm belongs to a R&D-intensive sector.

With respect to the way the R&D-activities are financed, we expect firms which receive R&D-subsidies from the government to have a higher probability of disclosure. If a firm does not disclose its R&D-expenditures in the financial statements, the government has less information to track the record of good R&D performance of this firm, which might decrease the probability of receiving grants in the future.

If the expenditures are more research oriented, as compared to development, one might expect the firms to be more likely to disclose their expenditures since the competitive effect of disclosing research expenses is smaller than for development activities. On the other hand, as the revenues from development activities are more identifiable and can be realized in a shorter time period, the probability of capitalization (and therefore disclosure) is larger.

R&D-activities which are oriented towards the development of new processes will limit costs while the purpose of product oriented R&D is the development of new products. The benefits of new products are typically more identifiable than those of cost reductions. We therefore expect that the higher the amount of R&D-expenses for the development of new products (processes), the higher (lower) the chance of disclosure.

The outsourcing of R&D is an observable action contrary to a situation where a firm performs its R&D-activities "intra muros". Given this observability, there is less need to keep information proprietary. Therefore, the higher the percentage of R&D-expenditures which is spent "extra muros", which implies of course a lower percentage spent "intra muros", the higher the chance of disclosure. Similarly, when a firm has an R&D-department or is involved in a R&D-cooperation agreement, we expect the probability of disclosure to be higher since these are more observable anyway and can be used as a signal to attract partners.

A last related R&D-variable is the R&D-intensity of a sector. The R&D-intensity of a sector was measured by the amount of R&D-expenditures divided by sales at the sector level. The classification of sectors follows Veugelers et al. (1995). High-tech sectors are the chemical industry (Nace 24), the food industry (Nace 15), the metal processing and electrotechnical industry (Nace 28, 29, 31, 34), the information technology industry (Nace 30, 32) and the informatics industry (Nace 72)⁸. All other NACE-sectors are classified as sectors with a low R&D-intensity.

⁸ The firms in these highly R&D intensive sectors were responsible for about 97 % of the R&D-expenses reported by all firms in the sample.

We constructed the variable "R&Dint(H)" referring to the R&D-intensity of the firm if it belongs to an industry classified as highly R&D-intensive. Similarly, the variable "R&Dint(L)" refers to the R&D-intensity of the firm if it belongs to an industry classified as having a low R&D-intensity. A distinction between firms in high- versus low-tech sectors can be important. Firms which are active in a high tech sector can be expected to be R&D-active. If they do not disclose any information, it might be considered as a negative signal. For an R&D-active firm in a low tech sector however, keeping these activities proprietary may be more important.

Some of the R&D-variables, especially those which are related, one way or another, with the success of R&D, will probably also have an impact on the decision to capitalize. Basically, we expect that firms are more likely to capitalize when their R&D-activities are successful. Respecting the General Accepted Accounting Principles, expenses can only be capitalized when they contribute to future earnings. Current R&D expenses generate future earnings when the R&D activities are expected to pay off in the future. As we do not possess output related measures for the success of R&D (e.g. number of patents per million Belgian francs of sales), proxies have to be used. Holthausen et al. (1995) uses the ratio R&D-expenses to sales and the number of employees in the R&D-department to measure innovative performance. We expect the level of R&D-expenses, both in absolute as in relative terms as well as the number of R&D-personnel to have a positive impact on the probability of capitalization. The idea is that large R&D-investments can only be justified when they have a positive impact on the results of the firm in the future. The questionnaire provides additional information on "the production of innovation expenses" and "the expenditures for licenses", be it that the quality of this information is low. If the research and development activities are successful, a production phase of the innovation follows. Therefore, as the amount spent in the production phase is larger, the R&D-activities are more successful. Based on the same idea, we expect firms which spent a larger percentage of their R&D-investments on research as compared to development activities, to capitalize less. The reason is that for research expenses, the contribution to earnings is less certain as compared to development expenditures.

Finally, Young et al. (1994) stipulate that partnerships with firms and a separate R&D-department encourage the efficiency of R&D-activities, which can result in an increase of the expected revenues and success. We therefore expect that firms with an R&D-department and firms involved in an R&D-cooperation agreement are also more likely to capitalize their R&D-expenses.

4.3 *The size of the firm*

A final hypothesis is related to the size of the firm, measured in terms of total assets, turnover or the number of employees, as a control variable. Following the transaction costs literature, the incentive for private acquisition information is higher in large firms which makes disclosure more

likely (Lev et al. (1990), Lang et al. (1993)). On the other hand, using a political visibility argument, larger firms may prefer not to capitalize their R&D-expenses in order to avoid regulatory actions from the government. Therefore, we expect that larger firms have a higher probability to disclose their R&D-expenses but a lower probability to capitalize their R&D-expenses.

Table 1 : *List of variables and hypotheses*

<i>Variable (D = Dummy)</i>	<i>Probability of disclosure</i>	<i>Probability of capitalization</i>
<i>Accounting variables</i>		
current ratio	-	-
debt/equity ratio	+	+
return on assets	-	-
return on equity	-	-
finhealth ⁹ (= D)	-	-
stake ¹⁰ (= D)	-	-
profgrowth ¹¹	-	-
<i>R&D variables</i>		
R&D-expenditures	+	+
R&D-personnel	+	+
R&D-expenditures/sales	+	+
R&D-subsidies	+	
Research oriented (%)	?	-
Process oriented (%)	-	
Intra muros (%)	-	
R&Ddep (= D)	+	+
R&Dcoop (= D)	+	+
R&Dint(H)	+	
R&Dint(L)	-	
Production of innovation expenses	+	+
Expenses for licenses	+	+
<i>Size</i>		
total assets	+	-
turnover	+	-
number of employees	+	-

⁹The variable 'finhealth' equals 1 when the net worth, defined as (long term debt+equity-fixed assets), is larger than zero.

¹⁰The variable 'stake' equals 1 when the owners or the debt holders are satisfied with the current performance of the firm. This situation occurs when the return on equity >8% and/or the operational cash flow is positive.

¹¹The variable 'profgrowth' equals (Profits 93-Profits 92)/absolute value (profits 93).

The variables used and their expected impact on the disclosure and capitalization decision are summarized in Table 1. The table shows the different expectations for the influence of the "accounting" as opposed to the "R&D" variables on the disclosure and capitalization decision. While we expect that the accounting variables will have an influence on the disclosure as well as on the capitalization decision, the R&D-characteristics mainly determine the disclosure decision. If the indicated R&D-variables determine the capitalization decision, the reporting decision could give information about the expected success of the R&D-activities. However, one definitely needs to take into account the limitations of input related variables to measure the success of R&D.

5. Empirical Results

The paper aims to identify the circumstances which explain a firm's decision whether or not to disclose its R&D-expenses and if disclosed, whether these expenditures are capitalized or not. Both the disclosure and the capitalization decision are considered as 0/1-decisions¹². In what follows we will report on a logit-model estimating the probability of R&D-active firms to disclose and capitalize their R&D-expenses. The choice of the explanatory variables was based on an exploration of the related literature as well as on the available data. The results from non-parametric one-way tests are reported in section 5.1. While such a univariate test-procedure may give some first impressions of the driving factors, the different explanatory factors need to be considered together in econometric analysis, reported in section 5.2.

5.1. Non-parametric univariate test results

First we will discuss a number of "accounting" variables. Subsequently we look at variables which describe the R&D-profile of the firms involved. Finally, we will look at the impact of the size of the firm. To avoid mixing disclosure and capitalization decisions, only the disclosers are part of the sample when studying the capitalization decision. This seriously reduces the effective sample for the capitalization decision, and may limit reaching significant results. Whenever relevant, the variables were corrected for the influence of the reporting choice made¹³.

As financial variables are not normally distributed, a non-parametric test, the vanderwaerdentest, is used. This test computes the deviation from the mean score.

¹² In the paper we won't pay attention to the amount or the percentage of their R&D-expenses firms disclose and/or capitalise.

¹³ If a firm capitalises its R&D-expenditures for example, total assets are equal to (total assets - (amount of R&D capitalised - amount of R&D depreciated in the current year)).

a. accounting variables

The performance of the firm is a highly significant variable to distinguish between firms which disclose their R&D-expenses and those which do not (see Table 2). Like stated in our hypothesis, firms which disclose perform worse: they have a lower current ratio, a higher debt-equity ratio and a lower return on assets and on equity, their stakeholders are more dissatisfied in the current year and they may not be able to reimburse their short term debts. While the financial performance does influence the decision to disclose, it does not discriminate significantly between capitalisers and non-capitalisers.

The univariate test shows that an increase in the income compared to the previous year is an incentive to disclose R&D information, contrary to what we expected. This could indicate that the success of R&D, measured by the influence on profits, determines the disclosure of R&D-expenses. However, the change in profits does not determine the capitalization decision.

Table 2: *Univariate test results - accounting variables*

<i>Variable</i> (D=Dummy)	<i>Discl</i>	<i>NonDiscl</i>	<i>P-value</i>	<i>Cap</i>	<i>NonCap</i>	<i>P-value</i>
current ratio	-0.2435	0.1008	0.0045	-0.0010	0.0224	0.8805
debt/equity ratio	0.1500	-0.0622	0.0808	0.0276	-0.6414	0.6735
return on assets	-0.2722	0.1130	0.0015	-0.0843	0.1958	0.1983
return on equity	-0.1615	0.0671	0.0602	-0.0271	0.0628	0.6799
finhealth (= D)	-0.1488	0.0616	0.0192	-0.0520	0.1188	0.1187
stake (= D)	-0.1020	0.0422	0.0447	-0.070	0.1577	0.1110
profgrowth	0.1545	-0.0641	0.0721	-0.0914	0.2121	0.1629

b. R&D variables

Besides the size of the firms involved and a number of "accounting" variables, the R&D-profile of the firms involved may also influence the reporting decision (see Table 3). The impact of this type of variables has never been studied before. In what follows we report on the significance of a series of variables which describe the R&D-profile of the firms in the sample.

Variables describing the absolute as well as the relative importance of the R&D-activities turn out to be highly significant when distinguishing between disclosers and non disclosers. Like we expected, firms which disclose their R&D-expenditures spend more on R&D, in absolute as well as in relative terms and also employ more R&D personnel. However, as the interaction variables with R&D intensive industries show, the R&D intensity of the firm only discriminates

between disclosers and non-disclosers in R&D intensive industries. Except for the relative measure, these variables can also distinguish between capitalisers and non-capitalisers : firms which spend more on R&D and/or have a high number of R&D-personnel are more likely to capitalize their R&D-expenses.

Table 3 : *univariate test results - R&D variables*

<i>Variable</i> (D=Dummy)	<i>Discl</i>	<i>NonDiscl</i>	<i>P-value</i>	<i>Cap</i>	<i>NonCap</i>	<i>P-value</i>
R&D-expenditures	0.4706	-0.1948	0.0001	0.1381	-0.3096	0.0373
R&D-personnel	0.4415	-0.2102	0.0001	0.1922	-0.3773	0.0122
R&D-expenditures/sales	0.3164	-0.1310	0.0002	0.0897	-0.2009	0.1764
R&D-subsidies	-0.0234	0.0056	0.9154	0.0194	-0.0434	0.6403
Research oriented (%)	-0.0439	0.0191	0.6444	0.1212	-0.2590	0.1126
Process oriented (%)	-0.043	0.017	0.6443	-0.056	0.1032	0.4821
Intra muros (%)	-0.0905	0.0405	0.2396	0.0030	-0.0081	0.9546
R&D-dep (= D)	0.2089	-0.0865	0.0021	0.0142	-0.0064	0.9056
R&D-coop (= D)	0.2484	-0.1029	0.0002	0.0982	-0.0043	0.9264
R&Dint(H)	0.2082	-0.0862	0.0069	0.0566	-0.1268	0.3614
R&Dint(L)	0.01636	-0.0056	0.8562	0.0399	-0.1780	0.7550
Production of innovation expenses	0.0037	-0.0079	0.9212	0.0996	-0.2380	0.0941
Expenses for licenses	0.2297	-0.1069	0.0011	-0.0510	0.1219	0.4081

However, the amount of R&D-subsidies received from EC-, Belgian or Flemish government sources is not significantly different between disclosers and non-disclosers. The same is true with respect to the focus of the R&D-activities: the percentage of R&D expenses spent on research activities or on the development of new processes is also not significantly different between disclosers and non-disclosers, capitalisers and non-capitalisers.

Firms which disclose do not significantly outsource more their R&D-activities, but they are significantly more likely to have a separate R&D-department, and to be involved in R&D-cooperation agreements. None of these variables is significant to distinguish between capitalisers and non-capitalisers however.

We argued that firms which are more successful are more likely to capitalize their expenditures although this hypothesis could also be reversed. It turns out that firms which capitalize spend more on the production of innovations but the expenditures for licenses are not significant for the capitalization decision while they are highly significant to distinguish between disclosers and non-disclosers. The existence of an R&D-department as well as the involvement in

an R&D-cooperation agreement are also not significant at all to distinguish between capitalisers and non-capitalisers.

c. the size of the firm

The relationship between the size of the firm, measured in terms of total assets, turnover or by the number of employees, and the disclosure decision is as expected: larger firms significantly disclose more (see Table 4). Only the number of employees discriminates between capitalisers and non-capitalisers.

Table 4 : *univariate test results - size of the firm*

<i>Variable</i>	<i>Discl</i>	<i>NonDiscl</i>	<i>P-value</i>	<i>Cap</i>	<i>NonCap</i>	<i>P-value</i>
total assets	0.3888	-0.1610	0.0001	0.0537	-0.1203	0.4185
turnover	0.2406	-0.0919	0.0049	0.0287	-0.0642	0.6661
number of employees	0.3322	-0.1375	0.0001	0.1122	-0.2515	0.0909

While it is difficult to draw general conclusions from these results, they seem to suggest that the disclosure and the capitalization decision are distinct decisions that cannot be explained using the same variables and that variables related with the R&D-profile of the firm need to be taken into account. These conclusions need to be confirmed in a multivariate econometric analysis. In the next paragraph we therefore report on the results of a Logit model estimation.

5.2. Logit Estimations

a. the model

Since we considered the disclosure as well as the capitalization decision as (0,1) decisions, we used a logit estimation procedure to estimate the probability of disclosure and capitalization respectively. Many of the variables used in the univariate test procedure are highly correlated and could not all be included in the multivariate analysis. The following expressions resulted in the most significant parameter estimates :

$$P(\text{disclosure} = 1) = c + \alpha_1 R\&D_{int}(H) + \alpha_2 R\&D_{int}(L) + \alpha_3 R\&D_{dep} + \alpha_4 R\&D_{coop} + \alpha_5 \text{size} \\ + \alpha_6 \text{finhealth} + \alpha_7 \text{stake} + \alpha_8 \text{profgrowth}$$

Since one of our basic research questions is to know whether or not the same variables explain the disclosure and the capitalization decision, we deliberately used the same set of variables in both equations:

$$P(\text{capitalization} = 1) = c + \alpha_1 R\&Dint(H) + \alpha_2 R\&Dint(L) + \alpha_3 R\&Ddep + \alpha_4 R\&Dcoop + \alpha_5 size + \alpha_6 finhealth + \alpha_7 stake + \alpha_8 profgrowth$$

b. results

The empirical results are based on 317 observations for which all response and explanatory variables were available. The results for the Logit estimation are given in Table 5. Note that we estimated the probability that a firm discloses its R&D-expenditures. Variables with a positive parameter estimate therefore have a positive impact on the probability of disclosure. We will discuss the impact of the different variables, starting with the most significant one. The introduced independent variables certainly explain part of the disclosure decision as the overall p-value of the model (=0.0001) is highly significant.

As the univariate test results already suggested, the size of a firm turns out to be an important variable influencing a firm's decision to disclose its R&D-expenditures. Bigger firms have a significantly higher probability to disclose their R&D-expenditures, which further confirms our size-hypothesis.

Table 5: *Logit estimation results for the decision to disclose*

variable	parameter estimate	standard error	Prob > Chi-square
<i>intercept</i>	-4.2036	1.0597	0.0001
<i>R&Dint(H)</i>	0.0253	0.0130	0.0522
<i>R&Dint(L)</i>	0.0053	0.0058	0.3591
<i>R&Ddep</i>	0.4766	0.2726	0.0804
<i>R&Dcoop</i>	0.5164	0.3146	0.1007
<i>size</i>	0.2212	0.0768	0.0040
<i>finhealth</i>	-0.5957	0.2988	0.0462
<i>stake</i>	-0.8916	0.4123	0.0306
<i>profgrowth</i>	0.0013	0.0091	0.8846

Another significant variable, which supports one of our hypotheses, is the performance of the firms in the eyes of the stakeholders of the firm, more precisely the shareholders and the creditors. If both these parties are dissatisfied with the performance of the firm (in the way we

specified before), chances are higher that this firm will disclose its R&D-expenditures. Firms may do this in order to explain their bad performance to their shareholders and creditors. The idea is that because of their R&D-expenses, they performed badly. By disclosing these R&D-expenses, the firm wants to convince the stakeholders that the performance of the firm will improve in the future when the R&D investments pay off.

Firms which are financially healthy have a lower probability to disclose their R&D-expenditures. This result can be explained along similar veins as for the "stake"-variable. Firms which are financially healthy have no problems to repay their debt and therefore no need to justify their performance vis a vis their creditors. However, if the sum of the equity of the firm and its long term debt is smaller than its fixed assets, problems may arise to repay the debts and the firm may try to explain this lack of financial means by disclosing its R&D-expenditures. In addition, financially healthy firms have a lower need for external funding and hence need to signal less their success by disclosing.

The R&D-intensity of the firm also positively influences the probability that a firm will disclose its R&D-expenditures, at least for those firms which belong to a sector we classified as being R&D intensive. This may be explained by the fact that when R&D is an important activity for firms, there is less need to hide this activity. In low R&D-intensive sectors, the R&D-intensity has no significant effect.

Firms with a separate R&D-department as well as firms which are involved in a R&D-cooperation agreement have a higher probability to disclose their R&D investments, although the parameter estimates for these variables are only significant at the 8 and 10 %-level respectively ¹⁴. The R&D-activities of a firm with a separate R&D-department can be considered to have a more permanent character and to stress their importance, firms may want to disclose their expenditures. The information on being R&D active is already more public for these firms, reducing the information costs from disclosing. In addition, the disclosure of their R&D-expenditures may support the credibility of firms which are partner in a R&D-cooperation agreement.

Finally, the decision to disclose its R&D-expenditures in 1993 isn't influenced by the growth rate of a firm's profits between 1992 and 1993.

We now turn to a discussion of the results for the capitalization decision. The first results which we will discuss are only based on the sample of firms which disclosed their R&D-expenses, i.e. 94 firms of which 65 firms capitalized their R&D-expenses. The overall logit estimation deteriorates ($p=0.0622$) and only a few parameter estimates are significant at a 10 % level,

¹⁴ Making a difference between cooperation within the group or with outside partners (research institutes or other firms) has no impact on the results. Contrary to what we expect, cooperation within the group also encourages disclosure.

probably because this sample is too small (see also the significance of the nonparametric tests). We will therefore also report the results based on a larger sample of firms in which we considered as "non-capitalisers" not only the firms which disclosed their R&D-expenditures but expensed them, but also all firms which didn't disclose their R&D-expenditures. This procedure allows to increase the number of observations but has the important disadvantage that we cannot distinguish between the factors which drive the decision to capitalize or not from the decision to disclose or not. However, by confronting these results with the supra reported disclosure results we can still single out some interesting results on the difference between disclosure and capitalization.

In some countries for instance, the disclosure of R&D expenses is required and disclosure is no longer a decision variable for the firm. It is therefore interesting to directly compare the group of capitalizing firms with the group of expensing firms, both disclosing and non-disclosing firms. This also allows a comparison with other empirical studies not distinguishing the capitalization from the disclosure decision. Comparing the results from capitalisers with non-capitalisers is also important with respect to the ungoing debate whether the capitalization of R&D expenses is information relevant.

Table 6: *Logit estimations for the decision to capitalize (small sample)*

variable	parameter estimate	standard error	Prob > Chi-square
<i>intercept</i>	0.587	1.9931	0.7683
<i>R&Dint(H)</i>	0.0272	0.0286	0.3411
<i>R&Dint(L)</i>	0.0098	0.0252	0.6986
<i>R&Ddep</i>	-0.2130	0.5174	0.6806
<i>R&Dcoop</i>	-0.1792	0.6885	0.7946
<i>size</i>	0.0608	0.1424	0.6696
<i>finhealth</i>	-0.9587	0.5701	0.0926
<i>stake</i>	-1.4765	0.8527	0.0834
<i>profgrowth</i>	-0.1549	0.0987	0.1167

None of the "R&D"-variables has a significant impact on the probability to capitalize. Only the "accounting" variables *finhealth* and *stake*, both related to the performance of the firm, are significant, though only at 10 %. Like we expected, if the shareholders and the creditors are dissatisfied with the performance of the firm in the way we specified before, the probability of capitalization increases. If a firm has a positive net worth (the dummy-variable "*finhealth*" gets the value 1), it will capitalize her R&D-expenditures with a lower probability as compared to a firm which may not be able to repay her debts. An insufficiently high income for the owners and the debt holders favors the capitalization of the R&D expenses. Finally, although the variable

profgrowth ($p=0.1167$) is not highly significant, it contributes to the overall significance of the model. If it is deleted, the p-value of the model drops to 0.1934.

Overall, the results based on this limited sample are weak. But this negative conclusion does not reject the idea that the disclosure and the capitalization decision are driven by different factors and therefore firms not only disclose their R&D-expenditures in order to be able to capitalize them. In order to further zero in on the factors which are of major importance in explaining the disclosure versus the capitalization decision, we now report on the results based on the extended sample, including as non-capitalizers, both disclosing and non-disclosing firms (see Table 7). Compared to the restricted capitalization model, the p-value of the model significantly improves ($p=0.0001$).

The size variable is significant and its impact is similar to the one we discussed for the case of the disclosure decision: larger firms have a higher probability to capitalize their R&D-expenditures. This contradicts the finding of Daley and Vigeland (1983) for the situation in the US before 1974. The same is true for the variable which refers to the financial health of the firm. A firm which has no problems to repay her debt (the dummy-variable "finhealth" gets the value 1) will capitalize her R&D-expenditures with a lower probability as compared to a firm which may not be able to repay her debts, similarly to what we found in the small sample. If the firm can not supply a sufficiently high income to the stake holders, the firm is more likely to capitalize the R&D expenses.

Table 7: *Logit estimations for the decision to capitalize (extended sample)*

variable	parameter estimate	standard error	Prob > Chi-square
<i>intercept</i>	-4.7946	1.1973	0.0001
<i>R&Dint(H)</i>	0.0295	0.0139	0.0334
<i>R&Dint(L)</i>	0.0073	0.0069	0.2901
<i>R&Ddep</i>	0.3485	0.3113	0.2629
<i>R&Dcoop</i>	0.3359	0.3658	0.3585
<i>size</i>	0.2436	0.0863	0.0047
<i>finhealth</i>	-0.8369	0.3322	0.0118
<i>stake</i>	1.2722	0.4352	0.0035
<i>profgrowth</i>	-0.0129	0.0167	0.4385

With respect to the impact of the "R&D"-variables, the R&D-intensity of the firms which we classified to be part of a R&D-intensive sector has a positive impact on the probability of capitalization. The other two R&D-variables, R&Dcoop and R&Ddep, which were significant in explaining the disclosure decision, do not significantly influence the probability of capitalization.

c. extensions

In this final paragraph we want to present the results of some extensions to the basic model, we discussed before.

The R&D profile as well as the financial performance of the firm determine the decision to disclose. However, once the firm decides to disclose, only financial performance influences the capitalization decision. This is also confirmed by the results we get when we leave the R&D variables out of the equation. The financial variables (finhealth, stake and profgrowth) all become significant at a 10% level and the overall p-value reaches the level of 0.0076.

Comparing the group of capitalizing firms to the group of expensing firms, whether disclosing or not, the results indicate that next to the financial performance the R&D intensity influences the decision to capitalize, while the existence of cooperation and an R&D department are insignificant. If we only introduce the financial variables, the overall significance slightly decreases (0.0004 instead of 0.0001), which demonstrates the importance of the R&D profile when the capitalizing and non-capitalizing firms (disclosing and non-disclosing firms) are compared. If we consider the R&D intensity, although an input related measure of innovative behavior, as a proxy for successful R&D activities, the results show that the expenses are only put on the balances sheet when they contribute to future earnings.

To further zero in on the correlation between the contribution to future earnings and the registration as an asset, the total amount of R&D expenses is split up in two parts: research expenses and development expenses. As development expenses can result in revenues in a shorter time period, the probability of capitalization is expected to be larger. When the R&D intensity is replaced by the development intensity (development expenses/sales), the results of the three basic models remain the same. As the development expenses increase, disclosure becomes more likely ($p=0.0851$) and all the other variables of the basic model remain significant. The development expenses do not influence the capitalization decision for the small sample, while they do for the extended sample ($p=0.0475$).

When the research intensity (research expenses/sales) is introduced, it does not influence the disclosure nor the capitalization decision¹⁵. The analysis of the development and research intensity shows that the R&D expenses are only capitalized when they are expected to result in an increase in revenues in the near future. We also tested the influence of innovation expenses as a measure of successful R&D output. We found that the variable "innovation expenses" does not discriminate neither between disclosers and non-disclosers nor between capitalisers and non-capitalisers. However, it should be mentioned that this information was only available for 192 out

¹⁵ Both variables, the research intensity and the development intensity could not be introduced simultaneously because of correlation problems between those two variables.

of the 321 firms. Another measure of R&D are the expenses for licenses. We extended the model with a dummy variable indicating the presence of such licensing expenses. The evidence shows that the existence of those expenses encourages firms to disclose their R&D-expenses ($p=0.0534$), but they don't have a significant impact on the probability of capitalization ($p=0.3865$). As the percentage of R&D spent to product innovation increases, disclosure becomes more likely ($p=0.0595$), but it does not influence the capitalization decision. An explanation could be that the revenues from product innovation are more identifiable than those from process innovation.

Further extending the model with a variable indicating the outsourcing of R&D-activities does not result in a significant parameter estimate for this variable for the disclosure decision nor for the capitalization decision. Again, these results are probably distorted by the limited availability of data (274 out of 321). Similarly, including a variable related to the granting of subsidies didn't result in significant parameter estimates.

Given the existence of an R&D department, the percentage of R&D spent in the R&D department, was also introduced in the analysis¹⁶. With a given amount of R&D expenses, we expected the chance of disclosure to increase when more expenses are done within the R&D department since those costs can be easier identified. The results confirm this hypothesis for the disclosure decision ($p=0.0509$) but not for the capitalization decision.

The influence of changes in the R&D-level (93-92) on the disclosure and capitalization decision, was also tested. But the change in the R&D-level, as absolute number or as a dummy, has no significant impact on the disclosure or the capitalization decision. We also checked whether the firms involved disclosed and capitalized their R&D expenses for tax reasons. When the financial statements are also used for tax purposes, firms will more likely to expense their R&D costs (Bhagat et al. (1995)). But our empirical results show that the tax rate can not discriminate between disclosers, capitalisers, non-disclosers and non-capitalisers. When a dummy variable ($dtax=1$ if taxes are paid), is introduced, a positive tax rate discourages firms to disclose information ($p=0.0321$) but it does not influence the capitalization decision even if the group of capitalisers is compared to all the other firms.

Finally, an R&D diversification measure, the percentage of R&D spent in the basic industry, is added to the disclosure model¹⁷. We expected that competitive reasons limit disclosure when the firm has R&D activities in other sectors. The results confirm this hypothesis ($p=0.0069$).

¹⁶ 116 firms in the sample have an R&D department, 37 of those firms have R&D activities outside the R&D department. The percentage spent outside the R&D department varies between 9% and 96%.

¹⁷ In the sample 37 firms have R&D activities in other industries than the basic industry. The percentage spent in other industries varies between 2 and 55% of the total R&D expenses.

5. Conclusions

The accounting rules in Europe, contrary to those in the US, allow firms to capitalize their R&D-expenses. Because of the presumed potential impact of this legal opportunity on the innovative activities of firms, the question which factors have an impact on this decision definitely is an interesting and important one. This paper tried to tackle this relatively unexplored question in the literature. The aim was more precisely to get an idea of the factors which have an influence, first, on the firm's decision to disclose its R&D-expenditures and, second, on the firm's decision to (partly) capitalize its disclosed expenditures as opposed to the decision to expense them fully. A unique combination of two data-sources could be used. For 321 innovative Flemish firms information concerning their R&D-expenditures and -behaviour could be mapped with the information in the financial statements of these firms.

With respect to the disclosure decision, several significant variables could be identified. Larger firms with dissatisfied shareholders and creditors, which have problems to repay their debts, which have a high R&D intensity -at least for firms in R&D-intensive sectors, a separate R&D-department and which are involved in a R&D-cooperation agreement have the highest probability of disclosure.

Once the firm decides to disclose the amount of R&D, mainly the accounting variables are significant in explaining the capitalization decision: the position of the stake-holders, and the financial health of the firm.

The results reported here can be of relevance for countries, debating whether the registration as an asset in the balance sheet should be allowed. When the group of capitalizing firms are compared to expensing firms, whether disclosing or not, our results suggest that the R&D intensity, at least in highly innovative industries, and the financial performance determine the capitalization of R&D expenses. Although this input related measure of innovative capacity has its limitations, the results suggest that the expenses of successful R&D activities are more likely capitalized as an asset in the balance sheet. This is further strengthened by differentiating the Research from the Development expenditures. With only the latter significantly influencing disclosure and capitalization, only innovative activities related to well defined projects with not too much risk are considered to be investments. The more basic and general exploratory research is rather considered to be a necessary overhead cost of doing business.

In order to check the robustness of the empirical results presented in this paper, a replication, if possible in different countries, on a larger dataset with longer time series and better variables is needed. The results mainly have their importance in stimulating further research into explaining why so many firms choose not to disclose their R&D-expenditures and why, if they disclose, don't capitalize these expenditures.

Acknowledgements

The authors gratefully acknowledge the comments and suggestions of the participants of the 21st Annual Conference of the European Accounting Association in Antwerp and of the 3rd EIASM Workshop on Accounting and Economics in London. We also are grateful to I.W.T. for providing the R&D data.

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