ARGUMENTA
OECONOMICA
CRACOVIENSIA

No 17 • 2017
ISSN 1642-168X
AOC, 2017; 17: 53–72
https://doi.org/10.15678/AOC.2017.1704

Barbara Grabińska
Konrad Grabiński

THE IMPACT OF R&D EXPENDITURES ON EARNINGS MANAGEMENT

Abstract

The main goal of the paper is to investigate the relationship between R&D spending and earnings management. While R&D expenditures create some of the most precious assets in today's economy, in many accounting jurisdictions they either may not be recognised as an asset in the balance sheet or their recognition is very limited. The main obstacle is the measurement process's lack of reliability, which is the result of information asymmetry caused by the nature of R&D investments. Additionally technological breakthroughs do not necessarily translate into commercial success.

The results of studies conducted until now provide evidence that managers taking responsibility for high-cost R&D projects become more and more emotionally engaged as time passes. In this paper, it is theorised that this phenomenon is also an important factor in earnings management. The following hypothesis is put forward: R&D expenditures are a significant determinant of earnings management after a two-year time lag. The time lag is adopted on the basis of the average length of time a research project lasts.

The empirical study was done on the basis of a sample of US stock listed companies (more than 4,500 firm-year observations). The group was chosen because US GAAPs require all R&D costs (with a few exceptions) to be fully expensed. This enables one to easily determine R&D spending, which would not be possible in the case of companies reporting under IFRSs. Regression analysis shows that R&D spending is a statistically significant determinant of earnings management after two and three time lags. The hypothesis was verified, suggesting that R&D investments influence managerial behaviour with regard to earnings management.

Barbara Grabińska, Cracow University of Economics, Faculty of Finance and Law, Department of Finance, e-mail: grabinsb@uek.krakow.pl

Konrad Grabiński, Cracow University of Economics, Faculty of Finance and Law, Department of Financial Accounting, e-mail: kg@uek.krakow.pl

Keywords: R&D expenditures, earnings management, financial reporting, agency costs.
JEL Classification: M41, G30, O32.

1. Introduction

Accounting of R&D activity is one of the most controversial issues in contemporary financial reporting. The main controversy concerns the issue of capitalising vs. not-capitalising on the costs of R&D projects. The debate on this issue has been present in the accounting regulations at least since the mid-1970's. One side of the discourse stresses that the decision of whether to capitalise or not is to some extent discretionary in nature and allows managers to manipulate earnings, and because of that the R&D expenditures should be fully expensed as incurred. On the other hand, adversaries point out that R&D investment creates the most prized assets in the economy and not recognising them creates substantial off-balance sheet assets. In consequence, not recognising intangibles arising from R&D investments deteriorates the relevance of financial statements (Healy, Myers & Howe 2002, pp. 677–78).

The debate is also visible at the level of accounting regulations. IFRSs adopt a more liberal approach and allow the recognition of intangibles arising from the development phase if an entity is able to meet certain conditions. US GAAPs (SFAS No. 2) adopt more conservative accounting treatment and require all R&D expenditures to be expensed in the current period with some minor exceptions. The introduction of SFAS No.2 in the US has also had an impact on managerial behaviour. Several studies (Horowitz & Kolodony 1980, Cooper & Selto 1991) provide evidence that companies previously capitalising R&D costs reduced their spending on research after SFAS No. 2 was introduced. Critics of this accounting treatment argue that US companies are losing their competitiveness due to implied underinvestment in R&D (Mande, File & Kwak 2000, p. 269). Such underinvestment is described in the literature as a myopic investment behaviour or managerial myopia. J. Bushee (1998, p. 306) defines it as a situation in which managers face a trade-off between meeting earnings targets and maintaining R&D investment. However, there is reporting data that suggests this is not true. In 2016, according to PwC ranking (http://www.strategyand.pwc.com/innovation1000, accessed: 15 May 2017), 13 out of the 20 top global R&D spenders and 9 out of 10 top innovative companies were from the US.

The central issue of this problem is the nature of R&D assets, which are unique assets characterised by informational asymmetry. Companies report

R&D activity as discreetly as possible in order not to disclose too much to competitors. R. Guidara and Y. Boujelbene (2014, p. 26) and Holmstrom (1989) describe R&D expenditures as a firm-specific investment usually characterised by a high level of uncertainty and informational asymmetry. The character of intangibles arising from R&D activity, which potentially can be recognised, is usually a very technical issue, difficult to understand for outsiders, while its impact on the market position of the firm is even more difficult to grasp. As a result, users of financial information or even financial auditors are unable to correctly assess the probability of an R&D investment succeeding. R&D assets are unique also in that there is usually no active market for them – they are innovative but at the same time are not homogenous (comparable to each other). L. N. Davis (2001) provides the following reasons for why R&D activity increases information asymmetry: each research project is unique and not repeatable; there is no organised market for R&D activity (so it is difficult to measure the value of intangibles arising from R&D); and, finally, different accounting is allowed in different jurisdictions.

There is also the theory of the spill-over effect, which postulates that the benefits of research activity are accessible not only for the company initiating an R&D project but, with time, also for more and more other parties. The consequence of this diffusion of R&D benefits is that the value of intangibles' erodes. All of these arguments illustrate the difficulty in measuring R&D assets.

N. Seybert (2010) postulated that managers responsible for initiating R&D projects are more likely to overinvest when costs are capitalised. If the project fails, the resulting asset impairment may harm the manager's reputation. This provides a strong incentive for managers to achieve success in their R&D projects by putting more money on the table. For the same reason, managers are afraid to capitalise R&D expenditures and tend to expense them as incurred, leading to lower earnings being reported and consequently underinvestment in innovative projects. Both strategies – over- and underinvestment in R&D – may destroy a firm's value. Seybert conducted this study in an IFRS regime and cannot be replicated in a US GAAP environment, where R&D costs cannot by law be capitalised.

The relationship between R&D investment and its effect on revenue is an interesting one. While little research has been done on this issue, O. Lome, A. G. Haggeseth and Ø. Moen (2016) provide convincing evidence that, on average, the effect of investment is visible after two or three years. This accords with the widespread notion that a successful research project takes an average of two years from start to commercial launch. Other studies (Leonard 1971, Rapoport 1971, Pakes & Shankerman 1984) provide results for different US industries showing the average time lag to be between 1.17 years in the electronics industry up to 2.40 years in the machinery industry. We assume that managers and company shareholders will expect financial results two years after the launch of a research project.

A research project can be counted among the riskiest investments. Business practice provides no lack of examples of failed R&D investments taking a toll on company profitability. In some cases the outcome of research activity is critical for the future of the company and determines the assessment of managerial performance. We theorise that intensive investment in R&D influences managerial behaviour. Managers take full responsibility for the research project and tend to more strongly identify themselves with the final result. Following this line of reasoning, we hypothesise that two years after initiating an intensive R&D project, managers will be inclined to manage earnings in order to demonstrate success or to adopt a big bath strategy in the event of failure. In both cases the absolute values of accruals should be higher and show more intensive earnings management.

The total investment is the sum of the amount reported in profit and loss and costs capitalised in the balance sheet as intangibles (in the case of companies reporting under IFRS). To avoid the problem of cost capitalisation, we limited our sample to US companies, where under US GAAP, R&D expenditures may not be capitalised. As a proxy for R&D intensity, we take first the ratio of R&D expenditures to total assets and, second, the proxy R&D expenditures to sales.

The results show that R&D intensity with a two-year time lag is a significant determinant of earnings management. Additional tests show that the effect is less or not significant for R&D intensity with a one-year time lag or without a time lag. We are inclined to conclude that R&D spending influences managerial behaviour after a period of two years.

The paper proceeds as follows. Section 2 reviews the relevant literature and presents the hypothesis. Section 3 demonstrates the research design and sample description. Section 4, while not fully developed, provides the anticipated results of the study.

2. The Literature and the Hypothesis

Earnings management is sometimes considered a symptom of agency problems. The conflict of interest between management and the providers of capital creates agency costs. The greater the asymmetry of information, the more difficult it is to control management and to prevent management from creating agency costs. R&D activity is reported as discreetly as possible, which further increases informational asymmetry between management and the company's stakeholders and creates an opportunity for earnings management.

The theoretical link between undertaking and reporting R&D investment and earnings management is not very soundly grounded in the accounting literature. Very few papers have investigated the issue from a theoretical or an empirical point of view. Two strands of research on R&D can be distinguished: accrual and real earnings management, the latter of which, surprisingly, is the more popular. Secondly, studies conducted on R&D expenditures are used either as a tool or as an incentive to manage earnings.

S. Roychowdhury (2006) carried out empirical research on real earnings management. The basic assumption of this form of management is that managers structure real transactions in order to manage earnings – or, in other words, to hit their earnings targets. The measurement of real EM is conceptually based on the difference between the real and expected (under normal conditions) scale of operating activities. In the case of R&D investment, a researcher must assume a "normal" level of research activity. It is very difficult to determine what the normal level of R&D expenditures is for those outside the company, making this approach controversial. One important result of Roychowdhury's study is the evidence it provides for some categories of costs being very frequently used for real EM, particularly the costs of advertising, promotion, maintenance and R&D. Yet, this should come as no surprise: these costs are usually the first to be cut when financial trouble rears its head.

A study conducted by S. Perry and R. Grinaker (1994) was probably among the first to observe that R&D spending is adjusted to improve firms' success in meeting their current earnings goals. They found a linear relationship between unexpected R&D spending and unexpected earnings on the basis of 99 large US companies. Prior year R&D expenditures and earnings were taken as proxies (a normal level of operating activity) for the current year after controlling the effects of selected economic changes during the current period.

J. Bushee extended previous research in a 1998 study that assumed there is a relationship between R&D budgets and the desire to hit earnings targets. He selected a very specific sample of companies with pre-R&D earnings that came in below the prior year's, but by such an amount that if it were reversed, the earnings goals would be met. Then he introduced another variable – institutional ownership. He hypothesised that if institutional ownership is low, managers will be likely to cut R&D costs in order to meet earnings targets. The study was performed on a sample of US companies from the period 1983–1994 (13,944 firm-year observations). The empirical part of the study provided evidence that high institutional ownership can persuade managers to adopt more long-term policy with regard to R&D investment while having no regard for achieving earnings targets.

Another study on this issue was conducted by V. Mande, R. G. File and W. Kwak (2000), though in a unique Japanese environment that made the research setting quite different. It is widely accepted that the economic growth in Japan was based on new technologies. In the 1990s Japan's economy was second only to the US in terms of its commitment to R&D. However, it is also commonly believed that, unlike their American counterparts, Japanese managers adopt a long-term perspective with regard to financial results and accentuate research activity as one of the key components of corporate strategy. With the stereotypical image of a Japanese manager in mind, one might expect there to be no link between R&D spending and achieving earnings targets. However, Mande, File and Kwak 2000 (2000, pp. 288–89) found that Japanese firms, at least in several industries, do in fact adjust R&D spending according to current period earnings performance.

A further paper on this topic was published by R. Guidara and Y. Boujelbene (2015), who on the basis of 800 firm-year observations (80 French companies qualified as R&D intensive in the reports within 2005–2014) showed that firms manage R&D expenditures to avoid earnings losses and decreases. The empirical part of the study provides evidence that decisions concerning R&D budgets are used to help achieve earnings targets. The dependant variable in the study was defined as "R&D cut", which was assigned a value of one if R&D spending was lower than it had been in the previous period, and a zero otherwise. This and other papers on the subject suggest that it is earning targets that determine the level of R&D investment. Overall the results of these studies provide evidence that R&D spending is subject to real earnings management.

The strand of research related to accrual earnings management is less robust, consisting of only a few papers. R. Guidara and Y. Boujelbene (2014) investigated the link between R&D and earnings management. Their sample of 302 French listed companies is divided into a test sample including R&D intensive companies (107 companies), and a control sample of non-R&D intensive companies (195 companies). The former sub-sample encompasses companies listed in the scientific project "The Economics of Industrial Research & Innovation", conducted by the European Commission. As a measure of EM, Guidara and Boujelbede used discretionary accruals estimated on the basis of Jones' model. Empirical analysis provides evidence that discretionary accruals (DA) in the sample of R&D intensive companies are, at a 5% significance level, statistically different from zero, while in the sample of non-R&D intensive companies DAs are statistically equal to zero. In their conclusion, the authors state that R&D increases informational asymmetry and provides an incentive for EM.

A study done by G. Markarian, L. Pozza and A. Prencipe (2008) was empirically tested on a sample of companies listed on the Milan Stock Exchange (43 firms, 86 firm-year observations). The Italian context is interesting from the regulatory point of view, because it allows for flexibility in how it accounts for R&D costs. The focus of the study is on the accounting choice of whether to capitalise R&D costs or not from the perspective of achieving earnings targets and smoothing earnings. The main variable is total R&D capitalisation divided by total assets while the control variable is total R&D expenditures divided by total assets in the current year. The authors hypothesise that the decision to capitalise R&D costs is related to a firm's change in profitability. The results of the study suggest that companies with lower return on assets are more likely to capitalise R&D costs, and the more profitable firms are, the more likely they will also be to expense R&D costs.

Accounting regulations can affect real decisions about underinvestment or overinvestment in R&D projects. Several studies provide evidence that obligatory expensing of R&D costs causes underinvestment in research and development activities (Oswald & Zarowin 2007). Analogically, N. Seybert (2010, p. 672) posits that capitalising R&D costs leads to overinvestment in R&D projects, and when a manager decides to, or is obliged to, capitalise costs, he opens up the possibility of the research project being abandoned. From the point of view of accounting, this directly impairs intangibles. R&D asset write-down is relevant information for users and may have a profound impact on a manager's reputation, thus strongly incentivising the continuation of research projects.

Seybert empirically tested this with an experiment. His analysis provides evidence that the participants in his experiment were more likely to continue the original project when R&D costs were capitalised. On the basis of this result, we are going one step further: we hypothesise that managers who decide to undertake a substantial R&D project are motivated not only to continue the project, but also to report favourable results and, if necessary, manage earnings upward. In other words, we assume that deciding to undertake a research project makes decision-makers not only responsible for the success, but motivates them to manage the results of the project to show them in as favourable a light as possible. Therefore, the decision to invest in an R&D project affects managerial behaviour. Managers become more engaged and less objective and can, to some extent, be considered hostages of a project's success. Specifically we formulate the following hypothesis: companies reporting intensive R&D expenditures after a two-year period are more likely to engage in earnings management practices.

We assume a time lag of two years between the year when substantial spending on R&D was reported and the year when the effect on revenues is expected. O. Lome, A. G. Haggeseth and Ø. Moen (2016), W. N. Leonard (1971), J. Rapoport (1971) and A. Pakes and M. Shankerman (1984) all provide evidence that on average this lag is around two years and we assume that the main stakeholders expected to see the effect of an R&D project occur two years after the launch of the project. Additionally, we assume that managers' success depends on the research project succeeding in the case of companies initiating costly research projects and this will be a strong incentive to engage in earnings management.

3. Research Design, Sample Description and Results of the Study

The main focus of the study is on the relationship between R&D intensity and the accrual of earnings management. We use two proxies for R&D intensity:

– *RD_INT1* – R&D expenditures divided by total assets,

– *RD_INT2* – R&D expenditures divided by sales.

The latter occur more frequently in the literature and accounting research.

R&D intensity is a proxy depicting a company's involvement in research and development activities. These two measures take into consideration the size of the company and the volume of its activity. Therefore they are assumed to be a good measure of R&D intensity and are comparable between entities.

Total accruals are calculated using the statement-of-cash-flows approach (*CA*) according to the formula: the difference between income before extraordinary items and cash flows from operations:

$$TA_{i,t} = \frac{NI\_b\_Ext_{i,t} - CFO_{i,t}}{A_{i,t-1}},$$

where TA_{it} is total accruals, $NI\_b\_Ext_{i,t}$ is net income before extraordinary items, $CFO_{i,t}$ is cash flows from operations and $A_{i,t-1}$ is lagged total assets.

To measure discretionary accruals we plan to use the cross-sectional Jones model (1991):

$$TA_{i,t} = \beta_{1i}\left[\frac{1}{A_{i,t-1}}\right] + \beta_{2i}\left[\frac{\Delta REV_{i,t}}{A_{i,t-1}}\right] + \beta_{3i}\left[\frac{PPE_{i,t}}{A_{i,t-1}}\right] + \varepsilon_{i,t},$$

where $TA_{i,t}$ is total accruals (scaled by lagged total assets), A is total assets, ΔREV is the change in revenues, and PPE represents property, plant and equipment (Ronen & Yaari 2008, p. 404). The proxy for earnings management is the discretionary accruals, estimated as absolute residuals from the cross-sectional Jones model.

We use the main model in two variants, employing *RD_INT1* and *RD_INT2* interchangeably and, in result, end up with two models to test our hypotheses:

Model I:

$$EM_{i,t} = \beta_0 + \beta_1 RD\_INT1_{i,t-2} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 ROA_{i,t} + \beta_5 IND_{i,t}$$

and

Model II:

$$EM_{i,t} = \beta_0 + \beta_1 RD\_INT2_{i,t-2} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 ROA_{i,t} + \beta_5 IND_{i,t},$$

where *EM* is a proxy for earnings management (discretionary accruals from the Jones model), *RD_INT1* is R&D intensity measured by R&D expenditures divided by total assets for the period ($t-2$), and *RD_INT2* is R&D expenditures divided by sales for the period ($t-2$). The rest are control variables: *SIZE* – the company's size calculated as a natural logarithm of total assets, *LEV* – the financial leverage calculated as total liabilities divided by total assets, *ROA* – the company's profitability represented by return on assets, *IND* – industry affiliation – 17 industries represented by 17 dummy variables (the financial sector was excluded).

In the above models, we use the most commonly applied determinants of earnings management as control variables. All of them are firm-level variables: size, leverage, profitability, and sector affiliation. Company size is an empirically tested variable and at least several studies provide evidence that larger firms are less likely to manage earnings (Albrecth & Richardson 1990, Scott 1991, Lee & Choi 2002). Financial leverage is often used as a control variable. Theoretically, it is rooted in the debt covenant hypothesis, which postulates that management tends to manipulate accounting figures in order to avoid negative consequences of violating credit agreements. Many empirical studies (Duke & Hunt 1990, Bartov 1993, Beatty & Webber 2003) provide evidence that in more leveraged companies there is more pressure to manage earnings upward. The institutional framework and quality of the legal system are important determinants of *EM*. A rich body of research on this issue provides convincing empirical evidence.

The initial sample consists of US companies listed on the stock exchange (7,034 companies and 77,374 observations). The data were downloaded from Orbis database and acquired from yearly financial statements published by publicly traded US companies in the period 2007–2016. Financial information derived from yearly financial statements is considered to be of higher quality, since it is reviewed by an independent financial auditor. Observations from the financial sector, with negative equity and insufficient data on total assets, were excluded from the sample.

Table 1. Descriptive Statistics

Variables	Total sample								
	No. of observations	Min.	Max.	Mean	Median	St. Dev.	Variance	Skewness	Kurtosis
EM	11,436	0.000	100.00	2.515	0.085	10.06	101.40	7.16	60.758
RD_INT1	6,772	–0.731	100.00	1.917	0.069	10.85	117.76	7.75	65.466
RD_INT2	8,219	–28.83	100.00	0.988	0.064	7.309	53.419	11.937	154.319
SIZE	18,043	–2.000	8.90	4.315	4.633	2.004	4.015	–0.519	2.590
LEV	18,043	0.000	100.00	5.860	0.572	19.245	370.375	4.209	19.849
ROA	18,041	–100.00	100.00	–5.080	–0.025	19.159	367.050	–3.689	20.568

Source: the authors' own calculations based on Orbis database.

We ran OLS regression as well as panel regression for both models using lagged *RD_INT1* and *RD_INT2* ($t-1$ and $t-2$). Since the panel regression is considered to be superior to simple OLS, we presented results only for panel regression analysis. For each panel regression we used Hausman test to determine if a fixed or random model is more appropriate. In all cases, the model with fixed effects proved superior (see Tables 2, 4, 6 and 8). The results of the regression analysis are presented in Tables 3, 5, 7, 9, 11 and 13.

Table 2. Hausman Test for Panel Regression for *RD_INT1* (Two-year Lag)

Variables	Coefficients		(*b* – *B*) Difference	sqrt (diag(*V_b* – *V_B*)) S.E.
	(*b*) fixed	(*B*) random		
SIZE	–2.2740	–1.2631	–1.0109	0.3995
LEV	0.0310	0.1220	–0.0910	0.0172
ROA	0.2176	0.1932	0.0244	0.0117
L2.RD_INT1	0.0144	0.0382	–0.0239	0.0082

b = consistent under H_0 and H_a; obtained from xtreg
B = inconsistent under H_a, efficient under H_0, obtained from xtreg
Test: H_0: difference in coefficients not systematic
$chi^2(4) = (b-B)'[(V\_b - V\_B)\verb|^|(-1)](b-B) = 62.73$
Prob > $chi^2 = 0.0000$

Source: the authors' own calculations based on Orbis database.

Table 3. Results of Panel Regression with Fixed Effects for *RD_INT1* (Two-year Lag)

Independent variables	General sample			
	Coeff	Std. error	*t*-statistic	*p*-value
Constant	13.01417	2.17647	5.98	0.000
L2.RD_INT1	0.01436	0.01171	1.23	0.220
SIZE	–2.27396	0.40936	–5.55***	0.000
LEV	0.03100	0.02238	1.39**	–0.013
ROA	0.21761	0.02044	10.65***	0.000
IND	0.15206	0.02085	0.73	4.466
No. of observations	4 069			
Prob > F	0.0000			
R-squared	0.1316			
Ajusted R-squared	0.1305			
Root MSE	4.6646			

** 5% significance. *** 1% significance.

Source: the authors' own calculations based on Orbis database.

Table 4. Hausman Test for Panel Regression for *RD_INT2* (Two-year Lag)

Variables	Coefficients		(*b* – *B*) Difference	sqrt (diag(*V_b* – *V_B*)) S.E.
	(*b*) fixed	(*B*) random		
SIZE	–2.9932	–2.4319	–0.5614	0.4676
LEV	–0.0019	0.0145	–0.1641	0.0130
ROA	0.0991	0.0800	0.0191	0.0100
L2.RD_INT2	0.1389	0.1113	0.2761	0.0213

b = consistent under H_0 and H_a; obtained from xtreg
B = inconsistent under H_a, efficient under H_0, obtained from xtreg
Test: H_0: difference in coefficients not systematic
$chi^2(4) = (b - B)'[(V\_b - V\_B)^\wedge(-1)] (b - B) = 16.62$
Prob > $chi^2 = 0.0023$

Source: the authors' own calculations based on Orbis database.

Table 5. Results of Panel Regression with Fixed Effects for *RD_INT2* (Two-year Lag)

Independent variables	General sample			
	Coeff	Std. error	*t*-statistic	*p*-value
Constant	16.9453	2.49015	6.80	0.000
L2.RD_INT2	0.1389	0.03424	4.06***	0.000
SIZE	–2.9932	0.49624	–6.03***	0.000
LEV	–0.0019	0.02072	–0.09	0.928
ROA	0.0991	0.01847	5.37***	0.007
IND	0	(omitted)	×	×
No. of observations	4 651			
Prob > F	0.0000			
R-squared	0.4880			
Ajusted R-squared	0.3508			
Root MSE	7.0830			

*** 1% significance.

Source: the authors' own calculations based on Orbis database.

The results of panel regression for *RD_INT2* (see Table 5) suggest that R&D intensity is a significant positive determinant of earnings management. However, the results for *RD_INT1* are not statistically significant (see Table 3). We also want to test if this effect is true for R&D intensity with a one-year lag and without a lag. The results show that *RD_INT1* is, unexpectedly, a negative determinant of earnings management.

Table 6. Hausman Test for Panel Regression for *RD_INT1* (One-year Lag)

Variables	Coefficients		$(b-B)$ Difference	sqrt (diag($V\_b - V\_B$)) S.E.
	(*b*) fixed	(*B*) random		
SIZE	–2.2146	–2.0345	–0.1802	0.3428
LEV	–0.0399	–0.0025	–0.0374	0.0122
ROA	0.1190	0.1040	0.0151	0.0078
L1.RD_INT1	–0.0226	–0.0165	–0.0062	0.0057

b = consistent under H_0 and H_a; obtained from xtreg
B = inconsistent under H_a, efficient under H_0, obtained from xtreg
Test: H_0: difference in coefficients not systematic
$chi^2(4) = (b-B)'[(V\_b - V\_B)\hat{}(-1)](b-B) = 18.80$
$Prob > chi^2 = 0.0009$

Source: the authors' own calculations based on Orbis database.

Table 7. Results for Panel Regression with Fixed Effects for *RD_INT1* (One-year Lag)

Independent variables	General sample			
	Coeff	Std. error	*t*-statistic	*p*-value
Constant	12.80752	1.97574	6.48	0.000
L1.RD_INT1	–0.02262	0.01130	–2.00**	0.045
SIZE	–2.21465	0.37463	–5.91***	0.000
LEV	–0.03991	0.02093	–1.91*	0.057
ROA	0.11904	0.01737	6.85***	0.000
IND	0	(omitted)	×	×
No. of observations	4 771			
Prob > F	0.0000			
R-squared	0.4993			
Ajusted R-squared	0.3828			
Root MSE	4.5413			

* 10% significance. ** 5% significance. *** 1% significance.

Source: the authors' own calculations based on Orbis database.

We repeated the regression analysis for *RD_INT1* and *RD_INT2* without a lag. The results show that *RD_INT1* and *RD_INT2* without a lag are not statistically significant (see Tables 6 and 7) as compared to the model with the two-year lag.

Table 8. Hausman Test for Panel Regression for *RD_INT2* (One-year Lag)

Variables	Coefficients		$(b - B)$ Difference	sqrt (diag($V\_b - V\_B$)) S.E.
	(b) fixed	(B) random		
SIZE	–2.1500	–2.5352	0.3853	0.4076
LEV	–0.6751	–0.0526	–0.0149	0.0115
ROA	0.0365	0.0281	0.0084	0.0088
L1.RD_INT2	0.0246	0.0269	–0.0023	0.0162

b = consistent under H_0 and H_a; obtained from xtreg
B = inconsistent under H_a, efficient under H_0, obtained from xtreg
Test: H_0: difference in coefficients not systematic
$chi^2(4) = (b - B)'[(V\_b - V\_B)^\wedge(-1)] (b - B) = 18.63$
Prob > $chi^2 = 0.0009$

Source: the authors' own calculations based on Orbis database.

Table 9. Results of Panel Regression with Fixed Effects for *RD_INT2* (One-year Lag)

Independent variables	General sample			
	Coeff	Std. error	t-statistic	p-value
Constant	12.92108	2.16733	5.96	0.000
L1.RD_INT2	0.02454	0.03173	0.77	0.439
SIZE	–2.14997	0.43720	–4.92***	0.000
LEV	–0.06751	0.01923	–3.51***	0.764
ROA	0.03648	0.01710	2.13**	0.033
IND	0	(omitted)	×	×
No. of observations	5 616			
Prob > F	0.0000			
R-squared	0.4521			
Ajusted R-squared	0.3194			
Root MSE	7.6834			

** 5% significance. *** 1% significance.

Source: the authors' own calculations based on Orbis database.

An additional OLS regression analysis for R&D intensity for a three--year time lag shows that these variables are still significant determinants of earnings management. Most of the models presented have a low determination coefficient (as measured by adjusted *R-squared*), whose values vary between 30% and 40%. However, the aim of these models is not

Table 10. Hausman Test for Panel Regression for *RD_INT1* (Without Time Lag)

Variables	Coefficients		$(b - B)$ Difference	sqrt (diag($V\_b - V\_B$)) S.E.
	(b) fixed	(B) random		
SIZE	–2.9595	–2.2309	–0.7286	0.3532
LEV	–0.0326	–0.0023	–0.0303	0.0139
ROA	0.1367	0.0835	0.0532	0.0092
RD_INT1	–0.0024	0.0010	–0.0034	0.0051

b = consistent under H_0 and H_a; obtained from xtreg
B = inconsistent under H_a, efficient under H_0, obtained from xtreg
Test: H_0: difference in coefficients not systematic
$chi^2(4) = (b - B)'[(V\_b - V\_B)\hat{}(-1)] (b - B) = 56.20$
Prob > $chi^2 = 0.0000$

Source: the authors' own calculations based on Orbis database.

Table 11. Results of Panel Regression with Fixed Effects for *RD_INT1* (Without Time Lag)

Independent variables	General sample			
	Coeff	Std. error	t-statistic	p-value
Constant	16.71889	2.05799	8.12	0.000
RD_INT1	–0.00239	0.01107	–0.22	0.829
SIZE	–2.95954	0.39068	–7.58***	0.000
LEV	0.03261	0.02342	–1.39	0.164
ROA	0.13672	0.01846	7.40***	0.000
IND	0	(omitted)	×	×
No. of observations	4 801			
Prob > F	0.0000			
R-squared	0.5310			
Ajusted R-squared	0.4203			
Root MSE	4.7446			

*** 1% significance.

Source: the authors' own calculations based on Orbis database.

to predict or forecast variability of the dependent variable, but to infer the causal relationship between independent and dependent variables, which in this case are R&D intensity and earnings management. Therefore the power of the model is of negligible importance in our case.

Table 12. Hausman Test for Panel Regression for *RD_INT2* (Without Time Lag)

Variables	Coefficients		(*b* – *B*) Difference	sqrt (diag(*V_b* – *V_B*)) S.E.
	(*b*) fixed	(*B*) random		
SIZE	–2.5672	–2.4115	–0.1557	0.3983
LEV	0.0010	0.0036	–0.0026	0.0127
ROA	0.0761	0.0491	0.0270	0.0095
RD_INT2	0.0747	0.0435	0.0313	0.0200

b = consistent under H_0 and H_a; obtained from xtreg
B = inconsistent under H_a, efficient under H_0, obtained from xtreg
Test: H_0: difference in coefficients not systematic
$chi^2(4) = (b - B)'[(V\_b - V\_B)\hat{}(-1)] (b - B) = 12.92$
$Prob > chi^2 = 0.0117$

Source: the authors' own calculations based on Orbis database.

Table 13. Results of Panel Regression with Fixed Effects for *RD_INT2* (Without Time Lag)

Independent variables	General sample			
	Coeff	Std. error	*t*-statistic	*p*-value
Constant	14.7963	2.09944	7.05	0.000
RD_INT2	0.07473	0.03564	2.10**	0.036
SIZE	–2.56719	0.42493	–6.04***	0.000
LEV	0.00101	0.01942	0.05	0.959
ROA	0.07610	0.01735	4.39***	0.000
IND	0	(omitted)	×	×
No. of observations	5 648			
Prob > F	0.0000			
R-squared	0.4454			
Ajusted R-squared	0.3099			
Root MSE	7.7992			

** 5% significance. *** 1% significance.

Source: the authors' own calculations based on Orbis database.

Table 14. Summary of Results

Time lag	Panel regression		Linear regression	
	*RD_INT*1	*RD_INT2*	*RD_INT1*	*RD_INT2*
0			(+)**	
1	(–)**		(+)*	
2		(+)***	(+)***	(+)***

* 10% significance. ** 5% significance. *** 1% significance.

Source: the authors' own calculations based on Orbis database.

The results of regression analysis in most cases (see Table 14) provide evidence that two and three years after undertaking intensive R&D investments (projects), company management is more willing to manage earnings. The output of the study also shows that the link between R&D intensity and earnings management is much less pronounced in the current period.

4. Conclusions

We want to contribute to accounting research by providing evidence that engaging in R&D investment impacts managerial behaviour. The nature of R&D investment is unique considering its indeterminacy and often finds expression in the realm of managerial ambitions, expectations and dreams. We argue that with the passage of time, managers lose objective distance with regard to an R&D project. They become emotionally tied to the research project, which alters their behaviour and in some cases motivates them to manage earnings.

Our findings provide evidence that the intensity of R&D influences managerial behaviour and is a significant determinant of the extent of earnings management. The more intensive investments on research projects become, the more prone managers are to manage earnings after a period of two or even three years. The results have much less or no significance for measures of R&D intensity with a one-year or no time lag.

Our study has at least two limitations. First, we use only four control variables, and do not take into account other factors influencing managerial behaviour. Second, we use the absolute value of discretionary accruals, as a proxy for earings management.

Bibliography

Albrecth, W. D. and Richardson, F. M. (1990) "Income Smoothing by Economic Sector". *Journal of Business, Finance and Accounting* 17 (5): 713–30, https://doi.org/10.1111/j.1468-5957.1990.tb00569.x.

Bartov, E. (1993) "The Timing of Asset Sales and Earnings Manipulation". *The Accounting Review* 68 (4): 840–55.

Beatty, A. and Weber, J. (2003) "The Effects of Debt Contracting on Voluntary Accounting Method Changes". *The Accounting Review* 78 (1): 119–42, https://doi.org/10.2308/accr.2003.78.1.119.

Bushee, J. (1998) "The Influence of Institutional Investors on Myopic R&D Investment Behavior". *The Accounting Review* 71 (3): 305–33.

Cooper, J. C. and Selto, F. H. (1991) "An Experimental Examination of the Effects of SFAS No. 2 on R&D Investment Decisions". *Accounting, Organizations and Society* 16 (3): 227–42, https://doi.org/10.1016/0361-3682(91)90002-v.

Davis, L. N. (2001) "R&D Investment, Information and Strategy". *Technology Analysis & Strategic Management* 13 (3): 325–42, https://doi.org/10.1080/09537320120088165.

Duke, J. C. and Hunt, H. G. (1990) "An Empirical Examination of Debt Covenant Restrictions and Accounting-related Debt Proxies". *Journal of Accounting and Economics* 12 (1–3): 45–63, https://doi.org/10.1016/0165-4101(90)90041-2.

Guidara, R. and Boujelbene, Y. (2014) "Earnings Management around Research and Development Manipulation". *International Journal of Academic Research in Accounting, Finance and Management Science* 4 (2): 26–37.

Guidara, R. and Boujelbene, Y. (2015) "R&D Expenditures and Earnings Targets: Evidence from France". *Journal of Economics, Finance and Accounting* 2 (2): 164–80.

Healy, P. M., Myers, S. C. and Howe, Ch. D. (2002) "R&D Accounting and the Tradeoff between Relevance and Objectivity". *Journal of Accounting Research* 40 (3): 677–710, https://doi.org/10.1111/1475-679x.00067.

Horowitz, B. N. and Kolodony, R. (1980) "The Economic Effects of Involuntary Uniformity in the Financial Reporting of Research and Development Expenditures". *Journal of Accounting Research* 18: 38–74, https://doi.org/10.2307/2490326.

Jones, J. J. (1991) "Earnings Management during Import Relief Investigations". *Journal of Accounting Research* 29 (2): 193–228, https://doi.org/10.2307/2491047.

Lee, B. and Choi, B. (2002) "Company Size, Auditor Type, and Earnings Management". *Journal of Forensic Accounting* 3: 27–50.

Leonard, W. N. (1971) "Research and Development in Industrial Growth". *Journal of Political Economy* 79 (2): 232–56, https://doi.org/10.1086/259741.

Lome, O., Haggeseth, A. G. and Moen, Ø. (2016) "The Effect of R&D Performance: Do R&D-intensive Firms Handle a Financial Crisis". *Journal of High Technology Management Research* 27 (1): 65–77, https://doi.org/10.1016/j.hitech.2016.04.006.

Mande, V., File, R. G. and Kwak, W. (2000) "Income Smoothing and Discretionary R&D Expenditures of Japanese Firms". *Contemporary Accounting Research* 17 (2): 263–302, https://doi.org/10.1506/qxbv-uy71-a6w1-fwt4.

Markarian, G., Pozza, L. and Prencipe, A. (2008) "Capitalization of R&D Costs and Earnings Management: Evidence from Italian Listed Companies". *The International Journal of Accounting* 43 (3): 246–67, https://doi.org/10.1016/j.intacc.2008.06.002.

Oswald, D. R. and Zarowin, P. (2007) "Capitalization vs. Expensing of R&D and Earnings Management". *European Accounting Review* 16 (4): 703–26.

Pakes, A. and Schankerman, M. (1984) "The Rate of Obsolescence of Patents, Research Gestation Lags, and the Private Rate of Return to Research Resources" in Z. Grillches (ed.) *R&D Patents, and Productivity.* Chicago: University of Chicago Press.

Perry, S. and Grinaker, R. (1994) "Earnings Expectations and Discretionary Research and Development Spending". *Accounting Horizons* 8 (4): 43–51.

Rapoport, J. (1971) *The Autonomy of the Product-innovation Process: Cost and Time* in E. Mansfield (ed.) *Research and Innovation in the Modern Corporation.* New York: Norton.

Ronen, J. and Yaari, V. (2008) *Earnings Management. Emerging Insights in Theory, Practice, and Research.* New York: Springer.

Roychowdhury, S. (2006) "Earnings Management through Real Activities Manipulation". *Journal of Accounting and Economics* 42 (3): 335–70, https://doi.org/10.1016/j.jacceco.2006.01.002.

Scott, T. W. (1991) "Pension Disclosures under SFAS No. 87: Theory and Evidence". *Contemporary Accounting Research* 8 (1): 62–81, https://doi.org/10.1111/j.1911-3846.1991.tb00834.x.

Seybert, N. (2010) "R&D Capitalization and Reputation-driven Real Earnings Management". *The Accounting Review* 85 (2): 671–93, https://doi.org/10.2308/accr.2010.85.2.671.

Abstract

Wpływ wydatków na badania i rozwój na zachowania menedżerów związane z kształtowaniem wyniku finansowego

Celem artykułu jest analiza wpływu wydatków na badania i rozwój na kształtowanie wyniku finansowego. Wydatki na badania i rozwój to najcenniejsze aktywa w gospodarce, a mimo to regulacje rachunkowości w wielu krajach nie dopuszczają możliwości ich kapitalizacji i ujęcia jako aktywów w bilansie lub też możliwości te są mocno ograniczone. Organy stanowiące regulacje rachunkowości (IASB i FASB) wskazują na brak możliwości wiarygodnej wyceny księgowej tego typu aktywów. Raportowanie wydatków wiąże się z licznymi problemami, do których można zaliczyć m.in. dużą asymetrię informacji pomiędzy jednostką sprawozdawczą a użytkownikami sprawozdania finansowego. Ponadto sukces projektu badawczego niekoniecznie przekłada się na sukces komercyjny.

Wyniki dotychczasowych badań wskazują, że menedżerowie podejmujący decyzję o rozpoczęciu projektu badawczego o znacznym budżecie wraz z upływem czasu coraz bardziej wiążą się z nim emocjonalnie. W artykule postawiono tezę, że zjawisko to ma również wpływ na kształtowanie wyniku finansowego. Przyjęto hipotezę badawczą, że wydatki na badania i rozwój są istotną determinantą kształtowania wyniku finansowego po okresie dwóch lat. Przyjęty okres opóźnienia wynika z faktu, że projekty badawczo-rozwojowe zazwyczaj trwają od półtora do dwóch i pół roku.

Badania zostały przeprowadzone na próbie amerykańskich spółek giełdowych (ponad 4500 obserwacji) ze względu na fakt, że US GAAP nie dopuszczają możliwości kapitalizacji wydatków na badania i rozwój (z małymi wyjątkami). W rezultacie na podstawie danych ze sprawozdania finansowego można łatwo ustalić całkowite wydatki na B+R. Analiza regresji wskazuje, że wydatki na badania i rozwój są istotną determinantą kształtowania wyniku finansowego po dwóch i trzech latach. Efekt ten nie jest widoczny w bieżącym okresie oraz po jednym roku. W rezultacie pozytywnie została zweryfikowana hipoteza badawcza, co dowodzi, że wydatki na badania i rozwój wpływają na zachowania menedżerów amerykańskich spółek giełdowych w zakresie kształtowania wyniku finansowego.

Słowa kluczowe: wydatki na badania i rozwój, kształtowanie wyniku finansowego, sprawozdawczość finansowa, teoria kosztów agencji.