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CORPORATE EXPENDITURES ON R&D

NAKŁADY PRZEDSIĘBIORSTW NA B + R

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Summary: The study identifies factors determining accounting policy in respect to signaling results of undertaken R&D activity. Under International Financial Reporting Standards there is a choice between the capitalization of R&D expenses in the form of intangible assets or treating them as reporting period costs thus decreasing financial result. In order to test if the decision to capitalize development expenditures is a way of signaling the success of undertaken research and development (R&D) activity to the stakeholders, a logistic regression analysis was performed on a sample of 112 non-financial firms listed on the WSE in 2010–2013. Development of enterprises in the global market depends on the implementation of innovative products and services. This can be achieved through the use of available intellectual resources and by investing in the R&D activity.

Keywords: R&D, capitalization, innovations, disclosure.

Streszczenie: Artykuł identyfikuje czynniki determinujące politykę rachunkowości spółki w zakresie sygnalizowania wyników prowadzonej działalności B + R. Zgodnie z MSSF istnieje możliwość wyboru między kapitalizacją wydatków na B + R w postaci wartości niematerialnych a traktowaniem ich jako koszty okresu sprawozdawczego, obciążające wynik finansowy. W celu sprawdzenia, czy decyzja o kapitalizacji nakładów na prace rozwojowe jest sposobem sygnalizowania interesariuszom sukcesu prowadzonej działalności B + R, przeprowadzono analizę regresji logistycznej na próbie 112 niefinansowych spółek notowanych na GPW w latach 2010–2013. Rozwój przedsiębiorstw na rynku globalnym zależy od wdrażania innowacyjnych produktów i usług. Można to osiągnąć poprzez wykorzystanie dostępnych zasobów intelektualnych i inwestowanie w działalność B + R.

Słowa kluczowe: B + R, kapitalizacja, innowacje, ujawnienia informacji.

1. Introduction

In the modern economy growth of companies depends on implementation of innovative products and services as well as on exploitation of intellectual resources. Companies increase their knowledge-based competitive advantage by investing in

research and development. Successful implementation of such strategy is determined by availability of external financing, which prompts companies to compete in investment attractiveness. Disclosure of intellectual capital and its' results of R&D activity in the form of realized development costs may act as the key incentive for investors. This study aims to identify determinants of accounting policy in respect to signaling results of undertaken R&D activity by public companies listed on the stock exchange in Poland. We chose Poland, because International Financial Reporting Standards and Polish Accounting Act allow to decide between development expenditures capitalization or recognition as a reporting period costs. Authors suggest that the choice to capitalize development costs is a way of reporting the success of current development activities and strategic position of the firm to stakeholders. This in turn affects the financial standing of the firm and its' future economic benefits. The research was based on data from financial reports of companies listed on WSE. The hypotheses were verified using qualitative methods and logistic regression model.

The first section provides a review of literature on the investments in R&D activities at a firm level and on the determinants of recognizing R&D expenses as intangible assets. The second section discusses an accounting approach for R&D in respect to national and international accounting standards. The third section presents the methodology used in this study. In the fourth section authors present results of their empirical research. It ends with summary of findings and recommendations for future research.

2. Literature review

According to the new growth theory by P. Romer [1994] and R.E. Lucas [1988], R&D is one of the main sources of economic growth. Therefore, more and more countries pursue policies promoting R&D activities, particularly at the corporate level [Adamczyk 2013]. J. Schumpeter [1960] points out the importance of self-financing and allocating profits to R&D activities in the process of raising companies' innovativeness.

The OECD report on satellite account for R&D in the Netherlands shows that companies do not disclose the results of their R&D in the balance sheet unless they are confident that their products, patents or licenses find buyers [Rooijen-Horsten et al. 2007].

We obtained a positive impact of employees, and thus the size of the enterprise, for a chance of success. According to D.R. Oswald [2008], smaller companies, due to the need for financing its activities, are more likely to disclose development work in the balance sheet, while larger companies that generate high tax revenues are seeking tax optimization tools and prefer reducing the tax liabilities by recognizing development costs as tax deductible expenses. In the Polish case the results indicate, however, an inverse relationship. This may be due to greater awareness and knowledge of accounting standards in large enterprises, greater awareness of the board about the

need for signalling firm's innovativeness, as well as the desire to increase profitability through capitalizing development costs in the balance sheet. A. Mora and A. Sabater [2008], under the political costs hypothesis, predict that the negotiations with the employees encourage companies to reduce accounting profits in order to avoid requests to increase employees' wages. J. Waterhouse et al. [1993] argue that managers reduce the firm's financial results, in order to avoid difficult wage negotiations with employees and trade unions.

When a unit carries out activities aimed at commercialization of research results, the chance to reveal the cost of completed development work in the balance sheet increased by 38%, which is consistent with the results of D.R. Oswald [2008]. It justifies that companies which heavily invest in R&D are more willing to demonstrate results of research and development in the balance sheet.

G. Markarian et al. [2008] suggest that managers prefer flexibility in the choice of accounting policy. They tend to choose option which will allow them to avoid exceeding restrictive financial ratios. This finds reflection in the case of a choice between capitalizing or expensing development costs, because it directly affects the profitability and size of firm assets. S. Triki-Damak and K. Halioui [2013] indicate that managers of companies with higher rates of debt, and therefore higher share of borrowing, tend to choose solutions that will let them reduce the size of these indicators. Capitalizing the cost of completed development works allows for reducing debt ratios, enhancing financial performance, and even avoiding the risk of exceeding permissible limits of debt ratios [Triki-Damak, Halioui 2013]. The results of our study confirm the positive impact of a higher debt ratio on the capitalization of development costs in the balance sheet.

The research of N. Nehrebecka et al. [2015] indicates that the Polish non-financial companies, during the period 1997–2012, were using their cash reserves (savings) to smooth spending on R&D. Results show that cash flow has positive impact on investments in R&D (as measured by the share of completed development costs in total assets) in the short (0.031) and long term (0.023). It indicates that a self-financing ability of companies prompt R&D activities.

D.R. Oswald [2008] identifies the following factors determining the choice of capitalizing development expenses in accounting books: the firm size, intensity of R&D activities (programs), and expansion of R&D activities within the firm. On the other hand, S. Triki-Damak and K. Halioui [2013] point the factors related to profits of management staff. Based on the audit of 125 French public companies the authors examine other factors: differences between national and international accounting standards in terms of recognition of development costs, the risk of exceeding the financial indicators (in particular debt ratios), volatility of financial results of the firm (ROA), the political costs, salaries and number of employees, firm size, innovation sector of the economy, the quality of the audit, market value to book value, information if the company is listed on the American Stock Exchange and the risk (beta). The significance of factors related to political costs are also noted by A. Mora and A. Sabater

[2008] and J. Waterhouse et al. [1993]. M. Rooijen-Horsten et al. [2007] show among Dutch companies the correlation between the ability to sell products, patents and licenses (including sale on foreign markets) and recognition of development costs as intangible assets. The results of D. Aboody and B. Lev [1998] and D.R. Oswald [2008] indicate that a more productive firm (with higher ratio of sales revenue to assets) is willing to recognize development expenditures as costs of the accounting period, thereby indicating its good financial standing. On the other hand, companies with low productivity are less likely to generate additional costs, therefore tend to capitalize development works in the balance sheet. A. Cazavan-Jeny and T. Jeanjean [2006] find that capitalization of R&D expenditures is negatively correlated with market prices of shares and a return on shares. According to the authors, investors react negatively to the capitalization of R&D. Additionally the authors suggest other potential factors such as leverage, financial performance and growth opportunities. On the other hand, N. Seybert [2009] recognizes as an important factor a risk of damage to the reputation of managers in case of failure of capitalized R&D works. M. Ciftci [2010] suggests that the managers who treat R&D expenses as reporting period costs gain better economic benefits than those who capitalize R&D expenditures.

3. Accounting treatment of completed development works

Companies conducting intensive R&D activities may require significant expenditures. A major accounting problem in such companies is the accounting choice in relation to recognition of R&D expenses in financial statements. Recognition of R&D activities in the financial statements is a consequence of the strategy adopted in the accounting policy. It may be a way of signaling results of strategies focused on innovation and commercialization of R&D results.

Before proceeding further, the differences between research and development works should be explained. Unfortunately, the Polish Accounting Act [Ustawa z 29 września 1994] does not define the concept of research and development, and does not directly determine which expenses are treated as expenditures on research and which on development. Furthermore, national accounting standards do not define expenditures regarded as a research and development expenses, thus the definition of these concepts must be sought in other regulations. Under the Law on financing of science, development works are “the acquisition, combination, development and utilisation of the currently available knowledge and skills related to science, technology and business activity as well as of other knowledge and skills in order to plan production and to develop and design new, modified or enhanced products, processes and services” [Ustawa z 30 kwietnia 2010, Art. 2, point 4]. The International Accounting Standard 38 Intangible Assets in Art. 8 defines development as “the application of research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes, systems or services before the start of commercial production or use” and part of the asset generation process associated

with the development work is called a development phase. Examples of development IAS 38 include:

- the design, construction and testing of pre-production or pre-use prototypes and models,
- the design of tools, jigs, molds and dies involving new technology,
- the design, construction and operation of a pilot plant that is not of a scale economically feasible for commercial production,
- the design, construction and testing of a chosen alternative for new or improved materials, devices, products, processes.

Usually the stage preceding development is the research phase. Research is “original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding”. Examples of research IAS 38 include:

- activities aimed at obtaining new knowledge;
- the search for, evaluation and final selection of, applications of research findings or other knowledge;
- the search for alternatives for materials, devices, products, processes, systems or services;
- the formulation, design, evaluation and final selection of possible alternatives for new or improved materials, devices, products, processes, systems or services.

Article 33 par. 2 of the Polish Accounting Act [Ustawa z 29 września 1994] allows for recognizing as intangible assets (balance sheet item I. Intangible assets – 1. R&D expenses) costs of a completed development works, carried out by an entity for its own needs and incurred before the commencement of production or implementation of a technology, if the following conditions are met:

- a given product or production technology is clearly defined, and related development costs are reliably measured,
- the technical usefulness of a product or technology has been determined and properly documented, and on that basis entity has decided to manufacture these products or implement the technology,
- it is expected that development costs will be covered with the revenue from the sales of these products or implementation of the technology.

IAS 38 allows for the recognition of development expenses as intangible assets, if entity can demonstrate all of the following:

- the technical feasibility of completing the intangible asset so that it will be available for use or sale,
- its intention to complete the intangible asset and use or sell it,
- its ability to use or sell the intangible asset,
- how the intangible asset will generate probable future economic benefits,
- its ability to measure reliably the expenditure attributable to the intangible asset during its development.

It is worth noting that in the case of IAS 38 there is no obligation to complete a development project (work, activities) in order to be able to recognize it as an

intangible assets. Polish Accounting Act allows for the expensing development projects in the period when expenses were incurred or when the development project was completed. On the other hand, entity may capitalize development expenditures in balance sheet (recognize as intangible assets) after development phase is completed and the economic usefulness of the product/technology has been determined. Until then it is permissible to capitalize them in the balance sheet as accruals. However, in the case of the International Accounting Standards cost previously recognized as an expense cannot be subsequently capitalized as an intangible asset.

Recognition of expenses which are incurred during the research phase is described in IAS 38. According to these regulations, research expenditures must be recognized as an expense of the period when incurred. This is due to the impossibility of proving that created asset will generate probably future economic benefits.

The choice between recognition of the development work, as an intangible assets or period expenses, is an important element signaling the success of development activities or tax optimization. Given the high public funds and EU grants for R&D activities in the modern economy, the recognition of the development expenditure as the expense (cost) of the financial year can significantly reduce the positive financial result, leading even to a loss (which decreases tax liability). On the other hand, disclosing development expenditures in the form of intangible assets can inform investors about the success of the next steps in the R&D strategy. It is worth mentioning that in the case of IAS, expenditures for R&D incurred during the period are mandatory disclosed in the financial statements. This indicates that the financial statements prepared in accordance with international accounting standards may have a greater information capacity for investors interested in supporting enterprises active in R&D.

These findings support the need to identify factors which affect an accounting treatment of expenditures on a completed development work.

4. Research methodology

For the purpose of this study, we identify potential independent variables which are correlated with recognition of completed development works as an intangible assets. The variables, shown in Table 1, are taken from the literature review. Nevertheless, the choice of variables is largely dependent on the available data in the financial statements of public companies listed on the WSE. The dependent variable in the model is a dummy variable *capitalize* that takes the value 1 when the firm recognized development costs in the balance sheet, and 0 otherwise. Due to the nature of binary dependent variable, logit regression is conducted through the use of Stata13 package.

The model allows for determining the probability of capitalizing the cost of completed development works in the balance sheet or as an expense of the firm, under the defined characteristics for each firm. In the case of the logit model, the probability of success, i.e. capitalization of R&D costs in the balance sheet equals to:

Table 1. Independent variables used in the study

Name of variable	Description of variable
<i>mssf</i>	binary variable that takes the value 1 when a firm applied IFRS, and 0 otherwise
<i>export</i>	binary variable that takes the value 1 when a firm exports its products or services, and 0 otherwise
<i>brexpend</i>	binary variable that takes the value 1 when a firm incurred R&D expenses in a given year, and 0 otherwise
<i>issue</i>	binary variable, which value 1 when a firm issued new shares in the reporting year, and 0 otherwise
<i>lnemployment</i>	natural logarithm of the number of employees
<i>commercialization</i>	binary variable that takes the value 1 if a firm carries out activities in a given year in order to commercialize new products, technologies or services, and 0 otherwise
<i>parentcomp</i>	binary variable that takes the value 1 when a firm is the parent firm of the group, and 0 if it is a subsidiary / joint venture or does not belong to the group
<i>subsidiary</i>	the number of subsidiaries in the business group
<i>assetsproductivity</i>	productivity of assets which is the ratio of net sales to total assets
<i>lnshares</i>	natural logarithm of the number of shares traded on the markets
<i>roa</i>	rate of return on assets, which is the ratio of profit to assets
<i>debt</i>	debt ratio, which is the ratio of foreign capital to total assets
<i>operatingef</i>	the ratio of net cash flow from operations to total assets

Source: own elaboration.

$$P(Y) = \frac{e^{(\alpha+\beta X)}}{1 + e^{(\alpha+\beta X)}}$$

Furthermore, the chance of success showing the dependence between the probability of success and the probability of failure equals $P(Y) = e^{(\alpha+\beta X)}$. The estimation of a model is possible by applying the maximum likelihood method [Mycielski 2010]. The regression is conducted on data from financial statements of 112 non-financial companies listed on the WSE in 2010–2013. After removing the incomplete data observations, the sample consists of 421 observations.

5. Results of empirical study

The results of logit model that includes all variables, under the significance level of 5%, point to the insignificance of the *brexpend*, *issue*, *assetsproductivity*, *lnshares* and *roa* (Table 2). As a part of the testing, linktest logit model is performed in order to check the specification error of variables, Hosmer-Lemeshow test for the goodness of fit and fitstat command for the other measures of fit.

Table 2. Results of logistic regression and marginal effects

Variable	Coefficient Std error	<i>p</i> -value	dy/dx Std error	<i>p</i> -value
1	2	3	4	5
<i>mssf</i>	-0.3520		-0.0815	
	(0.3425)		(0.0815)	
<i>export</i>	0.6379	***	0.1418	***
	(0.2485)		(0.0544)	
<i>brexpnd</i>	0.5744	*	0.1352	*
	(0.3272)		(0.0798)	
<i>issue</i>	0.1035		0.0234	
	(0.3028)		(0.0690)	
<i>lnemployment</i>	0.1825	***	0.0408	***
	(0.0512)		(0.0113)	
<i>commercialization</i>	1.6087	***	0.3817	***
	(0.3998)		(0.0864)	
<i>parentcomp</i>	1.0584	***	0.2100	***
	(0.3148)		(0.0535)	
<i>subsidiary</i>	-0.0294	***	-0.0066	***
	(0.0108)		(0.0024)	
<i>assetsproductivity</i>	-0.1260	*	-0.0282	##
	(0.0769)		(0.0173)	
<i>lnshares</i>	0.1063		0.0238	
	(0.0757)		(0.0170)	
<i>roa</i>	1.1809	*	0.2639	*
	(0.6231)		(0.1403)	
<i>debt</i>	1.5878	**	0.3549	**
	(0.6378)		(0.1444)	
<i>operatingef</i>	5.3333	***	1.1920	***
	(1.3062)		(0.2922)	
<i>_cons</i>	-2.7406	*		
	(1.4370)			
Pr(capitalize)			0.3372	
Pseudo R^2	0.1828			
LR chi2(13)	100.67	***		
LR(13)	100.672	***		
Log likelihood	-225.0054			
Pearson $\chi^2(407)$	406.12	0.5030		

1	2	3	4	5
hat	0.9755	***		
	(0.1170)			
hatsq	-0.0370	*		
	(0.0201)			
cons	0.0308			
	(0.1310)			

Source: own elaboration.

The results indicate the correct selection of variables and predictive ability of the model. For a more detailed interpretation of the influence of individual variables on the chance of success (the disclosure as an intangible assets), we calculate marginal effects based on which we provide our interpretation (Table 3). Obtained results show that the export activity of the firm increases the likelihood of disclosure of development costs in the balance sheet. The positive impact of export on the capitalization may be dictated by the desire to signal investors and potential buyers the success of implementing new technologies and innovative products or services. The positive results of the development projects disclosed in the balance sheet can contribute to the competitiveness of the firm on foreign markets, thereby increasing its attractiveness to investors.

The results indicate positive effect of “forcing” a specific accounting policy among the companies of capital group. The parent company prefers recognizing the cost of completed development work in the balance sheet among its subsidiaries. This can be explained on the basis of agency theory. Parent company can improve the control and supervision over the results of R&D of its subsidiaries thanks to the capitalization of development costs in the balance sheet. Although according to the theory of transaction costs by R. Coase, excessive need for control and oversight within the group may lead to conducting R&D activities outside of the group, thus affecting the financial result of the costs of R&D carried out in the group only to a small extent. It confirms a significant negative impact, although with small impact, of the size of the group (measured by the number of subsidiaries) on the choice of capitalization (Table 2).

The positive and highly significant effect of generated financial surplus (measured in cash flows from operations) indicates strong dependence of capitalization on the ability to self-finance their own research. Similar results were obtained by Bond et al. [2005] and N. Nehrebecka et al. [2015].

6. Conclusions

The purpose of this study was to identify determinants of an accounting treatment of costs of completed development works as intangible assets or as reporting period expenses. It is shown that being open to foreign markets (export sales), number of

employees, undertaking activities aimed at commercialization of R&D results and high level of debt increase the likelihood of disclosure of the costs of completed development works in the balance sheet. This is similar to the results of S. Triki-Damak and K. Haliouli [2013]. The authors demonstrate that disclosure of the development works in the balance sheet reduces debt ratios, enhances financial performance, and helps avoid the risk of exceeding permissible limits of debt ratios.

It is shown that the parent company which creates accounting policy for its subsidiaries can significantly increase the chance of disclosing development costs in assets. The authors state strong impact of ability to self-finance R&D activities on the capitalization of development works. We contribute to literature by showing that during the financial crisis in the euro zone (2009–2010) companies stimulated their investments in R&D, thus pursuing “go global” strategy. Furthermore, the crisis increased subsidies for capital investments and intangible assets in 2010, which points to the need for more research on intellectual capital and determinants of the R&D outcomes disclosure.

Future research can take into consideration variables describing ways of funding R&D activities such as loans and research grants. Subsequent work will focus on expanding data sample. One should also consider continuous variables in the form of indicators with total assets used as the denominator.

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