The Impact of R&D Accounting Treatment on Firm's Market Value: Evidence from Germany

Dejan Ravselj and Aleksander Aristovnik
Department of Economics and Public Sector Management, Faculty of Administration,
University of Ljubljana, Gosarjeva Ulica 5, 1000 Ljubljana, Slovenia

Abstract: Investment in Research and Development (R&D) is becoming very important in terms of improving corporate performance. However, the way this investment is treated in accounting has always been contentious. According to International Financial Reporting Standards (IFRS) or International Accounting Standards (IAS) which became mandatory for listed companies in European Union (EU) in 2005, R&D expenditures can be treated as an expense that flows through an income statement or as an intangible asset on a balance sheet, if certain conditions are met. The aforementioned may have significant impact on firm's market value. Accordingly, the main aim of the study is to evaluate the impact of R&D accounting treatment on firm's market value. For the purposes of the empirical analysis, data from Germany is used, since, it represents a country with Continental European model of accounting which is dominant throughout the EU. A multiple regression analysis is performed on a dataset of 779 firm-year observations for the period 2005-2016. The results of the study reveal that different accounting treatment of R&D expenditures have different impact on firm's market value. Capitalised R&D expenditures have a positive impact on firm's market value while expensed R&D expenditures have a negative impact on firm's market value. The results will be beneficial for different stakeholders such as managers, R&D policy makers, accounting standard setters and investors alike.

Key words: R&D accounting treatment, capitalised R&D expenditures, expensed R&D expenditures, firm's market value, Germany, capitalised

INTRODUCTION

Companies around the world are aware of that Research and Development (R&D) investment is becoming more and more important, since, it can generate future benefits which can consequently, result to better corporate performance as well firm's market value (Ravselj and Aristovnik, 2017, 2018a). Despite the favourable effects of private R&D expenditure, the accounting treatment for this type of investment is not yet fully settle. This can be partially explained by the changes which have affected the nature of the business. Over the past century, the global economy has changed dramatically. Currently, many countries around the world are making rapid progress to become knowledge-based economies. However, the debate regarding accounting treatment of R&D expenditures still remains contentious.

From historical perspective, there are two sets of standards that have been followed by several countries as accounting guidelines. The first accounting guidelines known as Generally Accepted Accounting Principles (US GAAP) were issued by the Financial Accounting Standards Board in the United States. The second accounting guidelines known as International Accounting Standards (IAS) were issued by International Accounting Standards Committee. Later, the aforementioned series of accounting standards were supplemented by International Financial Reporting Standards (IFRS) which were issued by International Accounting Standards Board. These accounting standards have significantly affected the area of the European Union (EU), especially, in 2005 when they become mandatory for listed companies in EU. In practice, the rule is that IFRS take precedence over IAS, if there is contradiction between them. On the one hand US GAAP require immediate expense on R&D expenditures in the income statement while on the other hand, IFRS/IAS allows capitalisation of R&D expenditures, if certain conditions are met. However, the decision whether the conditions for capitalisation are met or not is often left to the management of the company. However, different accounting treatment of R&D expenditures can ultimately have an impact on firm's market value.

Accordingly, the main aim of the study is to evaluate the impact R&D accounting treatment on firm's market value. The study tries to contribute to the accounting literature in the following way. While many existing empirical studies examine only the impact of overall R&D expenditures on corporate performance or firm's market
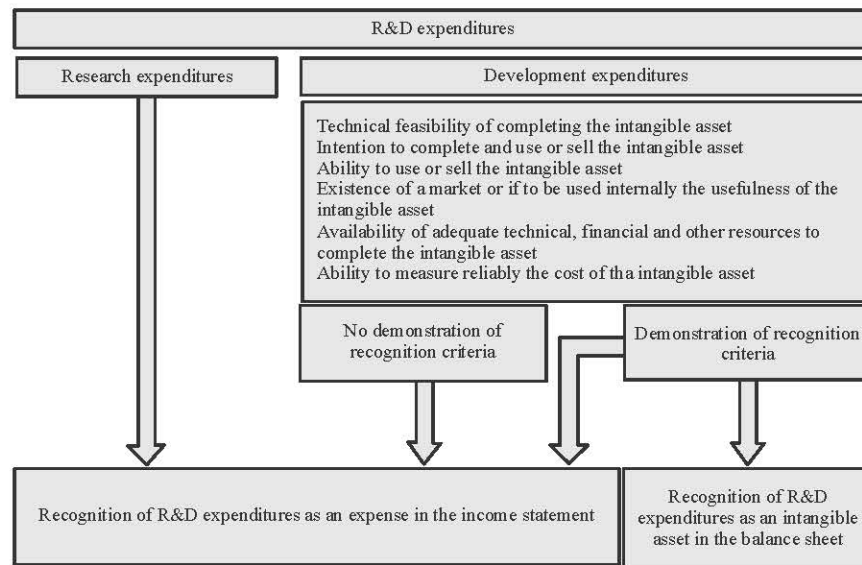
Corresponding Author: Dejan Ravselj, Department of Economics and Public Sector Management,
Faculty of Administration, University of Ljubljana, Gosarjeva Ulica 5, 1000 Ljubljana, Slovenia

Fig. 1: The sccounting treatment of R&D expenditures IAS 38

value, the study tries to expand previous empirical studies by dividing total R&D expenditures on expensed R&D expenditures and capitalised R&D expenditures and evaluating their impact on firm's market value.

Investment in R&D activities is subject to high uncertainty and information asymmetry (Aboody and Lev, 2000; Moehrle and Walter, 2008). In general, R&D expenditures can be treated in accounting in two different ways either as an expense in the income statement or as an intangible asset in the balance sheet (Mihai *et al.*, 2011). The aforementioned accounting treatment applies primarily to IFRS/IAS whereby the second way (capitalisation) is subject to IAS 38 criteria that are not quite easily met. The obligation to apply these accounting standards was prescribed by the European Commission which passed a regulation in 2002 mandating that listed companies in EU countries have to prepare their first consolidated financial statement using IFRS (Wang *et al.*, 2008). The aforementioned accounting standards have significantly affected the area of the EU, especially, in 2005 when they become mandatory for all listed companies in EU.

According to the IAS 38, the general guidelines for R&D accounting treatment are as follows. Expenditures from the research phase should be treated as an expense that flows through an income statement while expenditures from the development phase should be treated as an intangible asset on a balance sheet, if the following conditions are met technical feasibility of completing the intangible asset intention to complete and use or sell the intangible asset ability to use or

sell the intangible asset existence of a market or if to be used internally, the usefulness of the intangible asset availability of adequate technical, financial and other resources to complete the intangible asset and ability to measure reliably the cost of the Intangible Asset (IAS 38).

At first glance, this accounting rules seem to be very clear and straightforward. However, in this context, some researchers observe that IAS 38 often allows management a free choice on the accounting treatment of R&D expenditures, meaning a company must decide whether the criteria for capitalisation have been fulfilled or not (Markarian *et al.*, 2008). Since, management has often a power to decide whether the recognition criteria for capitalisation is met or not, it can conceal the satisfaction of these criteria which implies that development expenditures can be then treated as an expense in the income statement rather than an intangible asset in the balance sheet. The accounting treatment of R&D expenditures is presented in Fig. 1.

In the accounting literature, there are conflicting opinions regarding the accounting treatment of R&D expenditures. Recognition of R&D expenditures in the balance sheet (capitalisation) highlights relevance and usefulness while recognition of R&D expenditures in the income statement (expensing) highlights objectivity and reliability of accounting measurement (Healy *et al.*, 2002; Wang *et al.*, 2017). Some researchers support R&D capitalisation in the belief that R&D expenditures can produce future economic benefits, representing a meaningful reason to treat them as an asset on the balance sheet (Ballester *et al.*, 2003; Sougiannis, 1994).

According to the aforementioned, they argue that R&D capitalisation allows management to signal its private information about successful (capitalised) and unsuccessful (expensed) R&D investments which consequently help investors to discriminate between those investments (Aboody and Lev, 1998; Healy *et al.*, 2002; Kothari *et al.*, 2002; Callimaci and Landry, 2004; Ahmed and Falk, 2006; Cazavan-Jeny *et al.*, 2011; Li *et al.*, 2014; Wang *et al.*, 2017). Yet, other researchers are opposed to R&D capitalisation because they argue that future economic benefits are doubtful and management, thus, cannot assert the successfulness of the R&D project with certainty. Therefore, they contend that R&D expenditures should be treated as expenses in the income statement, since, such accounting treatment may make financial reports more objective (Cazavan-Jeny *et al.*, 2011; Kothari *et al.*, 2002). Namely, expensing of R&D expenditures eliminates the opportunity to recognise R&D expenditures in the balance sheet of unsuccessful (expensed) R&D investments with low probability of success (Nixon, 1997; Mande *et al.*, 2000).

As mentioned before within the context of IFRS/IAS, management may choose between capitalisation and expending of R&D expenditures. The consequences of this choice may be ultimately reflected in balance sheet, income statement, cash flow statement and related ratios both in the year the accounting choice is made and in future accounting periods (Wang *et al.*, 2017). In this context, some researchers establish that accounting choice regarding accounting treatment of R&D expenditures can be used as part of earnings management, meaning influencing on reported income, cash flows and other financial performance measures (Ballas and Anagnostopoulou, 2014; Dinh *et al.*, 2016; Markarian *et al.*, 2008; Wang, 2016, Wang *et al.*, 2017). The aforementioned can affect corporate performance as well as firm's market value.

In general, the accounting literature reveals a positive relationship between R&D expenditures and firm's market value with capitalised R&D expenditures having incremental explanatory power on the stock price (Hirschey, 1982; Hirschey and Spencer, 1992; Chan *et al.*, 2001; Chambers *et al.*, 2002; Callimaci and Landry, 2004; Han and Manry, 2004; Ahmed and Falk, 2006; Hsu *et al.*, 2013; Wang *et al.*, 2017). Moreover, according to the presented accounting rules which are prescribed by IFRS/IAS for EU countries the impact of capitalised R&D expenditures and expensed R&D expenditures on firm's market value may be different. This can be explained by IAS 38 prescribing that only successful R&D investments should be recognised as an intangible asset in balance sheet whereby the economic benefits have to be presented while unsuccessful R&D investment should be recognised as an expense that flows through an income statement. The balance sheet and income statement represent the key documents that can reveal current and future corporate performance which may be ultimately resulted in enhanced firm's market value. It can be therefore, argued that financial reports play a very important role in this context (Ravselj and Aristovnik, 2018b). To sum up, it is expected that investors perceive capitalised R&D expenditures as the amount of successful R&D projects which positively affects firm's market value. In contrast, it is expected that investors perceive expensed R&D expenditures as the amount of unsuccessful R&D projects which negatively affects firm's market value. Based on the aforementioned discussion, the following research hypothesis are proposed:

- H_1: capitalised R&D expenditures reflect a positive signal to market by having a positive impact on firm's market value
- H_2: expensed R&D expenditures reflect a negative signal to market by having a negative impact on firm's market value

MATERIALS AND METHODS

The study focusing on evaluating the impact of R&D accounting treatment on firm's market value. The empirical analysis is performed on German listed companies, since, Germany is a good representative of a country with Continental European model of accounting which is dominant accounting model throughout the EU. Data for the empirical analysis is obtained from the worldscope database, available through Thomson Reuters Datastream. It takes into account only those companies for which is possible to obtain all necessary data for the period 2005-2016. Therefore, companies with insufficient data for this period, especially as regards R&D expenditures representing the main interest of the study are therefore, excluded from the empirical analysis. After adjustments, the final sample consists of 779 firm-year observations. All of the variables used in the empirical analysis are derived from the existing empirical studies (Cazavan-Jeny and Jeanjean, 2006; Wang *et al.*, 2017). A summary of all variables used in the empirical analysis is presented in Table 1.

The study tries to evaluate the impact of R&D accounting treatment on firm's market value. The association between the capitalised and expensed R&D

Table 1: Abbreviations and definitions of variables

Abbreviations	Variables	Definitions
MP	Market price	Market price represents the closing price of the company's share in EUR at their fiscal year end
CapRDPS	Capitalised R&D expenditures per share	Capitalised R&D expenditures per share are calculated as development expenditures in EUR divided by outstanding shares whereby development expenditures represent the gross value of capitalised expenditure relating to development including the development of new products
ExpRDPS	Expensed R&D expenditures per share	Expensed R&D expenditures per share are calculated as research expenditures in EUR divided by outstanding shares whereby expensed R&D expenditures represent all direct and indirect expenditures related to the creation and development of new processes, techniques, applications and products with commercial possibilities
BVPS	Book value per share	Book value per share represents the book value in EUR (proportioned common equity divided by outstanding shares) at the company's fiscal year end
AdjBVPS	Adjusted book value per share	Adjusted book value per share is calculated as book value per share minus capitalised R&D expenditures per share. It is measured in EUR
EPS	Earnings per share	Earnings per share represents the earnings in EUR for the 12 months ended the last fiscal year
AdjEPS	Adjusted earnings per share	Adjusted earnings per share is calculated as earnings per share plus expensed R&D expenditures per share. It is measured in EUR
SIZE	Company size	Company size is calculated as natural logarithm of market capitalisation in EUR whereby market capitalisation is equal to the price of one share multiplied by the number of outstanding shares
LEV	Financial leverage	Financial leverage is calculated as debt-to-asset ratio
YR	Annual variable	Based on 2005 for each subsequent year, value is 1 and 0 otherwise

Anonymous (2007), Researchers elaboration

expenditures and firm's market value is examined by using a classic stock price model from Ohlson (1995) which is intended for examining the relationship between accounting information and firm's market value. Similar methodological approach is used also in the existing empirical studies (Cazavan-Jeny and Jeanjean, 2006; Wang *et al.*, 2017). In its fundamental form, the Ohlson (1995) model intends to explain firm's market value by considering book value per share and earnings per share as main determinants driving the overall quality of firm's financial reporting. The fundamental pooled regression model is presented in the Eq. 1 where $Mp_{i,t}$ is market price measured in EUR α_0 is the constant term $BVPS_{i,t}$ is book value per share measured in EUR, $EPS_{i,t}$ is earnings per share measured in EUR and $\varepsilon_{i,t}$ is the disturbance term:

$$MP_{i,t} = \alpha_0 + \beta_1 BVPS_{i,t} + \beta_2 EPS_{i,t} + \varepsilon_{i,t} \qquad (1)$$

The following empirical model is developed based on the previous one and explicitly examines the relationship between capitalised and expensed R&D expenditures and firm's market value. Therefore, the book value per share is divided into adjusted book value per share, i.e., book value per share before capitalised R&D expenditures and capitalised R&D expenditures per share. Similarly, the earnings per share is divided into adjusted earnings per share, i.e., earnings per share before expensed R&D expenditures and expensed R&D expenditures per share. The described pooled regression model is presented in the Eq. 2 where, $Mp_{i,t}$ is market price measured in EUR α_0 is the constant term, $CapRDPS_{i,t}$ is capitalised R&D expenditures per share measured in EUR, $AdjEPS_{i,t}$ is capitalised R&D expenditures per share measured in EUR, $AdjBVPS_{i,t}$ is adjusted book value per share measured in EUR $AdjEPS_{i,t}$ is adjusted earnings per share measured in EUR and $\varepsilon_{i,t}$ is the disturbance term:

$$MP_{i,t} = \alpha_0 + \beta_1 CapRDPS_{i,t} + \beta_2 ExpRDPS_{i,t} + \beta_3 AdjBVPS_{i,t} \beta_4 AdjEPS_{i,t} + \varepsilon_{i,t} \qquad (2)$$

Finally, the last empirical model which is developed based on the previous one includes also other determinants which can affects firm's market value, namely company size and financial leverage. In order to control for year effect also time dummy variables are taken into consideration. The described pooled regression model is presented in the (Eq. 3) where $Mp_{i,t}$ is market price measured in EUR α_0 is the constant term $CapRDPS_{i,t}$ is capitalised R&D expenditures per share measured in EUR $ExpRDPS_{i,t}$ is expensed R&D expenditures per share measured in EUR $AdjBVPS_{i,t}$ is adjusted book value per share measured in EUR $AdjEPS_{i,t}$ is adjusted earnings per share measured in EUR, $SIZE_{i,t}$ is company size measured as natural logarithm of market capitalisation in EUR, $LEV_{i,t}$ is financial leverage measured as debt-to-asset ratio $YR_{i,t}$ is annual variable defined as set of dummy variables and $\varepsilon_{i,t}$ is the disturbance term:

$$MP_{i,t}\alpha_0 + \beta_1 CapRDPS_{i,t} + \beta_2 ExpRDPS_{i,t} + \beta_3 AdjBVPS_{i,t} + \beta_4 AdjEPS_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 LEV_{i,t} + \beta_i \sum YR_{i,t} + \varepsilon_{i,t} \qquad (3)$$

In terms of the empirical results, it is expected that Book Value Per Share ($BVPS_{i,t}$) and Earnings Per Share ($EPS_{i,t}$) represent the main driver of Market Price ($Mp_{i,t}$) when estimating empirical model presented in the Eq. 1. When estimating empirical model presented in the Eq. 2, it is expected that the impact on Market Price ($MP_{i,t}$) is positive for Capitalised R&D expenditures Per Share ($CapRDPS_{i,t}$) and negative for expensed R&D Expenditures Per Share ($ExpRDPS_{i,t}$) as proposed by the

main research hypothesis. The impact of Adjusted Book Value Per Share (AdjBVPS$_{i, t}$) and Adjusted Earnings Per Share (AdjEPS$_{i, t}$) should be positive. Finally, the empirical model presented in the Eq. 3 examines also whether other firm characteristics such as company Size (SIZE$_{i, t}$) and financial Leverage (LEV$_{i, t}$) as well as time (Yr$_{i, t}$) change the results of the market value model. Besides the described effects, it is expected that the impact on Market Price (MP$_{i, t}$) is positive for company Size (SIZE$_{i, t}$) and negative for financial Leverage (LEV$_{i,t}$) as proposed by the existing research (Wang *et al.*, 2017).

RESULTS AND DISCUSSION

Descriptive statistics of variables included in the empirical analysis (except year effects) are presented in Table 2. Since, companies represent a very heterogeneous group of units, there may be some outliers in the data. In order to eliminate the effect of possibly spurious outliers, all of the continuous variables which are included in the empirical analysis are winsorized at 5 and 95% level by year. The procedure of Winsorisation is often considered also as robust statistics (Reifman and Keyton, 2010).

Table 3 shows Pearson correlations between estimated variables (except year effects). As expected, Market Price (MP) has a positive and significant correlation with Capitalised R&D expenditures Per Share (CapRDPS) while the correlation between Market Price (MP) and expensed R&D Expenditures Per Share (ExpRDPS) is positive and significant which is not in line with the expectations. As expected, Book Value Per Share (BVPS) and Earnings Per Share (EPS) as well as their Adjusted forms (AdjBVPS and AdjEPS) have positive and significant correlation with Market Price (MP). Moreover, the correlation between Market Price (MP) is positive and significant for company Size (SIZE) and negative and not significant for financial Leverage (LEV). The relationships between Book Value Per Share (BVPS) and Earnings Per Share (EPS) and their Adjusted forms (AdjBVPS and AdjEPS) are significant and above 0.80. However, these variables are not included in the same empirical model and are considered separately.

As regards other variables which are considered in the same empirical model, the simple correlation is below 0.80, suggesting that there is no very strong correlation between those variables. Nevertheless, in order to check the presence of multicollinearity, the multicollinearity diagnostics such as Variance Inflation Factor (VIF) and Tolerance (TOL) are applied.

The main aim of the study is to evaluate the impact of R&D accounting treatment on firm's market value.

Table 2: Descriptive statistics of variables

Variables	Min.	Max.	Mean	SD
MP	1.150	360.450	30.514	35.842
CapRDPS	0.000	37.524	3.026	5.120
ExpRDPS	0.000	11.186	1.625	2.079
BVPS	1.222	93.381	16.103	16.423
EPS	-9.608	10.520	1.477	2.762
AdjBVPS	-2.569	75.562	12.793	12.649
AdjEPS	-2.873	23.984	3.028	3.863
SIZE	9.580	17.999	13.162	2.150
LEV	0.000	61.230	20.915	15.138

Researchers elaboration

In order to evaluate the impact of capitalised R&D expenditures and expensed R&D expenditures on market value, multiple regression analysis is applied on German listed companies for the period 2005-2016 which results in 779 firm-year observations. The empirical results are presented in Table 4.

The results of Model 1, testing the relationship between book value, earnings and firm's market value, reveal positive and significant impact of Book Value Per Share (BVPS) and Earnings Per Share (EPS) on Market Price (MP) which is consistent with the findings of the existing accounting literature (Cazavan-Jeny and Jeanjean, 2006; Ohlson, 1995; Wang *et al.*, 2017). Further, the results of Model 2 which explicitly examines the relationship between capitalised and expensed R&D expenditures and firm's market value, reveal that Capitalised R&D expenditures Per Share (CapRDPS) has a positive and significant impact on Market Price (MP), suggesting that capitalised R&D expenditures can reflect a positive signal to market. The aforementioned is in line with the findings of other researchers (Lev and Sougiannis, 1996; Zhao, 2002; Callimaci and Landry, 2004; Tsoligkas and Tsalavoutas, 2011; Li *et al.*, 2014; Wang *et al.*, 2017). Further, the results reveal that Expensed R&D Expenditures Per Share (ExpRDPS) has a negative impact on Market Price (MP), suggesting that expensed R&D expenditures can reflect a negative signal to market. This finding is in line with other researchers as well (Cazavan-Jeny and Jeanjean, 2006; Tsoligkas and Tsalavoutas, 2011; Li *et al.*, 2014; Wang *et al.*, 2017). Moreover, the results show a positive and significant impact of Adjusted Book Value Per Share (AdjBVPS) and Adjusted Earnings Per Share (AdjEPS) on Market Price (MP) which is in line with Ohlson (1995), Cazavan-Jeny and Jeanjean (2006); Wang *et al.* (2017). Finally, the results of Model 3, reveals that the inclusion of other firm characteristics such as company (SIZE) and financial Leverage (LEV) as well as time (YR) does not change the results of the market value model. Moreover, they reveal that the impact on Market Price (MP) is positive and significant for company Size (SIZE)

Table 3: Pearson correlation matrix of variables

Variables	MP	CapRDPS	ExpRDPS	BVPS	EPS	AdjBVPS	AdjEPS	Size	LEV
MP	1								
CapRDPS	0.518^{***}	1							
ExpRDPS	0.559^{***}	0.689^{***}	1						
BVPS	0.740^{***}	0.696^{***}	0.776^{***}	1					
EPS	0.603^{***}	0.281^{***}	0.366^{***}	0.574^{***}	1				
AdjBVPS	0.693^{***}	0.467^{***}	0.687^{***}	0.914^{***}	0.620^{***}	1			
AdjEPS	0.736^{***}	0.497^{***}	0.689^{***}	0.741^{***}	0.865^{***}	0.744^{***}	1		
SIZE	0.528^{***}	0.263^{***}	0.403^{***}	0.465^{***}	0.477^{***}	0.507^{***}	0.537^{***}	1	
LEV	-0.037	0.091	0.035	0.032	-0.028^{***}	0.019	0.019	0.168^{***}	1

Levels of significance: $^{***}p<0.001$

Table 4: Multiple regression results for the relationship between R&D accounting treatment and firm's market value

DV: MP	PS	Model 1			Model 2			Model 3		
		Coefficient	VIF	TOL	Coefficient	VIF	TOL	Coefficient	VIF	TOL
BVPS	+	1.284^{***} (0.061)	2.350	0.426						
EPS	+	3.439^{***} (0.362)	1.670	0.600						
CapRDPS	+				1.665^{***} (0.215)	2.060	0.486	1.632^{***} (0.206)	1.920	0.521
ExpRDPS	-				-2.965^{***} (0.669)	3.130	0.319	-2.536^{***} (0.639)	3.060	0.327
AdjBVPS	+				0.962^{***} (0.101)	2.880	0.347	0.948^{***} (0.100)	2.670	0.375
AdjEPS	+				4.491^{***} (0.332)	3.210	0.311	3.599^{***} (0.341)	2.820	0.355
SIZE	+							2.297^{***} (0.443)	1.520	0.658
LEV	-							-0.175^{**} (0.051)	1.040	0.958
Constant	?	4.762^{***} (1.146)			4.391^{***} (1.137)			-20.295 (6.885)		

Model 1: PS: ?, YR: Not included, Adjusted R^2: 0.5944, Observations: 779; Model 2: YR: Not included, Adjusted R^2: 0.6167, Observations: 779; Model 3: YR: Included, Adjusted R^2: 0.6581, Observations: 779, Levels of significance: $^{***}p<0.001$, DV: Dependent variable, PS: Predicted sign, Standard errors are in parentheses, Researchers elaboration

and negative andsignificant for financial Leverage (LEV) which is in line with previous literature (Wang *et al.*, 2017). According to the Variance Inflation Factor (VIF) and Tolerance (TOL), multicollinearity is not an issue here, since, VIF is lower than 10 and TOL is higher than 0.10.

The results presented above reveals a positive and significant impact of Capitalised R&D Expenditures Per Share (CapRDPS) on Market Price (MP) in Model 2 and Model 3, supporting the hypothesis 1 that capitalised R&D expenditures reflect a positive signal to market by having a positive impact on firm's market value. Moreover, a negative and significant impact of expensed R&D Expenditures Per Share (ExpRDPS) on Market Price (MP) in Model 2 and 3 confirms the Hypothesis 2 that expensed R&D expenditures reflect a negative signal to market by having a negative impact on firm's market value. Summing up, the study shows that different R&D accounting treatment have the impact on firm's market value.

CONCLUSION

The study provides some insight into the area of the accounting treatment of R&D expenditures. Currently, R&D investment is becoming increasingly important, especially from the perspective of long-term firm viability. In this context, existing as well as potential new investors play an important role whereby it is important to bear in mind that the accounting information provided in the financial reports is often used in their decisions. However, the debate how to treat R&D expenditures in accounting is still contentious. Accordingly, the study tries to add new evidence to the existing accounting literature by evaluating the impact of expensed and capitalised R&D expenditures on firm's market value in the European context.

Using multiple regression analysis a dataset of 779 firm-year observations for Germany in the period 2005-2016 is analysed. The empirical results reveal that different R&D accounting treatment have the impact on

firm's market value. The way in which R&D expenditures are treated in accounting can convey different signals to the investors. On the one hand, capitalised R&D expenditures reflect a positive signal to market by having a positive impact on firm's market value while on the other expensed R&D expenditures reflect a negative signal to market by having a negative impact on firm's market value. In other words, these results suggest that capitalised R&D expenditures seem to be perceived as good news while expensed R&D expenditures as bad news on the market.

The findings of the study are useful for different stakeholders. Since, different R&D accounting treatment have different implications for firm's market value, managers can choose a favourable accounting treatment of R&D expenditures in order to pursue desired strategy of the company. Moreover, policymakers should provide such R&D policy which encourages R&D investment on the other but discourage from using accounting treatment of R&D expenditures for manipulation of investors by distorted accounting information. Finally, appropriate accounting treatment of R&D expenditures will be beneficial for the existing and new investors which will be capable to make better decisions by using the accounting information provided in the financial reports.

LIMITATIONS

The study has also some limitations. The first limitation is related to the fact that the study is only focused on German listed companies. It would be therefore, interesting to extent such research to other EU countries and beyond which allows comparative analysis between individual countries. Another potential limitation of the study is that it is focused only on the period after 2005 when IFRS/IAS became mandatory for listed companies in the EU. It would be interesting to compare the accounting treatment before and after the mandatory introduction of IFRS/IAS for listed EU companies.

ACKNOWLEDGEMENTS

REFERENCES

Aboody, D. and B. Lev, 1998. The value relevance of intangibles: The case of software capitalization. J. Accounting Res., 36: 161-191.

Aboody, D. and B. Lev, 2000. Information asymmetry, R&D and insider gains. J. Finance, 55: 2747-2766.

Ahmed, K. and H. Falk, 2006. The value relevance of management's research and development reporting choice: Evidence from Australia. J. Accounting Pub. Policy, 25: 231-264.

Anonymous, 2007. Worldscope database: Datatype definitions guide. Thomson Financial, Toronto, Canada.

Ballas, A. and S.C. Anagnostopoulou, 2014. Tax incentives as determinants of accounting for and spending on R&D: An international analysis. SSRN. Electron. J., 1: 1-41.

Ballester, M., M. Garcia-Ayuso and J. Livnat, 2003. The economic value of the R&D intangible asset. Eur. Accounting Rev., 12: 605-633.

Callimaci, A. and S. Landry, 2004. Market valuation of research and development spending under Canadian GAAP. Canadian Accounting Perspect., 3: 33-54.

Cazavan-Jeny, A. and T. Jeanjean, 2006. The negative impact of R&D capitalization: A value relevance approach. Eur. Accounting Rev., 15: 37-61.

Cazavan-Jeny, A., T. Jeanjean and P. Joos, 2011. Accounting choice and future performance: The case of R&D accounting in France. J. Accounting Pub. Policy, 30: 145-165.

Chambers, D., R. Jennings and R.B. Thompson, 2002. Excess returns to R&D-intensive firms. Rev. Accounting Stud., 7: 133-158.

Chan, L.K., J. Lakonishok and T. Sougiannis, 2001. The stock market valuation of research and development expenditures. J. Finance, 56: 2431-2456.

Dinh, T., H. Kang and W. Schultze, 2016. Capitalizing research & development: Signaling or earnings management?. Eur. Accounting Rev., 25: 373-401.

Han, B.H. and D. Manry, 2004. The value-relevance of R&D and advertising expenditures: Evidence from Korea. Intl. J. Accounting, 39: 155-173.

Healy, P.M., S.C. Myers and C.D. Howe, 2002. R&D accounting and the tradeoff between relevance and objectivity. J. Accounting Res., 40: 677-710.

Hirschey, M. and R.S. Spencer, 1992. Size effects in the market valuation of fundamental factors. Financial Anal. J., 48: 91-95.

Hirschey, M., 1982. Intangible capital aspects of advertising and R&D expenditures. J. Ind. Econ., 30: 375-390.

Hsu, F.J., M.Y. Chen, Y.C. Chen and W.C. Wang, 2013. An empirical study on the relationship between R&D and financial performance. J. Appl. Finance Banking, 3: 107-119.

Kothari, S.P., T.E. Laguerre and A.J. Leone, 2002. Capitalization versus expensing: Evidence on the uncertainty of future earnings from capital expenditures versus R&D outlays. Rev. Account. Stud., 7: 355-382.

Lev, B. and T. Sougiannis, 1996. The capitalization, amortization and value-relevance of R&D. J. Accounting Econ., 21: 107-138.

Li, E.Y., Y. Wang and W. Fan, 2014. R&D reporting methods and firm value: Evidence from China. Chinese Manage. Stud., 8: 375-396.

Mande, V., R.G. File and W. Kwak, 2000. Income smoothing and discretionary R&D expenditures of Japanese firms. Contemp. Accounting Res., 17: 263-302.

Markarian, G., L. Pozza and A. Prencipe, 2008. Capitalization of R&D costs and earnings management: Evidence from Italian listed companies. Intl. J. Accounting, 43: 246-267.

Mihai, I.O., C. Mihalciuc and C. Mihai, 2011. Accounting treatment for R&D activities in accordance with IFRS and Romanian legislation. USV. Ann. Econ. Pub. Administration, 11: 226-236.

Moehrle, M.G. and L. Walter, 2008. Risk and uncertainty in R&D management. R. D. Manage., 38: 449-451.

Nixon, B., 1997. The accounting treatment of research and development expenditure: Views of UK company accountants. Eur. Accounting Rev., 6: 265-277.

Ohlson, J.A., 1995. Earnings, book values and dividends in equity valuation. Contemporary Account. Res., 11: 661-687.

Ravselj, D. and A. Aristovnik, 2017. R&D subsidies as drivers of corporate performance in Slovenia: The regional perspective. DANUBE. Law Econ. Rev., 8: 79-95.

Ravselj, D. and A. Aristovnik, 2018b. Administrative barriers for SMEs in the field of tax compliance and financial and accounting reporting: Evidence from Slovenia. Manage. Prob., 16: 75-90.

Ravselj, D. and A. Aristovnik, 2018a. The impact of private research and development expenditures and tax incentives on sustainable corporate growth in selected OECD countries. Sustainability, 10: 1-16.

Reifman, A. and K. Keyton, 2010. Winsorize. In: Encyclopedia of Research Design, Salkind, N.J. (Ed.). Sage, Thousand Oaks, California, USA., pp: 1636-1638.

Sougiannis, T., 1994. The accounting based valuation of corporate R&D. Accounting Rev., 69: 44-68.

Tsoligkas, F. and I. Tsalavoutas, 2011. Value relevance of R&D in the UK after IFRS mandatory implementation. Appl. Financial Econ., 21: 957-967.

Wang, L., 2016. Capitalising or expensing research and development expenditures: A tax perspective explanation. China J. Accounting Stud., 4: 79-103.

Wang, X., D. Young and Z. Zhuang, 2008. The effects of mandatory adoption of International Financial Reporting Standards on information environments. Master Thesis, The Chinese University of Hong Kong, Hong Kong.

Wang, Y., R. Du, K.S. Koong and W. Fan, 2017. Effects of R&D policy choice on accounting performance and market value. R.D. Manage., 47: 545-556.

Zhao, R., 2002. Relative value relevance of R&D reporting: An international comparison. J. Intl. Financial Manage. Accounting, 13: 153-174.