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THE IMPACT OF INVESTMENT IN RESEARCH AND DEVELOPMENT ACTIVITIES ON THE PROFITABILITY OF PHARMACEUTICAL COMPANIES: A COST ACCOUNTING APPROACH

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Abstract

Investing in research and development (R&D) activities greatly impact the assessment of the company's finances and performance, which is why the issue of the accounting treatment of these costs is so important. The aim of this paper is to examine the relationship between investment in R&D activities and the profitability of pharmaceutical companies, i.e., to see whether R&D activities can affect the financial position and performance of 30 pharmaceutical companies in the period from 2010 to 2020. The obtained results show that investing in R&D activities has a positive effect on net income, earnings before interest and taxes, and earnings per share (EPS).

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JEL Classification: M40, M41, B23

Introduction

A large number of companies focus on R&D activities. Today, continuous investment in technology development is a prerequisite for the survival and development of companies. By investing in R&D activities, companies improve technical capacity, make progress in new product development, increase production efficiency and quality of services, and, thus, operate more successfully. Investing in these activities also brings a certain level of risk given the return on investment (whether the company's investment costs will be below the level of profit), but it is certain that investing in R&D activities will increase the competitive advantage of products and services through sales growth and higher market value. In addition, special attention should be paid to the accounting treatment of these costs, which can significantly affect the reality of the results the company reports and its production costs. The amount of investment in R&D is influenced by various factors such as capital structure, economic conditions, competitors' activities, globalization, and expansion of international networks. However, companies can cope with these factors in order to improve their future market position.

This paper focuses on international pharmaceutical companies with a high share of intangible assets (innovation) in their operations such as R&D, patents, brands, advertising, and the like. The pharmaceutical industry belongs to the group of high-tech industry and often faces numerous challenges. It is characterized by high manufacturer fragmentation, which can raise a number of issues such as drug safety, drug quality, as well as limited capacity for effective R&D. In addition to a high share of innovation, the price of innovation is high, which is certainly important for the survival of companies in this sector. That is why it is important to check the existence of a relationship between investing in R&D activities and the profitability of pharmaceutical companies.

The subject of the research includes 30 pharmaceutical companies selected as the highest-revenue companies in 2020. The research covers the period from 2010 to 2020. Secondary data are used and variables are selected (net income, earnings before interest and taxes, and earnings per share) to assess profitability using panel

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regression analysis. The aim of this paper is to assess the impact of investment in R&D activities on the profitability of pharmaceutical companies.

In this regard, the paper is divided into three parts. The first part gives an overview of the literature. The second part of the paper deals with the methodology of panel regression analysis, research design, and description of variable measurement. Finally, the research results and their discussion are presented.

Literature review

Scientific and economic development, intensive technology development, and growing competition raise the question of market survival when the product life cycle becomes shorter and shorter, forcing companies to monitor the relationship between business costs and the quality of products and services. This is especially true in the service sector, as the new strategic economic sector with a dominant share in GDP.

There are many definitions of R&D in scientific and academic literature, with as many links between R&D and innovation. The International Accounting Standard (IAS 38 – Intangible Assets) defines the concept of research *as* an *original* and *planned* investigation *undertaken* with the prospect of gaining *new scientific* or *technical knowledge* and *understanding* (Paragraph 8), while development is 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. Pursuant to Paragraph 126, an entity shall disclose the aggregate amount of R&D expenditure recognized as an expense during the period (IAS 38). R&D (OECD 2015) comprises creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture, and society – and to devise new applications of available knowledge. Block (2012) points out that companies investing in R&D activities can develop new products, and create and adopt innovative technologies that can increase their competitive advantage. What is more, as De Medeiros et al. (2014), Huang et al. (2016), and Tumelero et al. (2019) say, the higher the amount of investment in R&D, the greater its impact on green product innovation.

Wang (2011) confirms that company performance depends on resources and R&D activities. Gunday et al. (2011) find that product and marketing innovations have a positive impact on company performance. Silva et al. (2015) and Gu (2016) find that the intensity of R&D has a positive effect on company performance. Dai and Yu (2013, according to Agustia et al. 2020) point out that the costs arising

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from investment in R&D activities are not in vain. By investing, companies improve their innovative capabilities and absorption capacity. Dave et al. (2013) point to a significant relationship between R&D investment intensity and gross margin, while Beld (2014) finds a nonlinear relationship between R&D investment and financial performance. The performance of healthcare companies is one of the main scientific topics and is the subject of a large number of empirical studies (Fiala et al. 2020).

Pharmaceutical industries and their cumulative amount of investment in R&D activities, as well as the amount of investment at the level of individual companies, prove the importance of investing in R&D activities. The total global allocations of pharmaceutical and biotechnology companies for R&D activities increased from 108 billion USD in 2006 to 141 billion USD in 2015. The fifty largest world companies in terms of total investment in R&D activities in 2020 include 20 pharmaceutical companies. The companies in the top 10 leading companies for 2020 are Novartis (1), Roche (2), Pfizer (3), Merck & Co (4) Johnson & Johnson (5) (Figure 1). The 2020 World Preview Outlook report forecasted Novartis's 10.5-billion-dollar spending on R&D. Furthermore, Celgene was forecasted to increase the amount of R&D costs by 10% per year from 1.8 to 3.3 billion dollars. Investment in R&D activities in the pharmaceutical industry was to increase by 2% (Compound Annual Growth Rate – CAGR), i.e., to 160 billion in 2020. In 2014 global investment amounted to 141.6 billion, a rise of 3.1% compared to previous years. Ultimately, total R&D investment was expected to increase by 2.0% each year (Figure 2).

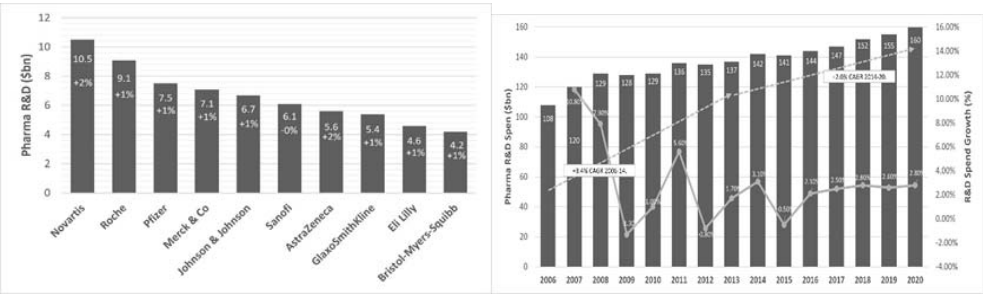

Figure 1 and 2. Top ten companies in 2020 and total investment in R&D activities of the pharmaceutical sector in the period from 2006 to 2020

Source: Evaluate Pharma. World Preview Outlook (2015). Available at: http://info.evaluategroup.com/rs/607-YGS-364/images/wp15.pdf (Accessed on 11 February 2022)

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Evaluate Pharma forecasts that global spending on R&D activities in the pharmaceutical industry will grow at an annual rate of 4.2% between 2020 and 2026. This is slightly slower than the historical CAGR of 4.7% between 2012 and 2020 (Figure 3). Figure 3 also shows that the amount of investment in R&D activities in 2020 exceeded forecasts (the realized amount is 198 billion).

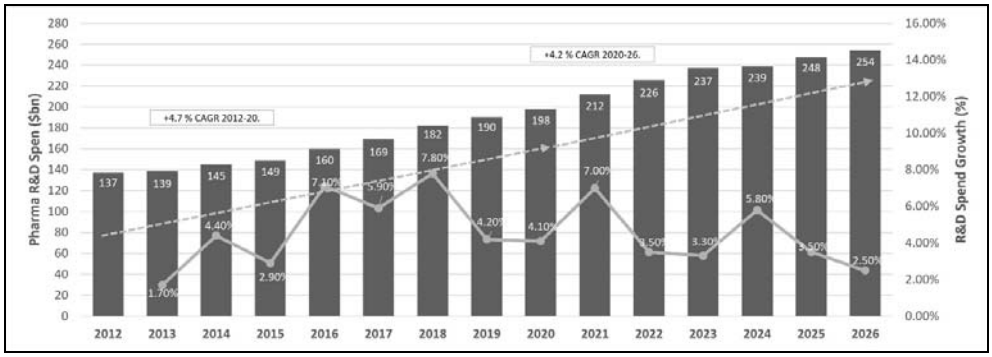

Figure 3. Total investment in R&D activities of the pharmaceutical sector in the period from 2012 to 2026

Source: Evaluate Pharma. World Preview Outlook (2021). Available at: https://info.evaluate.com/rs/607-YGS-364/images/WorldPreviewReport_Final_2021.pdf (Accessed on 11 February 2022)

Given its exposure to pressure and changes in recent years, the further course of the pharmaceutical industry should be considered. Merck points out that companies can further thrive if their environment is conducive to innovation. The pharmaceutical industry should focus on the following (Gelijns and Halm 1991): it should remain successful in the discovery, development, production, and sale of innovative and cost-effective drugs; it should be confident in the profitability of R&D investments and be able to successfully convey the message of product profitability and real risk levels in relation to the return on investment in R&D. Investing in R&D (James 2019) is important for business growth and the ability to compete with the competitors. Companies that innovate, adopt new technologies, and improve their existing processes will surely operate in the long run. Broadly taken, the benefits of investing have a positive effect on other sectors, but also on the economy in general. Of course, a sector that invests a lot in R&D activities will develop more and will also bring numerous benefits to people around the world.

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However, factors that may negatively affect the efficiency of R&D need also be considered, such as (Schuhmacher et al. 2016):

- Inadequate number of projects in early research stages;
- Technically complex research on new drugs and subsequent clinical studies;
- Increased burden of NME (new molecular entities) approval and refund with regard to already approved drugs;
- Lower risk tolerance;
- A Large number of mergers and acquisitions;
- Fewer research-based pharmaceutical companies that take the financial risk of drug R&D, and
- The negative effect of licensing, joint development, or joint ventures on clinical development and seeking authorization.

Therefore, the pharmaceutical industry must constantly check the strategy of its business model in order to generate revenue, and so that investment in R&D activities yields more important results in relation to the competition. Investment in innovation in this area brings a longer life expectancy of people, a large number of cured people, and improves available treatments. In fact, innovation has become a key factor in creating new and competitive products in the pharmaceutical industry. What is more, since the 1990s product development has become very important for companies operating on the global market (Calantone et al. 1997 according to Hutagaol and Natasha 2009). Company innovation does not have to be just about a new product. It can also be about investing in technology that allows companies to make progress in R&D (Aminullah 2007). R&D, as part of intellectual capital, has an impact on productivity and market value which can be beneficial. The rise in productivity increases profitability, while profitability determines the market value of companies (Pavlović et al. 2021). The pharmaceutical industry is very specific because it includes patent rights on the medicines produced, which for a longer period of time prevent the entry of competing players (Tömöri et al. 2022). Also, the pharmaceutical industry provides rewards in the form of intellectual property rights creating market power (Chen et al. 2021). Stanescu and Gurgu (2019) conducted research on the importance of marketing in the pharmaceutical field and examined how much companies spend resources on events organized in the pharmaceutical field. The authors came to the conclusion that in the Romanian pharmaceutical market, it is necessary to develop and implement complex marketing strategies that will ensure a competitive advantage in relation to competitors' channels. Besides, Calota Toma and Gurgu (2022) pointed towards the decisive role of the pharmaceutical field in the COVID-19 pandemic in Romania.

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Therefore, investing in R&D activities is very important for company operations, but accounting for R&D costs is not easy. What is more, numerous authors, such as Hannel and St-Pierre (2002), Hokkanen (2006), and Coad and Rao (2007), confirm that R&D activities have an impact on company performance, so they must be given special attention. As R&D activities refer to researching new products and production procedures, improving the existing products, examining the possibilities of application of new materials, finding new product purposes, activities related to fundamental research, etc., costs of activities are not conditioned by current production. In that regard, their inclusion is not easy, given the uncertainty of future benefits, longer period of time from the beginning of activities to the identification of possible problems of failure (Wild et al. 2007). VanderPal (2015) pointed out, that R&D has an impact on corporate performance and therefore on profitability using multivariate statistical modeling and proved that R&D is considered an important prerequisite for growth companies and positive outcomes in terms of financial performance, as well as that there is a positive relationship between investment in research and future profits, all of which affects the growth of the market value of companies. R&D costs belong to the non-productive area and, therefore, do not enter the production costs, but they are still extremely important for the realistic calculation of company costs and determining business results. There has long been controversy over how to treat R&D costs. It is irrational to link them to products because they do not arise from current production but as a result of activities related to research and the realization of research results for new product development. One of the accepted proposals for the accounting treatment of R&D costs is to (Novićević and Antić 2010):

- Include them as a separate group of costs and write off current costs or cover them from the income of the current period,
- Include them together with the costs of general administration and administration and write off current costs, i.e., cover them from the revenues of the current period,
- Include them as a separate group of costs, and then allocate them to the production of the current period and make them share the fate of the costs of the functional area and
- Include them together with the general costs of the production functional area, allocate them to the production of the current period and share the fate of the costs of that area.

The stated accounting treatment of R&D costs is in line with cost differentiation of costs that do not bring current effects, those whose effects are felt in the current

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period, as well as those whose effects are certain in the future. The effects of R&D costs are certain in the future and so it is reasonable to defer them to future periods in the balance sheet.

Thanks to innovation, the pharmaceutical sector has taken a high position in many countries. Observing its position from the economic and social aspects, the contribution of this industry is also important, emphasizing the good results in creating new jobs that result from continuous investment in R&D.

Research Methodology

The panel data technique is used to assess whether investments in R&D activities have an impact on the profitability of pharmaceutical companies. Baltagi and Kao (2000) state that the advantage of panel data analysis is that it enables the development of correlation in time and observation units. It produces results based on a high degree of freedom and a low degree of multicollinearity, thus allowing for better efficiency of econometric estimates. The combination of time series and cross-sectional data increases the number of observations in the sample and gives greater information power to the model (Jovčić and Dragutinović Mitrović 2011, p. 217).

The initial sample includes 50 pharmaceutical companies with the highest revenue in 2020 (Drug Discovery and Development 2022). However, after a detailed data availability assessment (some pharmaceutical companies do not have data on the amount of R&D costs or data is not available for the selected time period of impact monitoring), companies that do not meet research requirements are eliminated, so the final sample includes 30 pharmaceutical companies. Secondary data collected from publicly disclosed financial statements of companies published on companies' official websites are used to test the hypothesis. As the sample consists of 30 companies whose data is observed in the period from 2010 to 2020, the use of panel regression analysis is justified, within which appropriate economic models and tests are selected.

Depending on the constraints of the model parameters, the following types of panel analysis models can be distinguished:

- ***P**ooled **R**egression **M**odel* – In this model, all data can be combined and the least-squares model can be applied. The individual characteristics of companies are neglected, i.e., there is no single intersection and no universal effect over time, so it cannot explain the differences between observation units.

$$Y_{it}=\alpha+\beta X_{it}+\varepsilon_{it} \quad (1)$$

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where Y is a dependent variable, α is a regression constant, β is a regression coefficient, X is a dependent variable, ε is the error value, and i is the number of observation units (1, ... N), t is the number of time periods.

- ***Fixed Effect Model*** – FEM – There are unique characteristics of the observation units that do not change over time. Differences between observation units are covered by the regression constant.

$$Y_{it}=\alpha+\beta X_{it}+\mu_i+\varepsilon_{it} \quad (2)$$

where μ_i is the individual effect.

- ***Random Effect Model*** – REM – There are unique, time-constant characteristics of the observation unit that do not correlate with individual independent variables.

$$Y_{it}=\beta X_{it}+\mu_i+\varepsilon_{it} \quad (3)$$

The analysis of the panel regression model is done using the STATA software package and includes dependent and independent variables. The indicators proposed by the International Accounting Standards Board based on the Balance Sheet, Income Statement and Cash Flow Statement are used as dependent variables, namely: Net Income, Earnings Before Interest and Taxes (EBIT), and Earnings Per Share (EPS). Investment in R&D is an independent variable in the model. The variables used and the method of their measurement are given in Table 1.

Table 1. Selected variables for panel data analysis

Variable	Measurement	Acronym
Investment in R&D	Highlighted in the income statement	R&D
Net income	Highlighted in the income statement	NI
Earnings before interest and taxes	Highlighted in the income statement	EBIT
Earnings per share	Highlighted in the income statement	EPS

Source: Authors based on the proposal of the International Accounting Standards Board

Model adequacy testing is done using the F-test, the Breusch-Pagan LM test, and the Hausman test. Two hypotheses are set for each test. First, an F test is performed where the null hypothesis indicates that if the probability is greater than

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0.05 and if the variance of the standard error is zero, the Pooled OLS model should be accepted (the null hypothesis cannot be rejected), otherwise the fixed effect model is chosen. The model is then tested using the Breusch-Pagan LM test, where the null hypothesis refers to the Pooled model and the other hypothesis to the random effect model. The LM test checks whether variability applies only to a free member or to an independent variable. If the previous two tests (F-test and LM) point to different models for a final decision on the panel model, a Hausman test assesses the significance of the difference between the fixed and random effect estimates. The results of the models and tests as well as their discussion are presented in the third part of the paper.

Results and discussion

Before presenting the results of the model and tests, Table 2 provides a tabular presentation of the descriptive values of the selected variables and points to their characteristics. Data in Table 2 shows that investment in R&D has a minimum value of 1.7 million euros and a maximum value of 29 billion euros. The standard deviation in R&D is greater than the arithmetic mean, so there is a high asymmetry when it comes to deviations from the amount of R&D. The minimum value of net income is −15.6 billion euros, and the maximum value is 8.2 billion euros. EBIT has a minimum value of −16.2 billion euros, while the maximum value is 137 billion euros. The minimum value of earnings per share is −15.85 euros, and the maximum value is 37.08792 euros. As with the net income, the standard deviation of other observed variables is larger in relation to the arithmetic mean, so there is a high asymmetry.

Table 2. Descriptive statistics of selected variables

- In 000 euros

Variables	N	Mean	Standard deviation	Minimum	Maximum
R&D	317	3.212.356	3.983.965	1.720,4	29.039.296
NI	325	2.721.092	3.758.889	−15.561.000	18.150.050
EBIT	325	4.111.637	8.613.617	−16.169.000	136.781.510
EPS	325	3,575774	5,23147	−15,85	37,08792

Source: Authors' calculation using Stata

Correlation analysis is used to test the strength of the correlation between the variables. Correlation analysis relies on Spearman's nonparametric correlation coefficient. There is a strong positive statistically significant correlation between

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R&D investment and net income, as Spearman's coefficient is 0.7727 at a significance level of 1%. A strong positive statistically significant correlation is recorded with earnings before interest and taxes (0.8075). Spearman's earnings per share ratio is 0.4263, indicating a positive medium-strength correlation between R&D investment and earnings per share. The results of the Spearman coefficient are shown in Table 3.

Table 3. Spearman coefficient results

	NI	EBIT	EPS
R&D	0.7727 (0.0000)	0.8075 (0.0000)	0.4263 (0.0000)
Correlation is significant at the 0.01 level Note: *p* values in ( )			

Source: Authors' calculation using Stata

As the correlation analysis points to a correlation between the observed variables, the selection of an adequate regression model using the selected tests follows. The results of tests for the selection of an adequate regression model are shown in Table 4.

Table 4. Results of model adequacy tests

Dependent variable	***F-test*** ***H_0: Pooled, H_1: FEM***	***Breusch-Pagan LM*** ***H_0:Pooled, H_1:REM***	***Hausman*** ***H_0:REM, H_1:FEM***
NI	7.656 (0.0000)	230.75 (0.0000)	0.38 (0.5364)
EBIT	3.48 (0.0000)	55.92 (0.0000)	0.01 (0.9318)
EPS	11.97 (0.000)	275.90 (0.0000)	25.52 (0.0000)
Note: *p* values in ( )			

Source: Authors' calculation using Stata

The random effect model (REM) is adequate with two regression models – in models where net income and EBIT are dependent variables. The fixed effect model (FEM) is adequate to assess the impact of R&D investment on earnings per share, while the Pooled OLS model is not adequate to assess the impact of any model.

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The first model to be tested for adequacy is the one in which net income is the dependent variable. The results of the F-test show that it is more adequate to apply the fixed effect model (FEM) compared to the Pooled model. Using the Breusch-Pagan LM test, a random effect model (REM) should be selected, which the Hausman test and the acceptance of the H_0 hypothesis about the adequacy of the model confirm. As the probability is less than 0.01 (0.0000), this means that R&D has a statistically significant impact on net income. A 1% increase in R&D will increase net income by € 9.77 million. In the evaluated model, θ is 0.6438, which confirms the adequacy of the selected model. This model explains 64.38% of the changes in net income. The values of the parameter ρ explain a significant part of the variance of the total random error, on the basis of which model adequacy can be determined (Park, 2011, p. 37). In the selected model, specific individual errors explain 38.49% (ρ = 0.38489871) of the variance of the total random error.

The second model analyzes the impact of R&D on earnings before interest and taxes. The application of the F-test for model evaluation shows that the fixed effect model (FEM) should be selected, while the application of the Breusch-Pagan LM test shows that the random effect model is more adequate. Therefore, the Hausman test is applied in order to make a decision on the choice of the model. The results of the Hausman test show that a random effect model (REM) should be selected. An increase in R&D by 1% will increase earnings before interest and taxes by 16.37 million euros. The model is statistically significant ($p < 0.01$) and the model explains up to 46.93% of changes in EBIT. Specific values of individual error explain 18.82% of the variance of total error (ρ=0.18823633).

The last model examines the impact of R&D investment on earnings per share. The results of the model evaluated using the F-test show that the fixed effect model should be applied; however, using the Breusch-Pagan LM test, the random effect model (REM) proves more adequate so the Hausman test is performed, to conclude that H_1 hypothesis should be accepted, i.e., the fixed-effect model. The results of the tests point to a difference between the companies observed in the sample in terms of the impact of investment in R&D on EPS, i.e., the regression parameters are unique and do not change over the years. Investment in R&D has a statistically significant impact on EPS ($p < 0.01$) with a coefficient of 2.447189 (Table 5), i.e., an increase in R&D by 1% will lead to an increase in EPS by 0.024 euros. The model is statistically significant ($p < 0.01$), while the coefficient of determination (R-squared) indicates that changes in R&D explain up to 55.47% of changes in EPS.

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Table 5. Results of regression analysis

Independent variable	Dependent variable		
	NI	EBIT	EPS
Constant	−10975788 (0.000)	−18866143 (0.000)	−30.90713 (0.000)
ln R&D	977040.1 (0.000)	1636798 (0.000)	2.447189 (0.000)
R-squared			0.5547
Adj R- squared			0.5080
θ	0.6438	0.4693	
ρ	0.38489871	0.18823633	
F (FEM)			60.98 (0.000)
Wald (REM)	34.57 (0.000)	18.46 (0.000)	
Note: *p* values in ( )			

Source: Authors' calculation using Stata

The analysis of the impact of investment in R&D activities on the profitability of pharmaceutical companies has shown that there is a positive relationship, i.e., that it affects the profitability of companies, and thus improves their competitiveness.

The results obtained from the analysis of 30 companies in the pharmaceutical industry confirm the results of previous studies (Hanel 2002; Schumacher et al. 2016; Wang 2011; Natasha and Hutagaol 2009; Barna et al. 2010; Rahman and Howlader 2022; Tung and Binh 2022). Specifically, the results show that investment in R&D affects the profitability of companies in the pharmaceutical industry. *Changing R&D models in research-based pharmaceutical companies* by Schuhmacher et al. (2016) emphasizes that research-based pharmaceutical companies need to be aware of the factors that influence the rate of innovation, R&D costs, and probability of success. Accordingly, they should define their strategies and carefully determine the amount of investment in R&D activities. Also, the results of Hanel's study entitled *Effects of R&D Spillovers on the Profitability of Firms* on a sample of 278 companies show that R&D has a direct, positive effect on profitability, especially in industries with effective patent protection. Wang (2011) and Natasha and Hutagaol (2009) reach similar results on the positive relationship between R&D and market performance. In his paper *Clarifying the effects of R&D on performance: evidence from the high technology*

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industries Wang (2011) finds not only the optimal effect that a certain level of R&D corresponds to maximum performance but also indicates the minimum required level of R&D needed for company development and its performance to be effective. In their study, The analysis of R&D impact on the publicly listed companies' performance in Indonesia Natasha and Hutagaol (2009) conclude that there is a link between R&D and company business development and market performance. The study by Barna et al. (2010) confirmed the positive impact of R&D expenditures on performance of Romanian enterprises for the period 2003-2008. Rahman and Howlader (2022) investigated the impact of R&D expenditure on firm performance and firm value considering 22 pharmaceutical companies in Bangladesh from 2015 to 2019. Their results determined a significant and positive impact of R&D expenditure on firm market performance and firm value. The research by Tung and Binh (2022) confirmed the positive impacts of R&D investments on revenues, profits, ROA, and ROE, as well as that firms with high R&D, outperform those with low R&D in terms of profit, revenue and ROA.

Analyzing pharmaceutical companies and their specifics and their investments in R&D activities, it can be noticed that it is very important for pharmaceutical companies to focus on R&D activities and continuously harmonize their business strategy. It is so because unforeseen circumstances can occur that can endanger human health, and in such a situation, the development of new drugs is necessary. An example is the current pandemic caused by the COVID-19 virus, where it was necessary to develop vaccines and drugs in a very short time in order to help people. If pharmaceutical companies did not have an adequate amount of R&D at that time, and a well-established business strategy, they would not be able to react in a timely manner and provide medicines and vaccines. The study by Biswas (2022) pointed to the fact that R&D investments can lower value erosion for stakeholders during a severe crisis period. The favorable accounting performance indicates that engaging in R&D activities and the intensity of R&D activities can improve firms' resilience during a crisis period.

Conclusion

Investment in R&D activities allows companies to generate future growth and should, therefore, be treated as capital expenditure. This means that companies must remain consistent and treat cumulative R&D costs as assets. R&D costs accumulate after tax and over time create depreciable research assets. Companies that set aside a certain amount for R&D activities can ensure product diversification and refine different R&D concepts. Therefore, companies need to

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set an adequate investment strategy for R&D activities that will allow them to achieve productivity and sustainability.

The research objective was to test the impact of investment in R&D activities on the profitability of pharmaceutical companies through net income, earnings before interest and tax, and earnings per share. The panel regression analysis of 30 pharmaceutical companies in the period from 2010 to 2020 was conducted, and there is a strong positive correlation between investment in R&D activities and net income and earnings before interest and tax (R&D investment has the greatest impact on net income and earnings before interest and tax, i.e., the increase in the amount of investment in R&D activities increases net income). There is a positive strong correlation with EPS. The obtained results suggest that investing in R&D, i.e., in the creation of knowledge and innovation, makes a strong contribution to company performance.

Investment in R&D activities allows companies to achieve the desired performance growth (Chung et al. 2019). Based on the conducted analysis, it is evident that pharmaceutical companies need to pay attention to the strategy of investing in R&D activities. Besides, companies should choose an R&D strategy which differs from the industry's dominant R&D strategy to enhance performance (Mavroudi et al. 2023). In this way, companies will be able to rationally use funds for this purpose while properly recording and disclosing the amount of expenditure on R&D. Also, the research can be extended to other sectors to determine the R&D sector with the greatest influence or the sector that is most dependent on continuous allocations for R&D (Boiko 2022).

The practice has shown that R&D costs are best treated as period costs at the expense of performance, because they are not included in performance costs, but are considered period costs. In this way, accurate information on the company's costs and performance can be obtained. The study limitations are primarily reflected in a limited sample of only 30 companies, so future research could cover a larger sample.

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