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The Effect of R&D Intensity towards the Financial Performance among Malaysian Public Listed Companies

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Abstract
Purpose: The objective of this study is to explore the effect of R&D intensity towards financial performance of active Malaysia listed companies in R&D.
Design/methodology/approach: Based on a sample of 45 active Malaysian listed companies in R&D for the period 2017 to 2019, this study employs linear regression to analyse the correlation between R&D intensity and financial performance.
Findings: The association between R&D intensity and firm financial performance are significant.
Research limitations/implications: The study does not represent the broad population of companies in Malaysia. This is because, the population of this study is limited to only 45 active Malaysian listed companies in R&D.
Practical implications: This study able to gauge better understanding concerning R&D intensity towards the company's financial performance based active Malaysian listed companies in R&D.
Originality/value: This study represents the first attempt to explore the effect of R&D intensity towards financial performance of active Malaysia listed companies in R&D.
Paper type: Research paper

Keywords: R&D intensity, Financial performance, Malaysia

Introduction

In the age of 21st century, the world has witnessed the completion of globalisation process and the rapid development of technology. The technology which developed rapidly not only help in distributing information to other part of the world in a matter of seconds but also enable the delivery of consumable goods to the other part of world as well (Kurt, 2019). As a result, the consumption has also escalated vigorously. Hence, the producers are in stern competition in this digital era as the companies have to emphasise in research and development (R&D) strategies by investing more in R&D activities to produce innovative products or services (Kurt, 2019). Vu, Nguyen, Ho and Vuong (2019) further explained that these companies are

facing pressure to innovate, enhance productivity and improve competitiveness. As a result, the surge in R&D activities has attracted extensive research on R&D intensity (Yiu, Lam, Yeung & Cheng, 2020).

Ghazi and Rim (2015) stated that Research and Development investment is important for business to unlock its value and realising performance. Besides, Zona (2016) stated the core of organization's success is the decision on Research and Development investment. This is because Research and Development investment generates new technological process, firm growth, higher firm productivity, competitive advantage and utmost company performance (Zona, 2016).

As business sustainability needed innovation during this age of digitalised era, Research and Development is a relative recent phenomenon. Organisations face challenges in acquiring resources and processing complex information such as financial and human capital and hence significantly require the demand to produce new products (Xie, Zhou, Zong, & Lu, 2020). Hence, this quickly innovating evolving environment encourages the companies to generate expedient and prodigious alternatives (Xie et al., 2020).

However, R&D investment does come along with perils (Francis & Samuel, 2016). Despite the benefits of R&D, the R&D also imposes risks. As stated by Dong and Gou (2010), the success of Research and Development projects not only lead to higher profits, but also higher risks. Zona (2016) explains that despite the benefits created by Research and Development investment, there are huge number of reasons why executives are hesitant in investing in Research and Development. This is because, Zona (2016) further deduce that:

a) Research and Development investment is risky (Lee & O'Neill, 2003)
b) demands vague cause-effect relationship (Munari, Oriani, & Sobrero, 2010)
c) diminish short term performances (Driver & Guedes, 2012).

Despite acknowledging that organisation thrive when companies innovate, very little information is attained pertaining key factors of innovation and firm's survival. Nevertheless, previous researches explored the effect of R&D intensity on financial performance (Rafiq, Salim & Smyth, 2016; Lome, Heggeseth, & Moen, 2016; Erdogan & Yamaltdinova 2019; Diéguez-Soto, Manzaneque, Gonzalez-Garcia & Galache-Laza, 2019; Ravšelj & Aristovnik 2020; Yiu, Lam, Yeung & Cheng, 2020). However, in the context of Malaysian companies, it is not clear and uncertain about the role of R&D intensity towards financial performance. This is because, there are limited research which has been conducted with respect to R&D intensity and financial performance using Malaysian companies. Hence, this study intends to examine the effect of R&D intensity towards financial performance of active Malaysia listed companies in R&D.

Literature Review

Critical Analysis of Past Scholars

Previous scholars have investigated the relationship between R&D intensity and financial performance.

Rafiq et al. (2016) examined the impact of R&D on the financial performance of 168 major US and Chinese mining firms from financial year 2009 to 2013. Rafiq et al. (2016) concluded that the US firms show that R&D increase both the revenue and profit by 4-7% and 4-4.5% respectively. Meanwhile, Rafiq et al. (2016) also noted there is massive negative effect of R&D on the revenue and profit of the Chinese companies. Rafiq et al. (2016) also further demonstrated the importance of firm age being the moderating role in this R&D and firm performance. In short, it is concluded that in this study, there is on average of firms engaging in R&D activities generates 4% to 11% higher revenues and earns 4% to 13% more profit than organisations that does not engage in the R&D activities in which firm age plays a moderating

role in this relationship. Using the samples of 247 Norwegian manufacturers, Lome et al. (2016) examined the correlation of R&D intensity towards financial performance during a financial crisis. Lome et al. (2016) concluded that there is a positive correlation between R&D intensity and subsequent revenue growth. In other words, it is noted that the R&D has an influence towards revenue in growth periods. Besides, Erdogan and Yamaltdinova (2019) studies the effects of R&D expenditures on the financial performances of 62 production organisations which are listed in the Borsa Instanbul in the period of 2008 – 2017. In this research, there are approximately 620 observations were gathered from the 62 companies from the financial year 2008 to 2017. Erdogan and Yamaltdinova (2019) through this study has revealed that there is an existence of Inverted-U shaped nonlinear relationship between R&D expenditures and financial performance. This is evidential of which the dependent variable ROA has a significant and positive relationship with most of the variables in which the ROA has positive correlation with the RDI. In conclusion, Erdogan and Yamaltdinova (2019) explained that R&D investments play a crucial role for companies by demonstrating future growth opportunities.

In addition, Diéguez-Soto et al. (2019) examined the moderating influence of R&D intensity on the relationship between family management and firm performance amongst the private firms. Diéguez-Soto et al. (2019) concluded that R&D intensity creates a negative effect of family management towards firm performance. In other words, family-managed companies that belong to higher R&D intensity group are more negatively associated to firm performance. Moreover, Ravšelj and Aristovnik (2020) also explored the effect of R&D expenditures towards corporate performance using sample of Slovenian companies and worlds R&D companies in period 2012 to 2016 and 2015 to 2017 respectively. concluded that R&D investment is a critical component for the corporate performance. Initially, the R&D expenditures has adverse effects towards the current operating performance. Nevertheless, at later stages, the R&D expenditures has strong positive impact towards the operating performance. Furthermore, Yiu et al. (2020) studied the effect of R&D investment on firm's financial returns of which is Tobin's Q and also explored the moderating impact of quality management and operational efficiency initiative on R&D performance outcomes. Using 408 manufacturing companies in the US from the period of 2007 to 2014, Yiu et al. (2020) concluded that companies' financial returns of R&D investment are significantly higher when the companies adopt Six Sigma and improve the operational efficiency. In other words, this study deduces that for good R&D investment, the organisations should build stronger process systems and routines.

Hypotheses Development

Bigliardi (2013) in investigating innovation and its effect towards financial performance concluded that innovation is the crucial force for all the organisations in attaining a competitive advantage in the market. Correspondingly, Erdogan and Yamaltdinova (2019) in studying the R&D and its impact on the financial performance for 62 production companies listed in Borsa Istanbul from 2008 to 2017 concluded that the existence of Inverted-U shaped nonlinear relationship between R&D expenditures and financial performance. In this study, one main hypothesis is developed which includes below:

H1: *There is significant relationship between R&D intensity and financial performance*.

Methods

Populations & Samples

The research method applied in this study is deductive approach and quantitative data. The hypotheses are derived first while the data are collected later in confirming the propositions whether the R&D intensity have an influential role in deciding the financial performance Malaysian listed companies. The population of this research comprises of 45 active Malaysian listed companies in R&D which are collected from financial year 2017 to financial 2019. These data of active Malaysian listed companies in R&D is extracted from Bloomberg Professional software. Based on Krejcie and Morgan (1970) table, if the number of data for population is 45 (N), then 40 (n) samples should be selected. Similarly, using Sekaran and Bougie (2016) table as a basis of determining the number of samples, for a given population of 45 (N), approximately samples of 40 (n) should be employed. However, in this research, all the 45 companies are tested. As a result, these 45 companies selected will not only represents 100% of the population selection but also will generate better results. In this study, the samples are gathered from financial year 2017 to 2019, hereby creating 135 observations. However, it is noted that there 21 missing data on the key variables. Hence after excluding companies with the missing data on the key variables, the final data consist of 114 observations. Meanwhile, the financial year 2017 to 2019 is selected because 2017 has lowest effect from the 2008 global financial crisis in which providing added value and reliable findings (Alqatan, Chbib & Hussainey, 2019). Table 1 provides the summary of the population and samples for this study.

Table 1: Summary of the Population and Samples

Populations	45 active Malaysian listed companies in R&D
Sampling	100%
Samples	45 active Malaysian listed companies in R&D
Year	From financial year 2017 to financial year 2019
Observations	114 observations
Populations	45 active Malaysian listed companies in R&D

Variables

This study examines the impact of R&D intensity towards financial performance. The dependent variable in this study is company's financial performance which comprise of:

a) Return on assets (ROA)
b) Return on equity (ROE)
c) Tobin's Q.

The return on assets (ROA), which has been adopted as one of the dependent variables to measure firm's financial performance, is a measurement used to determine how effective a company generates its earnings from the asset (Ogunsanwo, 2019). ROA is an indicator used in previous literatures (Arulvel & Pratheepkanth, 2019; Ogunsanwo, 2019; Ibrahim, Zin, Kassim & Tamsir, 2019; Chen & Keefe, 2020). The ROA is computed by dividing the company's net profit by its total assets (de Oliveira, Basso, Kimura & Sobreiro, 2018; Ogunsanwo, 2019; Chen & Keefe, 2020).

Besides, the company's financial performance is also measured using ROE (return on equity). Al-ahdal, Alsamhi, Tabash and Farhan (2020) has stated that ROE measures the return of shareholder's equity by determining how efficient the company is generating profits. Many prior researchers have utilised ROE as a basis of measuring financial performance which includes Endraswati (2018), Al-ahdal et al. (2020) and Ravšelj and Aristovnik (2020). The

ROE is calculated by dividing the net profit for the financial year by the company's shareholder's equity (Ravšelj & Aristovnik, 2020).

In addition, Tobin Q is the other dependent variable used to measure the company's financial performance in this study. Tobin's Q is the market's expectation of the firm's financial performance (Al-ahdal et al., 2020). Vu and Nguyen (2017) describes that Tobin's Q which is the most popular proxy for market-based firm performance is used to determine firm's future potentiality and success in leveraging its investment. Previous researches such as Vu and Nguyen (2017), Bravo and Reguera-Alvarado (2017), Murwaningsari (2019), Khan et al. (2019), Freihat, Farhan and Shanikat, (2019) and Al-ahdal et al., (2020), have applied Tobin's Q in measuring the companies' performance. The Tobin's Q is calculated by adding the equity market value to company's total debt in the numerator and company's total asset book value in the denominator (Al-ahdal et al., 2020).

Meanwhile, the independent variable of this study refers to R&D intensity. The R&D intensity which is the critical source for innovation is also used by other researchers (Lee, 2018; Erdogan & Yamaltdinova, 2019; Harymawan, Nasih, Agustia, Ratri & Nowland, 2020; Liu, Zhang & Gao, 2020; AlHares, Elamer, Alshbili & Moustafa, 2020). Cho, Halford, Hsu and Ng (2016) stated that R&D intensity is the measurement of company's long-term competitiveness. This study measures R&D intensity as R&D expenditure per total sale of the firm (Lee, 2018; Erdogan & Yamaltdinova, 2019; Liu et al., 2020). The ratio of R&D intensity is computed by dividing the R&D expenditure with the total sales, which is then converted into percentage. R&D expenditure data for each company was collected from Bloomberg Professional software.

In this study, there are two control variables used, namely, leverage and firm value. Based on Erdogan and Yamaltdinova (2019) research, leverage refers the division of total debt from total equity while the firm size is the natural log of total assets of the company. Table 2 provides the summary of the measurements of the variables used for this study.

Table 2: Measurement of Variables

Variables	Abbreviation	Definition	Measurement	Adopted from
Dependent variable				
Return on Asset	ROA	Net earnings of the year divided by total asset value	(Net Profit ÷ Total Assets) × 100%	de Oliveira et al., (2018), Ogunsanwo, (2019), Chen & Keefe (2020)
Return on Equity	ROE	Net profit a company generates based on its capital	(Net Profit ÷ Total Equity) × 100%	Ravšelj & Aristovnik (2020)
Tobin's Q	TQ	Market expectation of companies' performance	(Market Capitalisation + Total Debt) ÷ Total Assets	Al-ahdal et al. (2020)
Independent variable				
R&D intensity	RND	R&D expenditure per net sale of the firm	(R&D expenses ÷ Total Sales) × 100%	Lee (2018), Erdogan & Yamaltdinova (2019), Liu et al. (2020)

Control variables				
Leverage	LEVERAGE	Firm's Debt divided by Equity	Total Debt/Total Assets	Erdogan & Yamaltdinova, (2019)
Firm Size	VALUELG	Firms Value which is calculated to natural log of Total Assets	Natural log of Assets	Erdogan & Yamaltdinova (2019)

Model Specification

To investigate the relationship of R&D intensity and firm financial performance, the following multiple regression analysis is employed:

$$\mathbf{FPERF = \alpha + \beta 1RD + \beta 2LEVERAGE + \beta 3VALUELG + \varepsilon}$$

where:

FPERF = Firm Performance (either ROA, ROE or Tobin's Q)
RD = Research and Development Expenditure divided Net Sales
LEVERAGE = Firm's Debt divided by Equity
VALUELG = Firms Value which is calculated to natural log of Total Assets

Findings

Descriptive Statistics

Table 3 explicates the descriptive information about each independent variable, dependent variable of Malaysian companies which are highly involved in R&D expenditure. The sample is collected with a range of three (3) years from the period of 2017 to 2019. The data were collected using secondary sources such as Annual Report and Bloomberg Professional software.

Table 3: Descriptive Statistics of Variables

Variable	Observations	Minimum	Maximum	Mean	Std. Dev
RD	114	0.02	59.74	3.2511	7.05322
ROA	114	-101.96	31.96	5.1043	14.03044
ROE	114	-125.64	38.09	8.1189	19.40379
TBQ	114	0.19	6.30	1.7679	1.28128
LEVERAGE	114	0.18	42.90	17.6204	12.06719
VALUELG	114	7.17	11.25	9.0048	1.00448

Notes:

RD = R&D intensity
ROA = Return on Asset
ROE = Return on Equity
TBQ = Tobin's Q
LEVERAGE = Firm's Leverage
VALUELG = Firms Value which is calculated to natural log of Total Assets

This study includes 114 observations of 45 active Malaysian public companies in R&D between 2017 to 2019. The independent variable, R&D intensity, has a maximum value of 59.74% while a minimum value of 0.02%. It is observed that the mean of companies spending on R&D activities is only 3.25% of their Net Sales which indicates that the companies in Malaysia has low level investment on R&D. Besides, the standard deviation of 7.05% shows that the sample consist relatively many firms that vary more or less on the R&D investment.

The results also elucidate that the descriptive statistics for the dependent variables which comprises of ROA, ROE and TBQ. Both ROA and ROE has minimum value of -101.96% and -125.64% respectively; hence indicating that there are companies which have made financial losses during the financial year. The ROA which has maximum of 31.96% has average of 5.10% while the ROE which has maximum of 38.09% has average of 8.11%. The Tobin's Q which measure the market performance has mean value of 1.77 with a minimum value of 0.19 and maximum value of 6.30.

Meanwhile, it is noted that based on Table 3, the firm value has an average of 9, maximum value of 11.25 and minimum of 7.17 while the leverage has the highest value of 42.90 and lowest value of 0.18.

Regression Analysis

Regression Analysis is a statistical method employed in estimating relationships between one or more independent variables towards dependent variable. This research investigates the effect of R&D intensity towards the financial performance of active Malaysian listed companies with R&D. In this section, the regression analysis is applied to define the relationship of R&D intensity towards financial performance.

Referring to the regression analysis where **FPERF = α + β1RD + β2LEVERAGE + β3VALUELG + ε** was developed in previous section, following are results where ROA, ROE and TBQ are being tested individually:

Table 4: Regression Analysis between R&D Intensity towards Financial Performance

Variables	**ROA**		**ROE**		**Tobin's Q**	
	β	**P-value**	**β**	**P-value**	**β**	**P-value**
Constant	2.27	0.000	2.17	0.000	0.82	0.012
R&D	0.01	0.805	-0.02	0.585	0.00	0.375
Firm Value	-0.05	0.160	0.01	0.897	0.00	0.697
Leverage	-0.156	0.001***	-1.28	0.006***	-0.08	0.048**
R-squared	42.40%		20.20%		8.50%	
F-statistic	18.43***		6.31***		2.63*	

Referring to Table 4, it is noted that the regression analysis of R&D intensity has significant influence towards the financial performance (ROA, ROE and Tobin's Q). For both ROA and ROE, the models are significant at $p < 0.01$ while for Tobin's Q, the model is significant at $p < 0.1$ level. Hence, the overall regression model is a good fit in explaining the financial performance. Therefore, Hypothesis posited in this study is accepted.

Based on the results, it is deduced that the R Square on Table 4 is amounting to 0.424 which indicates that 42.4% of the variations in the ROA is explained by the combined effect of the R&D intensity and the other control variables. Meanwhile, the R&D intensity and the control variables (Leverage and Firm Value) explains about 20.20% and 8.50% of the variations in ROE and TBQ respectively.

Discussion and Conclusion

In conclusion, this study reveals that R&D intensity are significant towards the financial performance. Besides, this study manages to provide findings of R&D intensity towards the financial performance based on active Malaysian listed companies in R&D. Using active Malaysian listed companies in R&D is relevant because there is lack of research on this topic previously. Since there is uncertainty and lack of knowledge to provide evidence that R&D intensity will influence financial performance using Malaysian listed companies which are

active in R&D, these findings contribute significantly to the companies which are active in R&D.

Theoretical Implications

This study would give additional value by contributing to other literature's body of knowledge that focus on the causal effects or outcome between R&D intensity and financial performance.

Practical and Social Implications

This research could highlight to the policy makers in Malaysia to emphasise the importance in maximising R&D intensity. Through this research, the policy makers can understand the relationship between R&D intensity and successful financial performance. Therefore, it would create positive competition for the companies from enterprise to private and public companies to capitalise Research and Development intensity in maximising profitable returns.

Limitations and Suggestions for Future Research

Although this research contributes by filling the gap in investigating the impact of R&D intensity towards firm financial performance of active Malaysian listed companies in R&D, this study also displays some limitations and offers many unanswered questions. This study does not represent the broad population of companies in Malaysia. This is because, the population of this study is limited to only 45 active Malaysian listed companies in R&D. Therefore, this study's findings may not be generalised as this study did not investigate the R&D intensity and firm performance in non-active R&D listed companies and non-listed companies in Malaysia. The future researchers who aspire to conduct research within this scope could ponder some modification of this study. Future research can consider using large samples that enable better statistical research analysis. Furthermore, this study used only firm value and leverage as control variables. Future researchers may modify the relationship by taking into other control variables such as corporate governance or board characteristic affect the relationship of R&D intensity and financial performance.

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References

Al-ahdal, W. M., Alsamhi, M. H., Tabash, M. I., & Farhan, N. H. (2020). The impact of corporate governance on financial performance of Indian and GCC listed firms: An empirical investigation. *Research in International Business and Finance, 51*, 101083. https://doi.org/10.1016/j.ribaf.2019.101083

AlHares, A., Elamer, A. A., Alshbili, I., & Moustafa, M. W. (2020). Board structure and corporate R&D intensity: Evidence from Forbes Global 2000. *International Journal of Accounting & Information Management, 28*(3), 445-463. https://doi.org/10.1108/IJAIM-11-2019-0127

Alqatan, A., Chbib, I., & Hussainey, K. (2019). How does board structure impact on firm performance in the UK? *Corporate Board: Role, Duties and Composition, 15*(2), 18-27. https://doi.org/10.22495/cbv15i2art2

Arulvel, K. K., & Pratheepkanth, P. (2019). Board composition and firm performance: The Sri Lankan case. *Arabian Journal of Business and Management Review* (Oman Chapter), 8(1), 40-49.

Bigliardi, B. (2013). The effect of innovation on financial performance: A research study involving SMEs. *Innovation, 15*(2), 245-255.https://doi.org/10.5172/impp.2013.15.2.245

Bravo, F., & Reguera-Alvarado, N. (2017). The effect of board of directors on R&D intensity: Board tenure and multiple directorships. *R&D Management, 47*(5), 701-714. https://doi.org/10.1111/radm.12260

Chen, Z., & Keefe, M. O. C. (2020). Rookie directors and firm performance: Evidence from China. *Journal of Corporate Finance, 60*, 101511. https://doi.org/10.1016/j.jcorpfin.2019.101511

Cho, C., Halford, J. T., Hsu, S., & Ng, L. (2016). Do managers matter for corporate innovation? *Journal of Corporate Finance, 36*, 206-229. https://doi.org/10.1016/j.jcorpfin.2015.12.004

de Oliveira, J. A. S., Basso, L. F. C., Kimura, H., & Sobreiro, V. A. (2018). Innovation and financial performance of companies doing business in Brazil. *International Journal of Innovation Studies, 2*(4), 153-164. https://doi.org/10.1016/j.ijis.2019.03.001

Diéguez-Soto, J., Manzaneque, M., González-García, V., & Galache-Laza, T. (2019). A study of the moderating influence of R&D intensity on the family management-firm performance relationship: Evidence from Spanish private manufacturing firms. *BRQ Business Research Quarterly, 22*(2), 105-118. https://doi.org/10.1016/j.brq.2018.08.007

Dong, J., & Gou, Y. N. (2010). Corporate governance structure, managerial discretion, and the R&D investment in China. *International Review of Economics & Finance, 19*(2), 180-188. https://doi.org/10.1016/j.iref.2009.10.001

Driver, C., & Guedes, M. J. C. (2012). Research and development, cash flow, agency and governance: UK large companies. *Research Policy, 41*(9), 1565-1577. https://doi.org/10.1016/j.respol.2012.04.003

Endraswati, H. (2018). Gender diversity in board of directors and firm performance: A study in Indonesia Sharia Banks. *Review of Integrative Business and Economics Research, 7*, 299-311.

Erdogan, M., & Yamaltdinova, A. (2019). A panel study of the impact of R&D on financial performance: Evidence from an emerging market. *Procedia Computer Science, 158*, 541-545. https://doi.org/10.1016/j.procs.2019.09.087

Francis, O., & Samuel, O. (2016). How does board composition affect R&D investments?: Quantitative study based on Swedish listed companies. Retrieved from https://www.diva-portal.org/

Freihat, A. F., Farhan, A., & Shanikat, M. (2019). Do board of directors characteristics influence firm performance? Evidence from the emerging market. *Journal of Management Information and Decision Sciences, 22*(2), 148-166. Retrieved from https://www.semanticscholar.org/

Harymawan, I., Nasih, M., Agustia, D., Ratri, M. C., & Nowland, J. (2020). CEO & CFO education and R&D investment in Indonesia. *Australasian Accounting, Business and Finance Journal, 14*(2), 16-34. http://dx.doi.org/10.14453/aabfj.v14i2.3

Ibrahim, N. A., Zin, N. N. M., Kassim, A. A. M., & Tamsir, F. (2019). How does directors' remuneration and board structure impact on firm performance in Malaysia telecommunication industry? *European Journal of Business and Management Research, 4*(4).

Khan, S. N., Yaseen, M. N., Mustafa, F., & Abbasi, S. (2019). The interaction effect of financial leverage on the relationship between board attributes and firm performance: Evidence of non-financial listed companies of Pakistan. *Journal of Accounting and Finance in Emerging Economies, 5*(1), 115-122. https://doi.org/10.26710/jafee.v5i1.681

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607-610. Retrieved from https://journals.sagepub.com/

Kurt, S. (2019). Investigation of the relationship between brand value and R&D activities: Fortune 500 companies analysis. *Procedia Computer Science, 158*, 1019-1024. https://doi.org/10.1016/j.procs.2019.09.143

Lee, P., & O'Neill, H. (2003). Ownership structures and R&D investments of U.S. and Japanese firms: Agency and stewardship perspectives. *The Academy of Management Journal, 46*(2), 212-225. https://doi.org/10.5465/30040615

Lee, S. (2018). Growth, profits and R&D investment. *Economic research-Ekonomska istraživanja, 31*(1), 607-625. https://doi.org/10.1080/1331677X.2018.1432380

Liu, S., Zhang, M., & Gao, B. (2020, January). Innovation Culture, R&D Intensity, and Firm Innovation. In *Proceedings of the 53rd Hawaii International Conference on System Sciences*.

Lome, O., Heggeseth, A. G., & Moen, Ø. (2016). The effect of R&D on performance: Do R&D-intensive firms handle a financial crisis better? *The Journal of High Technology Management Research, 27*(1), 65-77. https://doi.org/10.1016/j.hitech.2016.04.006

Munari, F., Oriani, R., & Sobrero, M. (2010). The effects of owner identity and external governance systems on R&D investments: a study of Western European firms. *Research Policy, 39*, 1093–1104. https://doi.org/10.1016/j.respol.2010.05.004

Murwaningsari, E. (2019). The relationship of corporate governance, corporate social responsibilities and corporate financial performance in one continuum. *Indonesian Management and Accounting Research, 9*(1), 78-98. http://dx.doi.org/10.25105/imar.v9i1.1289

Ogunsanwo, O. F. (2019). Effect of corporate governance on firm performance in Nigeria. *Œconomica, 15*(6), 82-97. Retrieved from http://journals.univ-danubius.ro/

Rafiq, S., Salim, R., & Smyth, R. (2016). The moderating role of firm age in the relationship between R&D expenditure and financial performance: Evidence from Chinese and US mining firms. *Economic Modelling, 56*, 122-132. https://doi.org/10.1016/j.econmod.2016.04.003

Ravšelj, D., & Aristovnik, A. (2020). The impact of R&D expenditures on corporate performance: Evidence from Slovenian and World R&D companies. *Sustainability, 12*(5), 1943. https://doi.org/10.3390/su12051943

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach.* John Wiley & Sons.

Vu, N. H., & Nguyen, T. (2017). Impacts of corporate governance on firm performance-Empirical studies of listed Singaporean companies.

Vu, T. H., Nguyen, V. D., Ho, M. T., & Vuong, Q. H. (2019). Determinants of Vietnamese listed firm performance: Competition, wage, CEO, firm size, age, and international trade. *Journal of Risk and Financial Management, 12*(2), 62. https://doi.org/10.3390/jrfm12020062

Xie, L., Zhou, J., Zong, Q., & Lu, Q. (2020). Gender diversity in R&D teams and innovation efficiency: Role of the innovation context. *Research Policy, 49*(1), 103885. https://doi.org/10.1016/j.respol.2019.103885

Yiu, L. M. D., Lam, H. K. S., Yeung, A. C. L., & Cheng, T. C. E. (2020). Enhancing the financial returns of R&D investments through operations management. *Production and Operations Management, 29*(7), 1658–1678. https://doi.org/10.1111/poms.13186

Zona, F. (2016). Agency models in different stages of CEO tenure: The effects of stock options and board independence on R&D investment. *Research Policy, 45*(2), 560-575.

https://doi.org/10.1016/j.respol.2015.10.012

Zouari, G., & Zouari-Hadiji, R. (2015). Directors' board, R&D investment and firm's performance: Evidence from France. *Corporate Board: role, duties and composition, 11*(1-1), 107-122. https://doi.org/10.22495/cbv11i1c1art3