THE ANALYSIS OF R&D IMPACT ON THE PUBLIC LISTED COMPANIES' PERFORMANCE IN INDONESIA

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ABSTRACT

Research & Development (R&D) is one of significant firms' activities that is expected to enhance firms' future value. This paper examines the relationship between R&D with firm's operation and market performance. The sample used is 106 firm years from 32 non-finance firms that listed in Indonesia Stock Exchange (IDX) and report R&D expenditure during period 2004-2007. Two research hypotheses are developed and tested using a multiple regression model.

The findings signify that all sample firms have reported their R&D activities accordingly to the applied accounting standard. However, the hypothesis testing results shows that there is no relationship between R&D and firm's operation and market performance. These findings imply that R&D activities in Indonesian firms are not yet perceived as an important element in firms' value added chain.

Keywords: *R&D, profit margin, stock price, Indonesia Stock Exchange (IDX)*

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INTRODUCTION

In today's world, where era of globalization begins, competitive advantage is needed to sustain in the market as product life cycle becomes shorter. Customers new demand for special features of the product makes competition more difficult (Jaruzelski et al, 2005). Innovation has become the key factor to create a new and competitive product. However, in recent years, although business environment has changed, firm's innovation has a little progress (Tidd, 2001).

Since 1990s, development of new products has become vital for firms operating in global markets (Calantone et al, 1997). Moreover, not only innovation takes place as the key factor, but also technology change. Technology investment is significant in a long run as a cultivation of technological capability indicated by a progress in R&D productivity (Aminullah, 2007). In contrast, many observers suggest that R&D-intensive technology company may reflects investor' over optimism of the effect on future profit (Chan et al, 1999). However, technology advancement implemented by big companies such as Microsoft and IBM have developed an innovative and successful product in which very competitive in a global market through high spending in R&D. (Hertzberg, 2008).

As R&D is an important activity, the accounting of R&D becomes one of the significant accounts. R&D cost is also one of the most difficult expenditures in financial statements to analyze and interpret. The accounting treatment for R&D is problematic. The reasons are high uncertainty of future benefits, a significant lapse of time between the initiation of R&D activities and determination of success and evaluation problems due to the intangible nature of most R&D activities (Wild et al, 2007). As R&D is uncertain, the cost related to R&D can be incurred earlier than it supposes to be, thus increase expenses. That can be one of the earning management techniques such as income smoothing that is used by the managers to smoothen the income or profit. Furthermore, R&D is an investment, which should be treated as an asset, likewise how plant and equipment is treated. However, current accounting standard, which is according to IAS and PSAK, requires recording it as an expense because payoffs from R&D are less certain than payoffs from investments in plant and equipment (Wild, 2007). This creates a distortion of reliability which may mislead investor's decision.

Other than its accounting treatment, R&D can have an impact on the firm's performance. A lot of studies have been done to obtain evidence that R&D affects firm's performance, such as profitability (Hanel and St-Pierre, 2002; Hokkanen, 2006; Coad and Rao, 2007) and share price or return (Woolridge and Snow, 1990; Chan et al, 1999; Xu and Zhang, 2004; de Queiroz et al, 2006). However, there is also an issue that there is no relationship between R&D expenditures and firm's performance (Jaruzelski et al, 2005). Furthermore, factors such as different in samples of company, country, time horizon, independent variables, economic and political condition can cause a different result.

Under paragraph 8 of PSAK 19, research can be defined as original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding. Development can be defined as the application of research findings or other knowledge into a plan or design for the production of materials, devices, products, processes, systems or services prior to the commencement of commercial production or consumption. Additionally, firm's performance includes, firm's profitability and share price. Firm's

profitability can be measured by operating profit margin. Those two components can be calculated using the data available in the financial statement. Profit is very significant as investor or public see first whether the company is good or not is from those two accounts. As a result, it affects the share price of the company.

Indonesia as a developing country has a low innovation and technological change (Aminullah, 2007). In 2007, allocation of R&D in Indonesia is 0.04 percent of GDP; while neighbor countries such as Malaysia and Singapore allocate almost 2 percent of GDP on R&D (The Jakarta Post, 2007). As nowadays R&D becomes one of the most important activities with the competition globally, it makes sense if Indonesian government and companies be aware of the importance of R&D. Thus, the purpose of this thesis is to find an evidence of whether Indonesian companies' R&D activities have a significant impact on their operation and market performance.

LITERATURE REVIEW

Accounting for R&D in Indonesia is under the rule of Indonesian Accounting Standard (PSAK) No.19: Intangible Asset. Under paragraph 8, research is defined as original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding. Development is defined as the application of research findings or other knowledge into a plan or design for the production of materials, devices, products, processes, systems or services prior to the commencement of commercial production or consumption.

Under paragraph 90, in the financial statement, R&D expenditures shall be recognized as an expense in a period incurred. Under paragraph 91, research and development expense consists of all expense that is directly attributable to R&D activities or that can be allocated on a reasonable and consistent basis to such activities.

For the purpose of this study, exploration & development in Mining, Oil & Gas Industry is treated as R&D expenditure as their definition is similar to R&D. Accounting for the mining industry is stated in PSAK 33 and accounting for oil and gas industry which is stated in PSAK 29.

R&D account is one of the significant accounts that could influence investors' decision in investing in the companies. Investor may want to invest in a company which has a very good prospect and performance, such as high profit and dividend. On firms' side, one way to earn high profit and have capability to pay high dividend is by conducting R&D activities. Therefore, it could be induced that firms that have higher R&D activities are expected to earn high profits and have capability to pay high dividends. This will affect investors' decision making, which will influence the movement of share price, eventually.

Furthermore, there are other variables such as labor productivity, debt ratio and firm size and dummy industry which affect R&D to have a relationship with firm's profitability and stock price.

There are some other factors that have a relationship between R&D and firm performance. One of the factors is firm's profitability. Several studies have used profit margin as an

indicator of firm's profitability (Hanel and St-Pierre 2002; Hokkanen 2006; Coad and Roa 2007). In last few decades, researchers have become increasingly interested in measuring the influence of R&D expenditures on the firm's financial performance. They have examined how different R&D based dimensions explain firm's long-run stock returns and operating performance (Chan et al, 1999). Hokkanen (2006) shows that there is a positive relationship between R&D and firm's profitability.

Stock price or return is the other measure used as a proxy of a firm performance.. Scholars find that stock market reacts usually positively to firms announcements to increase R&D expenditures (Woolridge and Snow 1990). There are also several studies which examine the impact of reported R&D expenditures on stock returns (e.g., Chan et al, 1999; Xu and Zhang 2004).

According to World Economic Forum 2008, Indonesia was in 27th rank for country spending on R&D. In 2007, Indonesia is lagging behind in terms of its annual spending on research with an average of some US$300 million per year – compared to US$2 billion in Singapore, US$1.2 billion in Malaysia and US$76 billion in China. In Indonesia, the allocation on R&D is only 0.04 percent of GDP; hence, its long term goal is to see 3 percent of GDP being spent on research (Chabada 2007).

Aminullah (2007) argues that technology investment will lead in performing greater productivity in R&D. Since the 1970s and until now, the Indonesian R&D expenditure has been mainly financed from the government budget and has constantly decreased, down to 0.1% of GDP in 2004. Among five ASEAN countries (Indonesia, Malaysia, Thailand, Vietnam, and the Philippines), only Indonesia failed to experience any increase in acquiring scientific knowledge through R&D, plus it constantly deteriorated and has occupied the bottom position since the year 2000 until 2007. It did not have any connection for Indonesia being the largest economy in Southeast Asia.

HYPOTHESIS DEVELOPMENT

Descriptive analysis is performed to examine whether company in Indonesia treated R&D as an expense. It is done by examining the financial statement of all public listed companies. Then, two hypotheses are performed.

Based on prior studies, this study argues that R&D activities are intended to enhance firms' competitive advantage. The competitive advantage is a firm's source of performance. Therefore, firms with higher R&D expenditures are expected to have higher performance. In this study, firm performance is defined as operational and market performance.

This study posits two hypotheses that are formulated below,

H_1: There is a positive relationship between R&D expenditure and firm's profitability measured by operating profit margin.

H_2: There is a positive relationship between R&D expenditure and stock price.

DATA & RESEARCH METHODOLOGY

The data used is from financial statement of public listed companies in IDX which is four years from 2004 until 2007. The sample is 32 non-finance firm that report R&D expenditure in their financial statement for 2004-2007 period. Overall the sample consists of 106 firm years

The dependent variables used in this study are Operating profit margin (OPM) and Stock price. OPM is measured using the equation below,

$$OPM = \frac{\text{Earnings before Interest and Tax (EBIT)}}{\text{Sales}}$$

While, Stock Price is defined as closing price at the end of March each year in period 2005 to 2009.

The independent variables used in this study are:
1. R&D intensity
   It is measured by a ratio of R&D expenditure relative to total assets. Xu and Zhang (2004) used total assets as the denominator as it reflects innovation better.
2. Labor productivity
   Labor productivity is one of the independent variables because it indicates the firm's production efficiency. It is calculated by earnings before interest and tax divided by number of employees (Hokkanen, 2006). An improvement in labor productivity and quality can increase the rate of successful of R&D in creating new product.
3. Debt ratio
   A firm's high debt may restrict an additional fund or budget for R&D division to develop a new product and to maintain the competitiveness in the long run (Hokkanen, 2006). It is calculated by long term debt divided by the total of long term debt and stockholder's equity.

1. Firm Size
   Firm size is measured by the book value of equity, which is total equity divided by number of outstanding shares.
2. Industry
   As firms in mining industry record their R&D expenditure differently to other industry, this study employs a dummy variable for industry. In which, the Industry will take a value of 1 if the firm is in mining industry, and thae a value of 0 otherwise.

To test the hypothesis, this study develops a multiple linear regression analysis. The research model used this study is expressed below,

$$Y = \beta_0 + \beta_1\,RD + \beta_2\,LP + \beta_3\,DEBR + \beta_4\,BV + \beta_5\,ID + E$$

Y	= Profit margin or Stock price
β_0	= Constant
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$	= Coefficient
RD	= R&D intensity

LP	= Labor productivity
DEBR	= Debt ratio
BV	= Book value of equity per share
ID	= Dummy industry
E	= Error term

Following are the testing procedure of regression result:

1. Null Hypothesis
    It is an assumption that no difference exists between the sample parameter and the population statistic (Cooper and Schindler 2006, 713).
2. Adjusted R Square
    Adjusted R Square is a measure of goodness-of-fit of a regression that is adjusted for degrees of freedom and hence does not automatically increase when another independent variable is added to a regression (Defusco, et al. 2007, 527). The higher the adjusted R square is, the fitter the model is
3. Analysis of Variance (ANOVA)
    F Significance is chosen as the dependent variable has a significant correlation with independent variable (Cooper and Schindler 2006, 517). The criteria for valuation is
    a. If significance is < 0.05, then H_a is accepted.
    b. If significance is > 0.05, then H_a is rejected.
    If condition (a) is met, it means that there is a relationship between the dependent and independent variables. If condition (b) is met, it means that there is no relationship between the dependent and independent variables.
4. Regression Coefficient
    It is a probability of observing a sample value as extreme as, or more extreme than, the value actually observed, given that the null hypothesis is true (Cooper and Schindler 2006, 714). The criteria for valuation is
    a. If probability is < 0.05, then H_a is accepted.
    b. If probability is > 0.05, then H_a is rejected.

If condition (a) is met, it means that there is strong evidence that the alternative hypothesis is true and the test is significant. If condition (b) is met, it means that there is no evidence that the alternative hypothesis is true and the test is insignificant.

FINDINGS & DISCUSSIONS

After qualitative examination on how the sample firm report their R&D activities, it could be concluded that all firms have recorded and reported the R&D activities accordingly to PSAK chapter 19.

Furthermore, the result of the descriptive statistic is shown in table 1 below.

Table 1. Descriptive Statistics Results

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Profit Margin	106	-52.707	44.108	6.836	14.188
Stock Price	106	25	40000	3720.888	7882.95
R&D Intensity	106	0.002	12.333	1.209	2.613
Labor Productivity	106	-191681	665611	63380.449	138202
Debt Ratio	106	-0.074	2.727	0.304	0.491
Firm Size	106	-7170.8	12383.7	1167.821	2886.65
Dummy Industry	106	0	1	0.198	0.400

The R&D intensity which is measured by a ratio of R&D expenditure over total assets has a mean of 1.209. It implies that on average the sample shows 1.209% R&D expenditure over assets. It is relatively small compared to results from prior studies in other countries. The highest ratio is 12.33% and the lowest ratio is 0.002%. From this description it could be concluded that on average, R&D activities are not yet used by the sample firms as a main driver to their added value chain.

Further, classic test assumptions such as multicollinearity will be performed to examine whether between independent variables are correlated. The result can be seen in table 2. The result shows that all the variables are not correlated with each other, therefore no multicollinearity problem exists and they are valid to be included in the model as independent variables.

Table 2. Pearson Correlations Results

		R&D Intensity	Labor Productivity	Debt Ratio	Firm Size	Dummy Industry
R&D Intensity	Pearson Correlation	1	-0.239*	-0.07	-0.007	0.588**
	Sig. (2-tailed)		0.014	0.479	0.943	0.000
	N	106	106	106	106	106
Labor Productivity	Pearson Correlation	-0.239*	1	-0.145	0.250**	0.097
	Sig. (2-tailed)	0.014		0.138	0.01	0.320
	N	106	106	106	106	106
Debt Ratio	Pearson Correlation	-0.07	-0.145	1	0.181	-0.150
	Sig. (2-tailed)	0.479	0.138		0.063	0.126
	N	106	106	106	106	106
Firm Size	Pearson Correlation	-0.007	0.250**	-0.181	1	0.002
	Sig. (2-tailed)	0.943	0.01	0.063		0.982

	N	106	106	106	106	106
Dummy Industry	Pearson Correlation	0.588**	0.097	-0.150	0.002	1.000
	Sig. (2-tailed)	0.000	0.320	0.126	0.982	
	N	106	106	106	106	106

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Then, multiple linear regression analysis is conducted by combining all the independent variables that test against each dependent variable. Additionally, White test for heteroscedasticity is performed so that the data is more reliable.

Table 3 shows the result of the first hypothesis testing. The results shows that the model is valid at $\alpha = 1\%$. The model could explain 68.9% of the profit margin variance. The R&D intensity appears to be insignificant at $\alpha = 5\%$. it is significant at higher $\alpha = 10\%$, however, the coefficient is negative implying that the higher the R&D intensity, the lower the profit margin. It indicates that the R&D activities will reduce the firms profit on the same financial year.

Table 3. Regression Result of Profit Margin

Variable	Coefficient	T-stat (White t-stat)	P-value
Constant	3.971	3.248	0.002
R&D Intensity	-1.199	-1.735	0.086
Labor Productivity	0.0000748	9.139	0.000
Debt Ratio	-0.827	-0.445	0.657
Firm Size	0.000305	1.394	0.166
Dummy Industry	-2.675	-1.297	0.198
Adjusted R-square	68.9%		
F-stat		47.422	0.000

The result also shows that only labor productivity has a significant positive relationship with operating profit margin, as expected. It indicates that firms with higher labor productivity shows higher profit margins compared to their counterparts. Unlike prior studies, other control variables appear insignificantly related to the firm's performance.

Next, table 4 shows the result of the second hypothesis testing. From the table, it can be seen that the model is valid at $\alpha = 1\%$. The model could explain 66.8% of stock price variation. Unlike the profit margin model, the stock price model does not show any relationship between the R&D intensity and the stock price. Although the coefficient retain its expected sign, it appears insignificant statistically. This result implies that market does not perceive the R&D activities conducted by the sample firms as a driver to firms' future performance. The low

R&D expenditure incurred in the research period could be an explanation why investors appear not to identify R&D activities as important.

Table 4. Regression Result of Stock Price

Variable	Coefficient	T-stat (White t-stat)	P-value
Constant	545.882	0.599	0.550
R&D Intensity	32.428	0.231	0.818
Labor Productivity	0.014	3.975	0.000
Debt Ratio	411.545	0.431	0.668
Firm Size	2.016	5.012	0.000
Dummy Industry	-1116.033	-0.949	0.345
Adjusted R-square	66.8%		
F-stat		43.346	0.000

Similar to the result of the first model, this model shows that labor productivity has a significant positive relationship with stock price. It indicates that market do perceive and value the labor productivity. The labor productivity seems to have an instant impact on firms' performance. This result is similar to prior studies.

Firm size has a positive and significant relationship with stock price. It implies that the higher the firm size is, the investors put more value to the stock. This result confirm previous studies. Other control variables appear insignificant statistically.

On main analysis above, this study uses the R&D expenditures based on the corresponding financial reporting. After examining the following years, there are lots of restated financial figures reports. Therefore, this study also conducts a sensitivity analysis using the R&D expenditures as the restated amount and adding the subsequent year deferred charges. The reason behind this is this study assume that both firms and market, somehow, know exactly that the R&D expenditure conducted by the firms are bigger that initially reported. Then, regarding the deferred charges, the subsequent year deferred charges are in fact expense for the current year, but not incurred yet. This may have an effect on the firm's profitability and leads to an effect on stock price.

Table 5 and 6 shows the result of the sensitivity analysis of the first and second hypothesis testing respectively. Table 5 shows that overall profit margin model is valid, however, it decreases marginally its explanatory power. It confirms the main analysis that the R&D intensity does not have a significant impact on the profit margin of the firms. Labor productivity retains its significant relationship to the profit margin. Other variables remain the same.

Table 5. Regression Result of Profit Margin of Sensitivity Analysis

Variable	Coefficient	T-stat (White t-stat)	P-value
Constant	4.101	3.104	0.002
R&D Intensity	-0.885	-1.116	0.267
Labor Productivity	0.0000769	9.459	0.000
Debt Ratio	-1.192	-0.720	0.473
Firm Size	0.000145	0.581	0.563
Dummy Industry	-3.083	-0.949	0.345
Adjusted R-square	66.9%		
F-stat		42.745	0.000

Table 6 also shows that the sensitivity analysis of stock price model has a similar conclusion to the main analysis. It increases the explanatory power of the model by 3.3%. Only labor productivity and firm size are significantly related to the stock price, while other control variables remain the same

Table 6. Regression Result of Stock Price of Sensitivity Analysis

Variable	Coefficient	T-stat (White t-stat)	P-value
Constant	-91.608	-0.099	0.921
R&D Intensity	-94.215	-0.541	0.590
Labor Productivity	0.014	4.435	0.000
Debt Ratio	1200.207	1.363	0.176
Firm Size	2.148	5.359	0.000
Dummy Industry	-112.631	-0.080	0.936
Adjusted R-square	70.1%		
F-stat		49.271	0.000

CONCLUSION & RECOMMENDATION

The qualitative analysis concludes that is public listed companies in Indonesia do report R&D accordingly to the applied accounting standard (PSAK) chapter 19. This study does not find evidence to support main hypotheses. The R&D intensity appears not to have a significant impact on the firms' performance, instantly, on the same financial year. In addition, the

analyses show strong evidence on the relationship of labor productivity and firms' operational and market performance. This study also finds that firm size has a significant positive relationship with stock price.

The sensitivity analysis is done to analyze whether investor and management decision are affected by the amount of R&D in the restated or not restated financial statement. The main analysis uses the not restated figure, while the sensitivity analysis uses the restated figure. The result of the sensitivity analysis confirms the result of the main analysis.

Based on the findings, it could be recommended to analyze the impact of the R&D activities on the firm's long-run performance since the R&D activities is intended for long-term purposes. Other issue is to examine the relationship between the R&D activities and the labor productivity since this study shows strong result of the labor productivity impact on the firms performance.

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