EFFECT OF GREEN PRODUCT INNOVATION AND GREEN PROCESS INNOVATION ON FIRM PERFORMANCE

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Abstract

This research aims to obtain empirical evidence on the effect of green process innovation and green product innovation on firm performance. This research conducted manufacture firm registered on Indonesia Stock Exchange (IDX) in 2016-2020. The sample in this study was obtained using a purposive sampling technique and based on predetermined criteria, a sample of 103 firm-years was obtained. The analytical method used is multiple linear analysis method with the E-views version 12. The independent variables in this study are green product innovation and green process innovation. Firm performance is the dependent variable in this study, while firm size and firm age is the control variable in this study. The results of this study indicate green product innovation have affect to firm performance at t_{+1} and t_{+2} and green process innovation has no affect to firm performance. This research contributes in terms of provide empirical evidence for researchers about the concept of green innovation and how it affects firm performance.

Keywords: Green Innovation; Firm Performance; Green Product Innovation; Green Process Innovation.

Abstrak

Penelitian ini bertujuan untuk mendapatkan bukti empiris mengenai pengaruh *green process innovation* dan *green product innovation* terhadap kinerja perusahaan. Penelitian dilakukan pada perusahaan manufaktur yang terdaftar di Bursa Efek Indonesia (BEI) pada tahun 2016-2021. Penyampelan ditentukan dengan menggunakan teknik purposive sampling dengan berdasarkan pada kriteria-kriteria tertentu. Berdasarkan kriteria yang telah ditentukan maka diperoleh sampel sebanyak 103 perusahaan. Pengujian hipotesis dilakukan dengan analisis linier berganda dengan menggunakan software E-views versi 12. Pada penelitian ini variabel independen adalah *green product innovation* dan *green process innovation*. Sedangkan variabel independent adalah kinerja perusahaan. Sementara variabel kontrol dalam penelitian ini adalah ukuran perusahaan dan umur perusahaan. Hasil dari penelitian ini menunjukkan *green product innovation* berpengaruh terhadap kinerja perusahaan pada t+1 dan t+2 dan *green process innovation* tidak berpengaruh terhadap kinerja perusahaan. Penelitian ini memberikan

kontribusi dalam hal memberikan bukti empiris bagi para peneliti mengenai konsep *green innovation* dan bagaimana pengaruhnya terhadap kinerja perusahaan.
Kata kunci: Green Innovation; Kinerja Perusahaan; Green Product Innovation; Green Process Innovation

INTRODUCTION

The current environmental conditions are impaired due to industrial activities that have been going on for a very long time. The impact of industrial activities on the environment can be seen, including global warming, groundwater pollution, forest fires, and the depletion of the ozone layer (Chang, 2011). The world is starting to pay attention to this problem which is then seen from various world meetings to discuss environmental sustainability, such as the Kyoto Protocol, Waste and Electronic Equipment (WEEE), the Montreal Conference, and the cessation of the use of certain hazardous substances. (Chen et al., 2006). Furthermore, the efforts made by the Government of Indonesia are through implementing regulations governing environmental issues. These regulations are regulated in Law no. 40 of 2007 concerning Limited Liability Companies. Law No.40/2007 stipulates that bussinesses operating in and/or exploiting natural resources must carry social and environmental responsibilities. Advances in technology encourage investors to consider other factors besides the company's financial position to invest. In this case, one of the nonfinancial factors that investors consider is the company's environmental performance. Investors can take advantage of environmental performance in determining the value of company shares (Christoffersen et al., 2013). This opinion is in line with Burnett et al. (2011). They stated that investors have confidence that investing in the environmental sector in the short term will increase company costs, but in the long term, it will increase value and firm performance. This is also shown by research conducted by Rezende et al. (2019)multinational companies that green innovation has a positive effect on the firm financial performance in the long term, in this study, the increase in financial performance is explained to appear 2-3 years after the company has a green patent.

Going green has become an important issue for business people. This statement is in line with (Weng et al., 2015).They stated that regulations issued by the government regarding the environment, resources, and business competition make companies innovate. The innovation aims to keep the company running its activities. In addition, if the company wants to continue operating, the company must meet government requirements in its business operations. In this case, green innovation is an approach that can be applied due to increasing environmental pressure (Sezen & Çankaya, 2013). Green innovation is considered a company advantage reflected in the uniqueness and differentiation of environmentally friendly products. These advantages can also improve performance, as seen from the increase in company profits which can be assessed by Return on Equity (ROE) and Return on Assets (ROA) (Przychodzen & Przychodzen, 2015).

Chen et al. (2006) placed green innovation into two main categories, namely green product innovation and green process innovation. Green Product refers to the creation of goods with a little positive or negative effect on the environment (Fabien Durif Caroline Boivin Charles Julien et al., 2010). Green Process refers to a company's manufacturing operations that are carried out without using hazardous chemicals to create environmentally friendly products (Fitriani, 2015). According to Ramanathan et al. (2010), the introduction of environmental rules will have an impact on production costs. They further added that the introduction of the environment makes the company more efficient in the long run. In addition, the application of green innovation has an impact on the company's competitive advantage (Küçükoğlu & Pınar, 2015).

Stakeholder theory suggests that companies that care about the environment, maintain a balance between corporate values and social values, and seek social improvement will receive more attention from stakeholders, who then have an impact on providing full support for company operational activities (Gray et al., 1995). This is in line with the opinion Carrión-Flores & Innes (2010) that product innovation with technology that can reduce environmental pollution and use of resources will give companies the ability to compete and increase growth, productivity, and profits. By carrying out these innovations, companies can reach consumers concerned about the environment with higher purchasing power (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013).

Some of the results of previous studies, for example, Küçükoğlu &Pınar (2015) found that green innovation affects firm performance and has a significant effect on environmental performance and competitive advantage. However, environmental performance is shown to be more influenced by green innovation than a competitive advantage. Fitriani (2015) provide evidence that green innovation product does not affect competitive advantage. Meanwhile, the green innovation process has an impact on competitive advantage. Zhang et al. (2019) show that there is a positive and significant relationship between green innovation and firm performance. Consistent results show an association between green innovation and firm performance, and there are studies conducted by Ar (2012) showing that green product innovation positively affects firm performance and competitive company capability. However, this study shows that green innovation has a more significant effect on competitive capability than firm performance.

Green product innovation is a modification of output design, product quality, and product safety that attempts to reduce negative environmental impacts throughout the product life cycle, such as minimizing the use of hazardous compounds in the production process, increasing energy efficiency, and using more environmentally friendly products (Kammerer, 2009). In line with the opinion of Brody & Lord (2007) that implementing innovations will make it possible to increase company growth and convince capital savers, workers, and suppliers to continue to support the company's continued existence. Companies engaged in green product innovation anticipate that they will be able to optimize the use of resources, which will affect the efficiency of their manufacturing processes. The greater the efficiency of a company in carrying out its business operations, the lower its operating costs and the higher its financial performance, thereby increasing firm performance.

Green product innovation minimizes the negative impact of creating new products by limiting the risks posed to the environment from the production process, raw material selection, and logistics to the end of the product's useful life (Pemayun1, 2016). Green product innovation also entails designing products with a net beneficial impact on the environment over the entire product life cycle (Fabien Durif Caroline Boivin Charles Julien et al., 2010). Creating green product innovation is also expected to be a means for the community to give legitimacy to companies. The development of green product innovation shows the public that the company has run its business by considering applicable regulations, the environment, and its social benefits. In this way, society will contribute value to the company, and the company will ultimately receive legitimacy from society. Based on the description above, the hypothesis can be formulated as follows:

H1: Green product innovation has a positive influence on firm performance

Green process innovation is the improvement of industrial techniques and systems to reduce environmental impact, save energy, prevent pollution, manage waste, etc (Qi et al., 2012). Green process innovation is a form of attention to the environment in company operations by using energy wisely, saving resources, waste management, and the resulting impact on the environment (Chiou et al., 2011). By implementing green process innovation, it is intended that energy and raw materials can be used more efficiently. It is estimated that if the use of energy is more efficient, operating expenses will also decrease, which will have an impact on increasing profits and the company's financial performance.

The company continues to safeguard the interests of stakeholders in its operations, the greater public awareness of the negative impacts caused by its operations that contribute to environmental damage, and the more environmental movements carried out by the community, especially in Indonesia, such as zero waste. The formation of green process innovation is expected to garner the full support of stakeholders. With the support of stakeholders, the company's products will be liked, and stakeholders will buy them in large quantities to benefit the company.

H2: Green process innovation has a positive effect on firm performance

RESEARCH METHOD

This research uses a quantitative approach. Quantitative research according to Sujarweni (2015) is a type of research that produces findings obtained using statistical procedures or other ways of quantification. A population is a group of people, events, or other things the researcher wants to investigate (Sekaran, 2013). The population in this study were all companies listed on the Indonesia Stock Exchange for the period 2016 – 2020. The sampling method in this study was purposive sampling. The purposive sampling method is a method of determining the sample by selecting data units using specific criteria. The goal is to get a representative sample according to the specified criteria. The requirements included in the sample are as follows:

1. Manufacturing companies listed on the Indonesia Stock Exchange and in the period 2016 – 2020.
2. Manufacturing companies that publish their financial reports in rupiah as of December 31 in the period 2016 – 2020.
3. Manufacturing companies that provide information related to the variable data are needed in this study.

Based on the purposive sampling criteria, the following is the number of samples used in the study.

Table 1
Criteria Purposive Sampling

	Criteria	2016	2017	2018	2019	2020
1	Manufacturing companies listed on the IDX for the 2016-2020 period	241	241	241	241	241
2	Manufacturing companies that don't publish report finance or report annual during period 2016-2020 with rupiah currency	(2)	(0)	(2)	(2)	(2)
3	Manufacturing companies that don't own completeness of related data with study	(219)	(220)	(219	(218)	(218)
	Obtained data in accordance criteria	20	21	20	21	21
	Final sample	103 firms-years				

Source: processed (2023)

Green Product Innovation is an environmentally friendly product update that positively impacts the environment, which is better than conventional products. The higher the company's innovation in improving existing products and its ability to produce new environmentally-based goods, the better the company's ability to compete with other businesses. In this study, the measurement of green product innovation was adopted from research by Peters (2015):

$$GPI = \frac{NCFO_{i,t} - NCFO_{i,t-1}}{Sales_{i,t}}$$

Information:
GPI = Green Product Innovation
$NCFO_{i,t}$ = Net Cash Flow Operation firms i, year t
$NCFO_{i,t-1}$ = Net Cash Flow Operation firms i, year t-1
$Sales_{i,t}$ = Sales firms i, year t

Green process innovation is the company's efficiency in protecting the environment through energy and resource conservation, good waste management, and consideration of the ecological impact of the process. Companies that build green process innovation can be determined by observing the company's operational efficiency, such as fuel and energy costs (Peters, 2005). Based on the research approach carried out by Peters (2015), the green process innovation can be formulated:

$$GPI = \frac{[energy\ expense + raw\ material\ expense]_{i,t} + [energy\ expense + raw\ material\ expense]_{i,t-1}}{sales_{i,t}}$$

Dependent variable in this research is firm performance. One of the indicators used by stakeholders to determine the size of the profit that an issuer can obtain is by looking at the firm performance indicators. The firm performance, in this case, can be divided into two parts, namely, the performance that comes from operational activities and the firm financial performance. Calculation of financial performance, in general, is often done by calculating the Return On Assets (ROA) ratio. ROA is a measure of a company's effectiveness in generating profits from its assets (Agrestya, 2012). The formula for calculating the ROA Ratio:

$$ROA = \frac{net\ profit}{Total\ Asset}$$

This study uses a control variable. The use of control variables aims to test the sensitivity and consistency of the overall test results. The control variables used are:
1. The firm's age is calculated from the date of its establishment until the date this research was conducted.
2. Firm size is calculated from the company's size as measured by the logarithm of the company's total assets

In this study, the Eviews 12 program was used to evaluate the hypothesis. The formula used to test the regression model is as follows:

$$ROA_{it+1} = \alpha_1 + \beta_1 Product + \beta_2 Process + \beta_3 Age + \beta_4 Size + \varepsilon$$

Information:

ROA_{it+1}	: Firm Performance in year t_{+1}
α	: intercept
$\beta_1....\beta_n$	: Regression direction coefficient
e	: Residual Error

Additional testing

In this study, additional research was also conducted to sharpen the research results when green innovation affects firm performance. Additional testing is done by linking the year of green innovation implementation with firm performance 2 year and 3 years after green innovation activities. The formula used is as follows:

$$ROA_{it+2} = \alpha_2 + \beta_5 PRODUCT + \beta_6 PROCESS + \beta_7 AGE + \beta_8 SIZE + \varepsilon$$
$$ROA_{it+3} = \alpha_3 + \beta_9 PRODUCT + \beta_{10} PROCESS + \beta_{11} AGE + \beta_{12} SIZE + \varepsilon$$

Information:

ROA_{it+2}	: Firm Performance in year t_{+2}
ROA_{it+3}	: Firm performance in year t_{+3}
α	: intercept
$\beta_5....\beta n$	: Regression direction coefficient
e	: Residual Error

RESULTS AND DISCUSSIONS

Initial testing before hypothesis testing is to conduct Chow Test testing. Chow Test testing aims to determine the most appropriate hypothesis testing model. In this panel data regression analysis technique, there are three models used, namely the common effect model, fixed effect model, and random effect model. After the Chow Test is carried out, the next step is to do the Hausman test. The Hausman Test is conducted to determine the best model to use between the fixed effect model or the random effect model.

The Chow Test is conducted to compare models with the aim of selecting the most suitable model between the common effect model or the fixed effect model to be used. Decision making is based on the probability value (p) of Cross-Section F. If the p value> 0.05 then the model chosen is the common effect model. However, if p < 0.05 then the model chosen is the fixed effect model. The Chow test results are presented below.

Table 2
Chow Test Results

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.868822	(21,56)	0.0000
Cross-section Chi-square	73.506263	21	0.0000

Source: data processed by Eviews (2023)

The Chow Test results in table 2 above show the probability value (p - value) cross section F of 0.0000 <0.05 with a significance level of 5%. So it can be concluded that the fixed effect model is better to use than the common effect model.

Hausman test aims to choose the best model between fixed effect or random effect. The basis for decision making uses the probability value (p) for Cross-Section F. If the p value> 0.05 then the model chosen is random effect. However, if p < 0.05 then the model chosen is the fixed effect model. Table 3 below presents the results of the Hausman test.

Table 3
Hausman Results

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.597736	4	0.6272

Source: data processed by Eviews (2023).

The Hausman Test results in table 3 above show the probability value (p - value) cross section F of 0.6272 <0.05 with a significance level of 5%. These results indicate that the random effect model is better used in hypothesis testing

This study aims to provide empirical evidence that green product innovation and green process innovation spending has an effect on firm performance.

Table 4
Hypothesis Testing Results

Variable	Prediction	Koef eq_1	Prob
Reg eq_ 1	+	0.0145	0.563
GI Product	+	0.149	0.698
GI Process	+	-0.020**	0.1213
AGE	+	-0.00022**	0.753
Firm Size	+	0.0042**	0.7024
AdjR^2 =0,4807	Prob (F statistic) = 0.065		α = 0.10

Source: data processed by Eviews (2023)

Based on the hypothesis test results on table 4, it can be seen that the adjusted R-squared value is 0.4807. This figure represents the coefficient of determination. The ability of the independent variable in explaining the dependent variable proxied by ROA is 48%. Meanwhile, the remaining 52% is explained by other variables outside this study.

The results of multiple linear regression analysis are presented as follows:

$$ROA_{it+1} = 0.0145 + 0.149\ PRODUCT - 0.020\ PROCESS + 0{,}00022\ AGE + 0.0042\ SIZE + \varepsilon$$

The constant value (α) of financial performance as the dependent variable is 0.014526. This shows that if the value of the independent variable consisting of green product innovation and green process innovation is 0 or constant, then the value of firm performance is 0.014526. The significance value of the green product innovation variable is 0.0042 smaller than 0.10 and the t value is 0.149. This shows that green product innovation has a significant positive effect on firm performance. The significance value of the green process innovation variable is 0.1362 greater than 0.10 and the t value is -0.020. This indicates that green process innovation has no effect on firm performance. The significance value of company age (age) is 0.7285 greater than 0.10 and the t value is 0.0002. This means that company age has no significant effect on firm performance. The significance value of firm size is 0.8516 greater than 0.10 and the t value is 0.042. Based on the table above, it can be seen that the prob value (F-statistic) at t_{+1} is 0.065 or smaller than 0.10, so H_1 is approved, which means that simultaneously the independent variables in this study, namely green product innovation and green process innovation (simultaneously) have a significant effect on the dependent variable, namely firm performance one year after green innovation is implemented.

In this study, researchers conducted additional tests to strengthen previous empirical evidence. Additional testing is done by linking the year when green innovation is applied with firm performance in one year and three years of green innovation activity. Additional test results are shown in the table below:

at year t_{+1} is 0.065 or smaller than 0.10, so H1 is approved, which means that simultaneously the independent variables in this study, namely green product innovation and green process innovation (simultaneously) have a significant effect on the dependent variable, namely firm performance 1 year after green innovation is implemented.

In this study, researchers conducted additional tests to strengthen previous empirical evidence. Additional testing is done by linking the year when green innovation is applied with firm performance in 1 year and 3 years of green innovation activity.

Table 5
Additional Testing Results

Var	Prediction	Koef	Prob
Reg eq_ 2	+	2,727	0.019
GI Product	+	-0.114	0.077
GI Process	+	0.0044	0.892
AGE	+	0.0150	0.0453
Firm Size	+	-0.256	0.0104
AdjR^2 =0,44	Prob (F statistic) 0,00004	=	α = 0,10
Reg eq_ 3	+	0.238	0,563
GI Product	+	-0.02823	0.698
GI Process	+	-0.0642	0.1213
AGE	+	-0.000275	0.753

Var	Prediction	Koef	Prob
Firm Size	+	-0.0125	0.7024
AdjR^2 = 0,008	Prob (F statistic) = 0.488	α = 0,10	

Source: data processed 2023

Based on table 5 above, a multiple linear regression equation can be formulated that explains the effect of green innovation on firm performance:

$$\text{ROA}_{it+2} = 2.727 - 0{,}114877 \text{ PRODUCT} + 0{,}004471 \text{ PROCESS} + 0{,}015023 \text{ AGE} - 0{,}256837 \text{ SIZE} + \varepsilon$$

$$\text{ROA}_{it+3} = 0.238 - 0{,}0283 \text{ PRODUCT} - 0.0642 \text{ PROCESS} - 0.00027 \text{ AGE} - 0{,}0125 \text{ SIZE} + \varepsilon$$

The t-value for each variable is also presented to determine which independent variable affects the dependent variable. The constant value (α) of financial performance as the dependent variable at t_{+2} is 0.0195 and t_{+3} is 0.563. This shows that if the value of the independent variable consisting of green product innovation and green process innovation is 0 or constant, then the value of firm performance is 0.0195 at t_{+2}, and 0.563 at t_{+3}. The significance value of the green product innovation variable at t_{+3} has no effect. While in t_{+2} is 0.0779 smaller than 0.10 and the t value is -0.114. This shows that green product innovation has a negative and significant effect on firm performance 2 years after green innovation is implemented. The significance value of the green process innovation variable at t_{+2}, t_{+3}, is 0.892, and 0.12, respectively. This value is greater than 0.10, indicating that green process innovation has no effect on firm performance. The significance value of company age (age) at t_{+2} is 0.0453 smaller than 0.10 and the t value is 0.015. This means that the age of the company has a significant positive effect on firm performance. While solid t_{+3} has a significance value greater than 0.10. This means that company age has no effect on firm performance. The significant value of firm size at t_{+2} is 0.0104 which is smaller than 0.10 and the t value is -2.65. This means that firm size has a significant negative effect on firm performance. Meanwhile, at t_{+1} and t_{+3} the company size has no effect. At t_{+2} has a prob value (F-statistic) of 0.00004 or smaller than 0.10. This means that H1 is approved, which means that simultaneously the independent variables in this study, namely green product innovation and green process innovation (simultaneously) have a significant effect on the dependent variable, namely firm performance 2 years after green innovation is implemented. While at t_{+3} green innovations has no effect.

In this study Hypothesis (H1) states that green product innovation has a positive and significant effect on firm performance. Based on the test results on t_{+1}, it shows that green product innovation has a t value of 0.149 with a significance level of 0.0042 smaller than 0.10, with a positive relationship direction. It can be concluded that green product innovation affects firm performance in the first year, these results indicate that H1 is supported. Green product innovation is a product that has environmental benefits and good quality that can make consumers interested. Thus, the higher consumer interest in environmentally friendly products will have an effect on increasing profits and firm performance, as evidenced by the increase in return on assets (ROA) obtained by the company as a result of low production costs as a result of savings in energy use and raw materials that are easily available and cheap, so that with emphasis on costs can create maximum profits in addition to reducing the tax burden for

companies due to price discounts. The research results are in line with stakeholder theory. Stakeholder theory implies that companies can utilize green product innovation strategies to help companies gain the trust of all stakeholders and support external institutions in carrying out their operational activities in accordance with applicable regulations. This research is also in line with legitimacy theory which explains that legitimacy theory reveals that companies should provide reports on their operational activities in order to ensure the survival of their companies. By paying attention to the environment and implementing green product innovation, companies will easily gain legitimacy from society (Chen & Chang, 2013. Thus, the company will indirectly change people's thinking that the application of environmentally friendly products is an effort from the company to enliven social activities, namely in the form of reducing the negative effects of global warming. This research is in line with research by Ar (2012), and Tang et al. (2018) that there is a positive influence between green product innovation and firm performance.

In the hypothesis development section, researchers hypothesize that green process innovation has a positive effect on firm performance. Based on the tests that have been carried out in table 3, it shows that green process innovation has a t-count value of -1.50225 and a significance value of 0.1362, which is greater than 0.10. Although the test results show that green process innovation is negatively related to firm performance, the significance of this relationship is weak so that hypothesis 2 in this study is rejected. This shows that green process innovation is not an indicator of increased firm performance. Green process innovation cannot affect the rise and fall of firm performance because there are other factors, such as high production prices, regulations that are not yet mandatory, and the need for more research funds, because the recycling process also requires specialized knowledge. Firm performance as measured by using Return On Assets (ROA), can be said to be successful if the profit generated by the company increases against the use of company assets. In the sense of how effectively and efficiently the company uses its assets to create high profits. In this case, green process innovation has no effect on firm performance, so the use of environmentally friendly production methods has not been able to support an increase in company profitability. Obviously, companies must also consider other variables to help green process innovation, so that the profits generated also increase. Legitimacy theory states that a successful company must be able to report on its social actions to ensure its existence. Because companies appear to care about the environment by introducing green product innovation and green process innovation, these innovations have a positive influence on the company's ability to survive (Chen & Chang, 2013). However, the high cost of more environmentally friendly procedures causes the selling price of the product to increase, making it less attractive to consumers. The results of this study are in line with the research of Sari et al. (2020), and Fitriani (2015) that green process innovation has no effect on firm performance, and is not in line with the research of Tang et al. (2018) that green process innovation has a positive effect on firm performance.

In this study, two control variables were included, namely company age and company size. Based on the test results, it can be seen that the significance value of the t test on the company age variable is 0.7285, which is greater than 0.10 with a t test value of -0.34818. This shows that company age has no effect on firm performance. The absence of this significant effect indicates that the length of time the company has been established or IPO cannot explain and predict the increase in profitability. The results of this study are in line with research conducted by Hariyanto & Juniarti (2014) which states that company age has no effect on company profitability. The results of this study are not in line with research conducted by Ilaboya & Ohiokha (2016) that there is a positive influence between company age and firm performance.

The second control variable is company size. Based on the test results displayed in table 4.8, it can be seen that the t-count value is at 0.187603 and the significance value is 0.8516 which is greater than 0.10. This presents that company size does not affect firm performance. This is because the large company size has not been supported by good management by the company of the company's resources, such as total assets, technology, intellectual property as factors that determine company size. The results of this study do not support the theoretical basis and research results from Yasir et al. (2013) and Amanuel Yemane et al. (2015), but in line with research conducted by (Silwal, 2016) that there is no significant influence between company size on firm performance.

ADDITIONAL TESTING

In additional testing on t_{+2} has a t-count of -0.114 and a significance value of 0.0779 smaller than 0.10. The direction of the relationship between green product innovation and company financial performance is negative. So, it can be concluded that green product innovation has a significant negative effect on firm performance 2 years after green innovation is implemented. While at t_{+3} green product innovation has no effect on firm performance. Green product innovation is a product that has environmental benefits and high quality, with high quality making products produced by companies that implement environmental conservation will tend to have higher prices. The high price of green product innovation is because the company's products are more durable in terms of product quality, because they are not easily damaged, do not contain toxins, can be recycled, and have minimalist packaging. Manufacturing green products requires resources that continue to emit emissions, but still meet environmental standards. Therefore, production to improve the quality of environmentally friendly goods continues to incur considerable costs, resulting in the high price of these products. The high price of the product does not match the public's desire to buy. This is in line with research by Nasir & Saputro (2019) that the high price of environmentally friendly products affects product demand, due to competitors of similar products that offer lower prices. This research is not in line with research by Ar (2012) and Tang et al. (2018) that there is a positive influence between green product innovation and firm performance. For green process innovation, the lack of effect of green process innovation on firm performance also occurs on t_{+2} and t_{+3}.

CONCLUSIONS

Based on the test results that have been carried out, at t_{+1} green product innovation affects firm performance. At t_{+2} green product innovation has a positive effect on firm performance, while at t_{+3} green innovations has no effect. It can be concluded that green innovation only affects firm performance at t_{+1} and t_{+2}. The direction of influence at t_{+1} is positive. This presents that the higher consumer interest in environmentally friendly products will affect the increase in profits and firm performance. At t_{+2}, green prober has a significant and negative effect on firm performance. This represents that production to improve the quality of environmentally friendly goods continues to incur considerable costs, resulting in high prices for these products. The high price of the product does not match the public's desire to buy, thus making the company's performance proxied by ROA decrease.

Green process innovation of manufacturing sector companies in Indonesia, as measured by energy expenses and raw material expenses, has no significant effect on firm performance. This presents good or worse green process innovation will not affect the company's

performance, because the use of environmentally friendly production methods has not been able to support the increase in company profitability.

Researchers realize that there are limitations in conducting this research including: The research object used in this study is a company engaged in manufacturing, so it cannot represent all companies listed on the Indonesia Stock Exchange. Future researchers are expected to add research objects in other sectors on the Indonesia Stock Exchange and add a period of observation years. The measure for firm performance in this study is ROA. Meanwhile, there are still many measures to measure firm performance. Future researchers are expected to measure firm performance with variables other than ROA, such as sales growth and market share. The measure for green product innovation in this study is net cash flow operation. While green product innovation can be measured by other variables, further researchers are expected to measure green product innovation with other variables such as R&D expense.

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