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The Effect of Green Banking and Green Investment on Firm Value with Eco-Efficiency as Moderation

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Abstract - *The purpose of this research is to analyze the effect of (1) green banking on firm value, (2) green investment on firm value. (3) Eco-efficiency moderates green banking on firm value, (4) and Eco-efficiency moderates green investment on firm value. This research method was carried out by taking secondary data, namely banks listed on the Indonesian stock exchange (IDX-IC), the number of research samples was 47 banks, according to purposive sampling criteria during the 2016-2021 period (6 years) so the number of samples was 107 observations, using panel data regression. The results of this study (1) Green banking has a positive effect on firm value. (2) Green investment has a positive effect on firm value. (3) Eco-Efficiency can strengthen the effect of green banking on firm value. (4) Eco-Efficiency cannot strengthen the effect of green investment on firm value. Implications (1) for companies, with this research it is expected that banking companies will be more aware that disclosure of sustainability reports plays an important role in which these reports can be used as a form of corporate responsibility in carrying out both corporate governance and corporate social responsibility. (2) for the government, with POJK Number 51/POJK.03/2017, it is expected to encourage all banking companies to implement Sustainable Finance. (3) for future researchers, it is expected that this research can add insight and be used as a reference for subsequent studies.*

Keywords*: Green Banking, Green Investment, Eco-Efficiency, Firm Value*

I. INTRODUCTION

The ever-developing science and technology has made people more concerned about and aware of the latest issues and trends in politics, health, law, environment, as well as economics and investment. Many people are starting to care and realize that investing is important. One investment instrument that is increasingly popular with the public is stocks.

One of the industries that has strengthened on the BEI (Indonesia Stock Exchange) is banking. The banking industry is an essential sector because it has an important role as an official institution in which, in addition to being an intermediary in the transfer of funds between one party and another, the banking sector is also a channel of credit to other institutions in need. Apart from being one of the essential sectors, if we refer to the Indonesia Stock Exchange, companies in the banking sector also have a large market capitalization.

The public's decision to invest in shares in a company is determined by many things, such as the value of the company is one of the determining elements. The higher the firm value, the more prosperous the owner because the better the value of a company indicates that management has acted to maximize their share price which has an impact on the welfare of the company owner or shareholders.

In increasing the value of the company, managers must be able to take the right steps and strategies. In addition to being able to maintain good performance, company managers must be able to make investment decisions from the company's shareholder funds so that the company can maximize existing assets with investments made to obtain greater cash inflows in the future. With the right investment decisions, maximizing assets in their use, as well as improving company performance, this is a positive signal for investors to place their funds due to investors' trust in the company so that with increasing capital coming into the company, the stock

price will increase. and the number of shares outstanding will increase, causing the market capitalization value and firm value to also increase.

In addition to decisions and company financial performance, there are also internal and external factors of the company, where the value of the company can be affected. In modern times, along with the increase in the earth's temperature and the increase in gas emissions, companies in all industrial sectors have begun to pay attention to the importance of the impact of carbon emissions on environmental damage.

Concern for the environment, especially for disclosure and efforts to reduce carbon emissions, the image and value of the company can increase in the eyes of stakeholders, especially investors. Investors in assessing a company not only look at the company's financial performance, but also the company's reputation. Company reputation can be formed and built by increasing awareness of the environment and social responsibility (Machmuddah et al., 2020; Somjai et al., 2020). According to Kelvin et al (2017), high firm value is not only based on good financial factors, but also on future business prospects.

Environmental preservation is the company's responsibility to the environment. In order for a company to support environmental preservation, the company must spend funds to invest in things that can support environmental preservation. Investments made to preserve the environment can also be referred to as green investment. Green investment is useful in reducing the negative impact on the environment resulting from business activities that are directly related to the environment without reducing the production and consumption of non-energy goods (Eyarud et al, 2013).

In the context of banking, green investment can be seen from the bank's efforts to respond and follow up on environmental and social issues by reducing the negative impacts of investment activities on the environment and society by considering the triple bottom line concept, namely profit, people, and planets.

According to Qiu et al (2014), companies that voluntarily disclose environmental information receive more attention from investors. This happens because currently the company's activities are very influential on environmental sustainability. That's why companies that have concern for the environment have a good image so that investors are interested in investing their funds in these companies and this can add value to the company.

Chen and Ma (2021) revealed that green investment is a complex management process and is an economic behavior. It is not easy to achieve mutually beneficial results between benefits in economy and environmental sustainability from green investment. Based on Anderson-Weir's research (2010), the environmental decisions of a company have a very large impact on the environment and the value of the company. Although it does not directly cause pollution and environmental pollution, banking plays a vital role in that this institution provides funding to companies in their operational activities that cause pollution and environmental pollution. If a bank company finances an industry or business that causes environmental damage, then the bank naturally contributes to causing environmental degradation. However, the popularity of green investment is considered not always attractive to investors who are looking for profit motives (Siswantoro, 2018).

Regarding its role in providing funding to other institutions, Masukujjaman and Aktar (2013) argue that banks must play an active role in inviting and requiring industry to invest in environmental management, with appropriate technology and management systems. Although the issue of environmental damage is irrelevant to banking, in recent decades, banks have recognized that the banking sector has affected and is affected by these issues (Kiernan, 2001; McKenzie and Wolfe, 2004). Therefore, banks can act and have a stake as ethical organizations that provide funding and loans only to institutions that are concerned with environmental issues (Muamat et al. 2011; Goyal and Josi, 2011; Thombre, 2011).

Apart from its function as a provider of funds for companies and other institutions, banks can also play a role in reducing carbon emissions by implementing green banking. Schultz (2010) revealed that green banking is an effort to promote environmentally friendly practices and reduce carbon emissions from activities related to banking. Zu (2019) revealed that green banking is a long-term business strategy that does not only focus on profit, but also on empowering and preserving the environment in society. Shaumya and Arulrajah (2016) stated that forms of implementing green banking can be in the form of using an online banking platform instead of opening a branch office, making billing and bill payments online instead of sending bills directly to customers, providing green mortgages, and opening green credit cards and money market where the account is opened through an online bank rather than doing it at a branch office.

According to The Guardian (2014), issues related to green-friendly banking have become a hot topic of discussion in recent years. As it becomes a global issue, green banking is increasingly important to note because disclosure of green banking provides important information for company stakeholders where company stakeholders do not only see company performance and operational activities that affect the environment. Based on research by Khan et al (2021), disclosure of green banking has a positive influence on the value of a company. However, the results of the research by Romli, R., & Reza Zaputra, A. (2022) show that the implementation of

green banking has not been able to increase firm value. This shows that investors do not respond to the implementation of Green Banking that has been carried out by the company.

According to Meutia et al (2019), eco-efficiency is a construction to see an increase in environmental performance by not only paying attention to increasing productivity but also cost efficiency. Panggau & Septiani (2017) stated that there is a positive relationship between the implementation of eco-efficiency and firm value where the implementation of an eco-efficiency strategy can increase firm value. The same results were also obtained from Danang Satrio's research (2020) where eco-efficiency has a positive impact on firm value. In addition to environmental factors, there are several factors related to firm value, especially financial factors. In this case, two important ratios are taken that can be used as a measure for assessing a bank's financial performance, namely the non-performing loan and loan to deposit ratio.

The motivation for the research is that the various impacts and climate change affect the quality of people's lives so that it attracts attention to research "the effect of green banking and green investment on firm value with eco-efficiency as moderation". There is an inconsistency with the results of previous studies, so this study adds a moderating variable, namely eco-efficiency. This is because eco-efficiency is a strategy that combines the concept of economic efficiency based on the principle of efficient use of natural resources. By implementing eco-efficiency, you can achieve the goal of reducing the environmental impact per unit produced and consumed so that you can achieve advantages because you have competitiveness by reducing the resources needed to form better products and services (Sari, et al. 2012).

HYPOTHESIS DEVELOPMENT

The effect of green banking on firm value

Green banking is all banking activities that encourage environmental preservation activities (Singh and Singh, 2013). Lalon and Raad (2015) revealed that the main goal of green banking is for banks to move towards sustainable banking by carrying out activities that protect the environment by actively promoting environmental sustainability and being responsible for investments made that have an impact on the social environment. According to Ramila and Gurusamy (2015), there are two dimensions in the implementation of green banking, namely: 1) minimizing the use of paper and maximizing the use of the internet and technology, 2) providing funding to companies that carry out business activities that have an adverse impact on the environment.

Based on Karyani & Obrien's research (2020), green banking practices have a positive effect on firm value. The practice of implementing green banking can increase the value of the company because the practice of green banking itself can provide future benefits for the company's stakeholders. Based on research conducted by Khan et al (2021), green banking disclosures affect firm value because green banking disclosures can reduce information asymmetry for company stakeholders. The disclosure of green banking practices has certainly received a positive response from stakeholders. Customers certainly make deposits in banks that perform well in both financial and environmental performance. This is in line with the theory of legitimacy where customers legitimize banking activities if the activities carried out by the company are positive activities. With the disclosure of green banking, investors' perceptions of bank companies that apply green banking are better because in the disclosure of green banking there are non-financial parameters that are disclosed such as environmental aspects to increase the credibility of company information. Therefore, the hypothesis proposed is as follows:

H1: Green banking has a positive effect on firm value.

The effect of green investment on firm value

Green investment is everything a form of investment that aims to reduce carbon emissions without reducing consumption and production of non-energy goods. According to Rachman (2018), green investment is a form of investment in projects that aim to preserve the environment, discover alternative energy, and other projects that are friendly to the environment.

Based on research that has been conducted by Tanasya and Handayani (2019), green investment has a positive effect on firm value with profitability as a moderator. The company's image can be better if the company invests in environmental preservation. With green investment, the public can give positive responses so that investors value the company well (Fauziyyah, 2019). Therefore, the hypothesis put forward is as follows:

H2: Green investment has a positive effect on firm value.

Eco-efficiency moderates the effect of green banking on firm value

Based on research conducted by Karyani & Obrien (2020), green banking practices have a positive effect on banking values. The practice of implementing green banking can increase the value of the company because

the practice of green banking itself can provide future benefits for the company's stakeholders. Based on research conducted by Khan et al (2021), green banking disclosure influences firm value because green banking disclosure can reduce information asymmetry, thereby obtaining a positive response from stakeholders, especially customers. This is in line with legitimacy theory where customers legitimize banking activities if the activities carried out pay attention to environmental aspects, to increase the credibility of company information.

The relationship between eco-efficiency and firm value is illustrated by signal and legitimacy theory where eco-efficiency can give a signal to investors whether this company has used natural resources in its production activities efficiently. If the company has implemented eco-efficiency, then this will be a good signal for investors and investors have an interest in investing in this company because investors have a good perception of companies that implement eco-efficiency (Godfrey, 2010). In legitimacy theory, saving the use of natural resources is certainly something that is expected by the community. Excessive use of natural resources can produce waste and pollution and can pollute the environment. Therefore, efficiency in the use of natural resources can be legitimized by society.

Based on the test results of Septiani and Panggau (2017), eco-efficiency has a positive and significant effect on firm value. Similar results also occurred in research conducted by Nosakhare et al. (2016) and Sinkin et al. (2008). Companies that apply eco-efficiency as one of the implemented business strategies can provide higher firm value because it will increase their market value and will generate high profits in the future due to efficiency in the use of natural resources. Therefore, the hypothesis put forward is as follows:

H3: Eco-efficiency strengthens the effect of green banking on firm value

Eco-efficiency moderates the effect of green investment on firm value

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H4: Eco-efficiency strengthens the effect of green investment on firm value

II. METHOD

This study uses a quantitative approach with associative research methods. Quantitative approach is a systematic scientific research approach to parts and phenomena and their relationships. Associative research is research that aims to determine the effect or relationship between two or more variables.

The population in this study are banks listed on the Indonesia Stock Exchange in 2016-2021 with a total of 47 banks with 107 observations.

Sampling used a purposive sampling method, which is a sampling technique based on certain considerations that are adjusted to the objectives or formulation of the problem in the research, as follows: (1) Banks that are actively registered on the Indonesia Stock Exchange in 2016-2021. (2) The company publishes annual reports and sustainability reports for the period ending December 31, 2016 for the five years period from 2016 to 2021. (3) Banks stating financial reports in rupiah currency (Rp) and have complete data to be used as research.

The type of data used in this study is secondary data, namely annual financial reports and banking sustainability reports listed on the Indonesian stock exchange. Secondary data sources were obtained through the IDX website (www.idx.co.id).

MEASUREMENTS

Green Banking

Green banking is activities which conducted by banking institutions to improve environmentally friendly practices and promote sustainability of the natural environment and social and environmental investment responsibility (Singh and Singh, 2013; Lalon and Raad, 2015). The measurement of green banking variables is carried out with content analysis based on the Green Banking Disclosure Index (GBDI), developed by Bose et al (2018). The total items in the GBDI are 21 items, each of which is given a score of one and zero if no related information is disclosed by the company. The following is the formula used to measure green banking variables:

$$GBDI = \frac{Total\ items\ disclosed\ in\ each\ element}{The\ total\ number\ of\ items\ in\ each\ element}\ x\ 100\%$$

Green Investment

Green investment is an investment made by companies to reduce carbon gas emissions without reducing production activities and consumption of non-energy goods (IMF, 2021). The green investment variable is measured by dividing all expenditures devoted to research and development of renewable and environmentally friendly technologies by the company's total assets at the end of the year. The following is the formula for measuring green investment variables based on research by Eyraud et al (2013):

$$GI = \frac{Total\ items\ disclosed\ in\ each\ element}{The\ total\ number\ of\ items\ in\ each\ element}\ x\ 100\%$$

Firm Value

The variable in this research is firm value. The firm value variable is measured using the Tobin's Q ratio. The Tobin's Q ratio measures firm value obtained from a combination and combination of tangible and intangible assets and shows how investors' expectations are related to the rate of return obtained from their investments in the future (Syafitri et al, 2018). The following is the formula used to calculate the Tobin'sQ ratio:

$$\text{Tobin}'\text{sQ} = \frac{\text{Total Market Value} + \text{Total Liabilities}}{\text{Total Assets}}$$

Eco-efficiency

Eco-efficiency is a concept that aims to reduce environmental damage due to company activities by reducing company operational costs (Avianti and Isbanah, 2019). DeSimone and Popoff (1997) revealed that eco-efficiency is the safe and optimal use of ecological and economic resources. Eco-efficiency measurement is based on research by Dewi and Ajeng (2020) with the following formula:

$$Eco - Efficiency = \frac{Product\ Value}{Environmental\ Influence}$$

Firm Size

Based on research by Gill and Obradovich (2012), the size of the company has a significant positive effect on firm value. This is according to research by Suwendra (2016) which also shows results that are no different from Gill and Obradovich (2012). To measure the firm size variable, you can use the ratio:

$$Size = Ln(Total\ Assets)$$

Non-Performing Loans

Non-Performing Loans are the ratio used to measure the percentage of non-performing loans (non-performing, bad or doubtful loans) to total loan financing disbursed (Maheswaris and Suryanawa, 2016). The European Central Bank (ECB) (2017) states that NPL is an indicator that marks the quality of bank assets where the quality of bank assets is an important indicator for companies in the banking sector among other indicators. The following is the formula for measuring non-performing loans:

$$NPL = \frac{The\ value\ of\ non\ performing\ loan}{Total\ value\ of\ loan\ portfolio}\ x\ 100\%$$

III. RESULT AND DISCUSSION

A. Descriptive Statistics

The sample of this research is 47 banks. The research period is from 2016 to 2021, thus the number of observations is 105. Table 4.1 is a descriptive statistic of the variables used in this study. To be clearer, it can be shown as follows:

Table 1. Descriptive Statistical Test Results

Variable	Min	Max	Mean	Std Deviation
Firm Value	0,039	3,806	1,045	0,522
Green Banking	0,285	1,190	0,677	0,178
Green Investment	0.000	0,005	0,008	0,050
Eco-Efficiency	-0,738	5,988	1,350	1,296
Firm Size	1154,338	1822406,680	286951,174	387920,330
Non-Performing Loans	0,007	0,105	0,029	0,016
Loan to Deposit Ratio	0,393	1,354	0,884	0,133

In table 1 above, it is known that the dependent variable used in this study is firm value. The firm value variable has a minimum value of 0.0399, with a maximum value of 3.8069, the average firm value of 105 observations is 1.0456 with a standard deviation of 0.5228. There are three independent variables in this study, namely green banking, green investment, and eco-efficiency. Descriptive statistical data for the green banking variable has a minimum value of 0.2857, with a maximum value of 1.1904, an average of 0.6770 from 105 observations with a standard deviation of 0.1787. The green investment variable is the second independent variable in this study, for descriptive statistical information it can be seen in table 4.1. The processed results show that out of a total sample of 105 samples, the minimum value is 0.000, with a maximum value of 0.0051, an average of 0.0084 with a standard deviation of 0.0505. Descriptive statistical data for the eco-efficiency variable has a minimum value of -0.7382, with a maximum value of 5.9880, an average of 1.3503 from 105 observations with a standard deviation of 1.2961. There are three control variables in this study, namely firm size, non-performing loans, and loan to deposit ratio. The firm size variable has a minimum value of 1154.3380, with a maximum value of 1822406.6800, the average firm value of 105 observations is 286951.1741 with a standard deviation of 387920.3306. The non-performing loan variable has a minimum value of 0.0070, with a maximum value of 0.1059, the average firm value from 105 observations is 0.0295 with a standard deviation of 0.0166. The loan to deposit ratio variable has a minimum value of 0.3933, with a maximum value of 1.3546, the average firm value from 105 observations is 0.8848 with a standard deviation of 0.1332.

B. Classical Assumption Testing

The method used in this study is Ordinary Least Square where if we use this method to answer the problem then there are several assumptions that must be met or commonly called the classical assumption test, which consists of error normality, multicollinearity, heteroscedasticity, and heteroscedasticity.

Table 2. Classical Assumption Test Results

Variable	Test Multikol VIF	Test Hetero Sig	Decision
GB	3,014	0,083	Ho failed to be rejected
GI	494,926	0,031	Ha failed to be rejected
EE	31,946	0,498	Ha failed to be rejected
GB*EE	34,365	0,915	Ha failed to be rejected

GI*EE	498,613	0,038	Ha failed to be rejected
SIZE	1,307	0,049	Ho failed to be rejected
NPL	1,217	0,181	Ho failed to be rejected
LDR	1,546	0,350	Ho failed to be rejected
Kolmogorov Smirnov	0,478		Ho failed to be rejected
Durbin Watson	1,897		Ho failed to be rejected

NP : Firm Value; GB : Green Banking; GI : Green Investment; EE : Eco Efficiency; Size : Firm Size; NPL : Non Performing Loans; LDR : Loan to Deposit Ratio

Based on the test results using the Kolmogorov Smirnov analysis tool, the asymp sig value of 0.478 is greater than 0.05, so Ho is accepted and concluded at the 95% confidence level, the normality distribution assumption for the error variable is fulfilled.

Based on the test results using the inflation factor variant analysis tool, it is known that in the model, the VIF value for all variables in this study is less than 10, so Ho fails to be rejected and it is concluded that the independent variables are not correlated with each other, or the assumption of no multicollinearity is met, except for the interaction variable between GB*EE and GI*EE.

According to Gary, et al, (2017) it is said that the multicollinearity test is also not needed in the multiple moderated regression (MMR) model. The multicollinearity test is only seen when the form of the additive regression analysis (ADD) research model.

Based on the test results using the glacier test analysis tool, it is known that the model obtained sig values for all variables in this study that had a value greater than 0.05 (5%), so Ho failed to be rejected and it was concluded that the homoscedasticity assumption was fulfilled.

The test results using the Durbin Watson Test analysis tool, showed a DWstat value of 1.897, then Ho failed to be rejected and it was concluded that the assumption of no autocorrelation was fulfilled.

Table 3. Test Results with Moderation

$$NP = \alpha + \beta1\ (GB) + \beta2\ (GI) + \beta3\ (GB)*(EE) + \beta4\ (GI)*(EE) + \beta5\ (Size) + \beta6\ (NPL) + \beta7\ (LDR) + €$$

Variable	Prediction	Coefficient	Std Error	Tstat	Prob
Konst		0,060	0,240	0,251	0,802
GB	+	0,972	0,218	4,458	0,000*
GI	+	3306,948	912,967	3,622	0,001*
EE		0,422	0,107	3,956	0,000*
GB*EE	+	0,267	0,121	2,208	0,030*
GI*EE	+	-1900,668	526,746	-3,608	0,001*
SIZE		-2,089E-07	0,000	-3,307	0,001*
NPL		0,259	1,410	0,183	0,855
LDR		-0,039	0,199	-0,197	0,844
Adjus R2					0,537
F stat					0,000

NP : Firm Value; GB : Green Banking; GI : Green Investment; EE : Eco Efficiency; Size : Firm Size; NPL : Non Performing Loans; LDR : Loan to Deposit Ratio

C. Discussion

Based on the results of the hypothesis test, green banking has a significant effect on firm value. This is in line with research by Bose et al (2021) where green banking has a positive effect on firm value. The application of green banking is considered a positive thing for society because it indicates that banks have a concern for the

environment. With the public's trust in banks that implement green banking, customers and investors will also have trust and a good view of the bank so that the bank's firm value will be even higher.

Based on the results of the hypothesis test, green investment has a significant effect on firm value. This is in line with research conducted by Tanasya and Handayani (2019) where there is an effect of green investment on firm value. Green investment is all expenditure that aims to improve the quality of the environment, such as investment or procurement of equipment to make the environment more beautiful and freer from pollution. In this research, banks also continue to spend on the environment where the financing can be used for environmental conservation, water sanitation, and so on.

Based on the results of the hypothesis test that eco-efficiency strengthens the effect of green banking on firm value. This is in line with research conducted by Al-Najjar and Anfimiadou (2011), Septiani and Panggau (2017), and Dewi and Rahmianingsih (2020). Eco-Efficiency is efficiency in the use of resources where this efficiency aims to reduce the impact of losses on the environment due to waste and pollution on the use of natural resources. With the implementation of eco-efficiency, the company will receive support from the community because the company has minimized waste and pollution on its business activities, causing investors to have a good view of this company and want to place their capital in the company so that the firm value of companies that implement eco -efficiency becomes higher. From the results of this study when referring to Sharma, et all (1981), namely the moderating variable (eco-efficiency) has a significant result of 0.000 while the interaction variable (GB*EE) also has a significant result. So, the moderating variable is included in the pseudo moderation category (Quasi Moderator). Pseudo moderation is a variable that moderates the relationship between the independent variables and the dependent variable which is also the independent variable.

Based on the results of the hypothesis test that eco-efficiency weakens the effect of green investment on firm value. This shows that according to Baron & Kenny, (1986) when the independent variable is not significant to the dependent variable, it is necessary to have a moderating variable. The independent variable cannot be the sole predictor if there is no moderating variable. The independent variable will affect the dependent variable if there is a moderating variable. The results of Videen's research (2010) show that eco-efficiency has a significant negative impact on firm value. From the results of this study, when referring to Sharma, et all (1981), namely the moderating variable (eco-efficiency) has significant results, while the interaction variable (GI*EE) does not have significant results, the moderating variable is included in the Predictor Moderation Variable category. This means that this moderating variable only plays a role as a predictor (independent) variable in the established relationship model.

IV. CONCLUSION

(1) Green banking has a positive effect on firm value, this supports the research of Khan et al (2021), green banking disclosure influences firm value because green banking disclosure can reduce information asymmetry for company stakeholders. (2) Green investment has a positive effect on firm value, this is in line with Tanasya and Handayani's research (2019), green investment has a positive effect on firm value. (3) Eco-Efficiency can strengthen the effect of green banking on firm value. (4) Eco-Efficiency cannot strengthen the effect of green investment on firm value.

A. Limitations

This research has several limitations, namely: (1) The sample in this study is relatively small because many banks have not disclosed sustainability reports. (2) There are outlier data which causes a reduction in the research sample.

B. Implications

This research is expected to have implications for: (1) Banking is more aware that disclosure of sustainability reports is very important where these reports can be used as a form of corporate responsibility in carrying out both corporate governance and corporate social responsibility. (2) The government, with POJK Number 51/POJK.03/2017, is expected to be able to encourage all banks to implement Sustainable Finance. (3) Academics can add insight and be used as a reference for subsequent research.

C. Suggestion

For future researchers, it is better to expand the research sample and not only take samples from banks so that they can increase the validity of the research. As well as choosing other variables that are thought to have a strong influence on firm value that are more relevant to banking.

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