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Relationship between Financial Development and Carbon Emission in Indonesia

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Abstract

Financial development is considered as one of the important factors influencing the quality of environment through the consumption of carbon emissions. This study aims to explain the influence of the development of the financial sector on carbon emissions in Indonesia from 1991 to 2020. This research was conducted through a literature study of data that has been published by the world bank and bank Indonesia. The results of the study using multiple linear regression found that of the 6 indicators used, 3 of them found that there was a significant relationship between the development of the financial sector and carbon emissions. The three indicators are Domestic credit provided by the financial sector, Domestic credit to private sector and Domestic credit to private sector by banks. The three variables are significant with values of 0.000, 0.001 and 0.039. Meanwhile, the other 3 variables, namely market capitalization, stock traded and foreign direct investment, are not significant in influencing carbon emissions. Government policies are expected to encourage the financial sector to benefit the environment such as encouraging projects that are more environmentally friendly.

Pendahuluan

Energy is an inseparable part of today's modern life. Almost all economic activity depends on the use of energy. It is known that the commercial sector, industrial sector, housing sector, and transportation are the sectors that consume the most energy (BPS, 2020). So that Energy is considered as an important factor to achieve economic development. However, energy consumption also plays an important role in increasing carbon emissions which will pollute the environment. It is known that the increase in energy demand is because many countries want to achieve high economic

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growth without regard to environmental conditions.

The development of the financial sector is considered as one of the important factors affecting carbon emissions. However, the specific effect caused by the development of the financial sector is still being debated. The financial sector is defined as a country's decision to increase activities such as foreign investment, banking activities, and stock market activities which of these activities will support a country's economic growth. In general, the financial sector is divided into two, namely the financial sector based on financial institution transactions and the second is the financial sector based on financial markets. The difference between the two types of financial sector is only in the funding process. In financial institutions such as banks, the process of transferring funds is carried out indirectly between parties who need funds and parties who have excess funds so that their role is as an intermediary to eradicate asymmetric information conflicts between these interested parties (Levine, 1997). Meanwhile, the funding process in financial markets occurs directly between parties who have excess funds and those who need funds. A well-developed financial market leads to an effective transformation of savings into investment which increases capital accumulation and technological progress thereby creating economic growth in the long run

According to previous research, there are at least three kinds of relationships created between the development of the financial sector and the consumption of carbon emissions. The first opinion states that the financial sector causes carbon emissions to decrease. The results of this study were found by(Gök, 2020). He stated that the development of the financial sector led to an increase in industrial competitiveness, reduced transaction costs, reduced pollution so that it would improve environmental quality. However, a different opinion was put forward by (Khan et al., 2020), he argued that the development of the financial sector had a positive effect on the consumption of carbon emissions. The development of an efficient financial sector encourages individuals to take cheaper credit and buy household goods such as cars which increase CO2 emissions (Sadorsky, 2010).

According to (Dogan & Seker, 2016), the difference in research results concluded that the financial sector which focuses on financing the latest technology reduces carbon emissions, while the financial sector which does not use the latest technology contributes to increasing levels of carbon emissions. In addition (Acheampong, 2019) also states that the characteristics of different countries will also produce different research results. In countries with low incomes, the development of the financial sector tends to increase consumption of carbon emissions, while in developed countries, which use more environmentally friendly technologies, the development of the financial sector causes consumption of carbon emissions to decrease. In addition, the development of the financial sector can improve the quality of the environment in countries where transactions on the stock market are more developed than financing in banks. On the stock market they can

encourage the reallocation of investment towards less polluting sectors. Meanwhile, bank financing causes the projects funded to pollute the environment (Haas & Popov, 2019)

Based on the explanation of the research results above, we can conclude that the relationship between the development of the financial sector and carbon emissions is still being debated. There are those who conclude that the financial sector increases carbon emissions, besides that there are also those who find that the financial sector reduces carbon emissions. Even the absence of a relationship between the two variables was also found. So researchers want to conduct research using different indicators in the financial sector, namely Domestic credit to the private sector (% of GDP) Domestic credit provided by the financial sector (% of GDP), Domestic credit to the private sector by banks (% of GDP), Total value of traded stocks (% of GDP), and Market capitalization of listed domestic companies (% of GDP), then how do these variables affect the consumption of carbon emissions in Indonesia

Literature Review

Previous literature that examined the relationship between the financial development and carbon emissions stated that this hypothesis was created because of the theory of EKC or the Environmental Kuznets Curve which states that there is a positive relationship between economic growth and environmental degradation, which means that high economic growth will cause environmental quality to be disrupted. The financial sector is one sector that drives economic growth. So that many experts examine the relationship between the development of the financial sector and carbon emissions linking it to economic growth. Research conducted by (Fang et al., 2020) using the autoregressive distributed lag-error correction model (ARDL-ECM), which measures the dynamic relationship between the financial sector, economic growth and carbon emissions, found that there is a positive relationship in the short term as well as the long-term between these variables, namely financial development stimulates economic growth, but also creates carbon emissions.(Farhani & Ozturk, 2015) also conducted the same research using the granger causality model, the results of the analysis show a positive relationship between financial development and environmental degradation in which financial development causes economic growth to increase.

According to (Acheampong, 2019), the influence of the development of the financial sector on carbon emissions can go through several channels, namely the household path, the wealth path and the business path. On the household path, the financial sector can cause households or consumers to have access to cheap credit to buy houses, cars and other household appliances which will increase energy consumption and ultimately affect the environment. (Sadorsky, 2010) (Shahbaz et al., 2015). In the business path, the development of the financial sector also allows entrepreneurs to get access to investment or capital at a lower cost to buy machinery and equipment needed in business, which in turn also increases energy consumption and affects the environment

(Sadorsky, 2010). The latter is the path of wealth. The development of the financial sector is believed to make it easier for companies to build their business and increase consumer demand so that it will lead to increased economic growth which will pollute the environment (Sadorsky, 2010).

According to previous research, there are at least three kinds of relationships created between the development of the financial sector and the consumption of carbon emissions. The first opinion states that the financial sector causes carbon emissions to decrease. The results of this study were found by (Gök, 2020). He stated that the development of the financial sector led to an increase in industrial competitiveness, reduced transaction costs, reduced pollution so that it would improve environmental quality. The same research was conducted by (Cole et al., 2011). He considers that financial institutions play an important role in reducing emissions. This is because financial institutions are more likely to promote environmentally friendly projects and facilitate the latest technologies that are more environmentally friendly. In addition, financial institutions also promote the efficiency of economic activity by minimizing financial costs and capital risks, thereby increasing foreign investment transactions. (Omri et al., 2015) argues that the development of the financial sector can encourage technological innovation by increasing R&D which produces more efficient energy thereby reducing emissions. This opinion is supported by(Wang et al., 2020) (Islam et al., 2013) (Boutabba, 2014). Furthermore (Odhiambo, 2020) examines the dynamic relationship between financial development and carbon dioxide emissions using the generalized method, empirical findings show that the development of the financial sector reduces carbon emissions by efficiently allocating available funds to projects that have high returns so that development The financial sector allows companies to use environmentally friendly technologies that will reduce carbon emissions. (Claessens & Feijen, 2006) has another point of view in examining the relationship between the development of the financial sector and the consumption of carbon emissions. He finds that the financial sector can improve environmental quality through good governance, which means companies that have good governance can improve environmental quality through development. financial sector. The same thing was found by (Dasgupta et al., 2001) he argued that a good financial system can create a reputation and financial incentives for companies to invest in projects that care about the environment so that financial institutions can encourage companies to reduce environmental pollution.

However, a different opinion was put forward by (Khan et al., 2020), he argued that the development of the financial sector had a positive effect on the consumption of carbon emissions. The development of an efficient financial sector encourages individuals to take cheaper credit and buy household goods such as cars which increase CO2 emissions (Sadorsky, 2010). In addition, the development of the financial sector leads to low borrowing costs enabling them to increase production, increase energy consumption and hence carbon emissions

will also increase (Dasgupta et al., 2001) (Tamazian et al., 2009) conducted research using the stock market as an indicator that represents the development of the financial sector and finds that the development of the financial system helps companies listed on the stock market to increase investment. In contrast to Tamzian, (Bekhet et al., 2017) found that using financial sector indicators as measured by domestic credit to the private sector, he found that the financial sector increases energy demand so that it will result in environmental degradation.

In addition to the positive and negative relationship hypothesis between financial sector development variables and carbon emissions. Another opinion was put forward by (Charfeddine & Kahia, 2019) who found that the relationship between the financial sector and carbon emissions was too weak and not significant. This shows that the development of the financial sector does not significantly affect environmental degradation. The same research results were found by (Dogan & Turkekul, 2016) that in the long run the development of the financial sector has no effect on the environment. So this research also indirectly rejects the existence of the EKC hypothesis.

Research Method

This research is aimed at explaining the influence of financial sector developments on carbon emissions in Indonesia from 1991 to 2020. This research was conducted through literature studies from data that had been published by the world bank and bank Indonesia. This study uses a multiple linear regression model. (Shahbaz et al., 2016) stated that using one indicator of financial development can lead to biased results and poor conclusions. So in this study the authors used 6 indicators that describe the development of the financial sector. The dependent variable in this study is the amount of carbon emissions in Indonesia in 1991-2020, while the dependent variable X1 is domestic credit provided by the financial sector, X2 is domestic credit for the private sector, X3 is market capitalization, X4 is stock trading, X5 is domestic credit for the private sector by banks and X6 is Foreign Investment. The research model in this study is,

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \mu i$$

Where Y is carbon emission which is defined as the result of burning fossil fuels and making cement in solid, liquid and gas forms. While X1 is domestic credit provided by the financial sector which includes all loans to various sectors on a gross basis, except credit to the central government which is net, X2 is domestic credit to the private sector which refers to financial resources provided to the private sector. sector by financial companies, such as through loans, purchases of non-equity securities, and trade credits and other receivables, that make up claims for payment, X3 is Market capitalization (also known as market value) is the share price times the number of shares outstanding for domestic companies that listed, X4 is the value of shares traded is the total number of shares traded, both domestically and abroad, X5 is domestic credit to the private sector by banks which refers to the financial resources

provided to the private sector by other depository companies (companies receiving deposits except central banks), such as through loans, purchases of non-equity securities, and trade credits and other receivables. And X6 is foreign investment which refers to the amount of money invested by foreigners in the country.

Result and Discussion

From the results of research using multiple linear regression which uses several indicators to describe the development of the financial sector simultaneously found that the development of the financial sector affects carbon emissions which is shown from the results of the F test which is 0.000. These results are also supported by the R-square value of 0.899 which means that as much as 89.99% of all independent variables can explain the dependent variable. Meanwhile, the results of the t test found that of the 6 indicators used, 3 of them found that there was a significant relationship between financial sector development and carbon emissions. The three indicators are domestic credit provided by the financial sector, domestic credit for the private sector, and domestic credit for the private sector by banks. These three variables are significant with values of 0.000, 0.001 and 0.039. While the other 3 variables namely market capitalization, traded shares and foreign investment are not significant in influencing carbon emissions with significance values of 0.618, 0.824 and 0.550.

Table 1. Estimation Results using Multiple Linear Regression

Source	SS	df	MS	Number of obs	=	28
				F(6, 21)	=	31.43
Model	3.4639e+11	6	5.7732e+10	Prob > F	=	0.0000
Residual	3.8577e+10	21	1.8370e+09	R-squared	=	0.8998
				Adj R-squared	=	0.8712
Total	3.8497e+11	27	1.4258e+10	Root MSE	=	42860

YCO2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
X1Domestic~y	10364.78	1619.474	6.40	0.000	6996.9	13732.66
X2Domestic~s	-12520.3	4470.196	-2.80	0.011	-21816.59	-3224.022
X3Marketca~s	588.4183	1163.383	0.51	0.618	-1830.969	3007.806
X4StockTra~d	671.8226	2974.909	0.23	0.824	-5514.84	6858.485
X5Domestic~s	10621.64	4823.713	2.20	0.039	590.1779	20653.1
X6ForeignD~e	8269.571	7925.305	1.04	0.309	-8212.003	24751.14
_cons	40167.46	66104.66	0.61	0.550	-97304.69	177639.6

The results of this study direct us to the structure of the financial system. In the monetary economy, the financial system in Indonesia is divided into two, namely financial institutions and financial markets. Three indicators that significantly affect carbon emissions are indicators that represent transactions in financial institutions, namely domestic credit provided by the financial sector, domestic credit for the private sector, and domestic credit for the private sector by banks. Meanwhile, the other three indicators, namely market capitalization, traded shares and foreign investment, are indicators that represent transactions on financial markets. Miskhin stated that the difference between the two financial systems only lies in the funding system. In financial institutions, the funding system between the parties involved is indirect, while in financial markets, the funding system occurs directly.

Based on the results of the regression analysis using the regression method it was found that the variables representing indicators of financial intermediation were domestic credit provided by the financial

sector, domestic credit for the private sector, and domestic credit for the private sector by banks. These three variables significantly affect carbon emissions in Indonesia. This finding is in line with research conducted by (Zhang, 2011) which states that financial institutions have a greater influence on carbon emissions compared to the stock market and foreign transactions. This is because bank loans cause companies to obtain financing for business expansion which will lead to increased energy consumption which will affect the environment.

Other variables representing financial markets, namely market capitalization, traded shares and foreign investment, were found to have no significant effect on carbon emissions. This research is supported by (Charfeddine & Kahia, 2019), which states that the development of the financial sector only has a very weak effect on the consumption of carbon emissions in developing countries because the stock market system is not very good in developing countries, so market mechanisms are not standardized such as lack of transparency and consistency, besides that political influence also has an effect, and finally company finances on the stock market are not fully used for productive projects as a result stock market funding tends to be ineffective so he suggests the importance of improving the quality of financial allocation to increase productivity and results of the economic sector. However, the opposite was found by (Abbasi & Riaz, 2016) who stated that financial markets are significant in influencing the consumption of carbon emissions because the stock market alleviates the liquidity constraints faced by issuers, enabling them to expand output, increase energy consumption and hence CO2 emissions. In addition,(Dasgupta et al., 2001) companies listed on the stock market tend to get funding at lower costs making it easier to invest in new projects and then increase energy consumption and carbon emissions.

Conclusion

Even though environmental damage is a global problem and the whole world is faced with threats arising from damage to environmental quality, the responsibility to save the world from these threats mostly falls on countries which are the main emitters, including Indonesia.

The three indicators are domestic credit provided by the financial sector, domestic credit for the private sector, and domestic credit for the private sector by banks. These three variables are significant with values of 0.000, 0.001 and 0.039. While the other 3 variables namely market capitalization, traded shares and foreign investment are not significant in influencing carbon emissions with significance values of 0.618, 0.824 and 0.550.

There are many ways that the government can do in terms of making the financial sector contribute to environmental safety, such as offering interest discounts to encourage investment in energy-saving technologies (Boutabba, 2014). In addition, companies that carry out financing on financial markets such as the stock market are also required to carry out CSR in projects that are more environmentally friendly

(Thangaiyarkarasi & Vanitha, 2021). The important point here is that the government as a policy maker must show a real desire to improve and develop a financial system for promising local and international investors to projects that are more environmentally friendly (Charfeddine & Kahia, 2019).

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