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Green Finance and Green Economic Trade Off Economic and Environtment in Indonesia

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Abstract

This study investigates the trade-off between economic growth and environmental sustainability. We use the variables CO2 emission, GDP, Investment, and Education. The World Bank contributed the data for this research. A multivariate regression model was used to investigate the causal association between variables CO2 emission, GDP, Investment, and Education in Indonesia. We found that CO2 emission has a negative causal relationship with economic growth where the higher CO2 emission will further suppress the country's productivity as indicated by GDP. Green investment has not been strong enough to encourage economic growth in Indonesia. Likewise, environmental education still needs to be developed to increase public awareness of the importance of environmental sustainability. In Indonesia, the economy and environmental sustainability have become a trade-off that requires practical solutions in the form of awareness of the importance of environmental sustainability and green investment based on environmental sustainability.

Keyword : Green Finance, Green Economic, Trade Off Economic and Environtment, Indonesia
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Background

Economics and finance are faced with a trade-off from the environmental crisis in today's modern times. To tackle the environmental crisis and achieve climate goals, not only goodwill is needed. Huge amounts of resources are also needed to finance new means of transport, sustainable infrastructure development, environmental stewardship, and the transition to a renewable energy

mix. The financial sector knows that the future is in the commitment to projects that adopt criteria that refer to environmental, social, and corporate governance factors. This becomes a road map for investors to choose their capital goals. But this trend, which has strengthened in recent years, still requires tightening. The greatest challenge faced by supervisors, financial institutions, and corporations, in general, is obtaining information that enables informed investment decisions and facilitates the optimal allocation of resources (Widarni & Bawono, 2021 ; Drean, 2021 ; Lin & Zhou,2021).

Financial intermediaries need to identify, measure, manage and report climate-related risks and properly incorporate them into investment decisions. To achieve this, the existence of a solid database is very important. The path to this sustainable economy, taxonomy, and classification of sectors must be progressive and orderly. The taxonomy should not be binary, in the sense of classifying sectors as green or brown, but should take into account all the nuances and peculiarities of each productive sector. This is necessary to adequately finance the transformation of the most polluting sectors (Drean & Bawono, 2021 ; Liu & Xiong, 2022).

Investors have shown increasing interest in products that combine sustainability factors, such as green bonds, social bonds, sustainability bonds, and bonds with sustainability-related objectives. However, many problems remain to be resolved in this sector. One of the major challenges that the financial sector has to face relates to the lack of specialists in sustainability issues. Need experts who really allow the company to apply regulations correctly. Information and studies of each project and its particular case will make the difference between plans seeking actual environmental and social change. The challenge is to dedicate time to analysis to discern companies that practice, perhaps, do more public relations than change (Wilantari, Widarni, & Bawono, 2021).

CO2 emission is one indicator in understanding the condition of environmental sustainability. The need for human development in human capital requires education that raises the level of awareness of environmental sustainability (Huang, 2022 ; Karaaslan & Çamkaya, 2022). This study investigates the trade-off between economic growth and environmental sustainability. We use the variables CO2 emission, GDP, Investment, and Education.

Research Method

In a 21-year data analysis from 2000 to 2020, "autoregressive vectors" were used to represent the causal link between variables. The World Bank contributed the data for this research. In this study, we look at CO2 emissions, GDP, investment, and education use in Indonesia. The following multivariate regression model was used to investigate the causal association between variables CO2 emission, GDP, Investment, and Education in Indonesia:

$CE_t = \beta_0 + \beta_1 GDP_t + \beta_2 I_t + \beta_3 E_t + e_t$ eql 1

$GDP_t = \beta_0 + \beta_1 CE_t + \beta_2 I_t + \beta_3 E_t + e_t$ eql 2

$I_t = \beta_0 + \beta_1 CE_t + \beta_2 GDP_t + \beta_3 E_t + e_t$ eql 3

$E_t = \beta_0 + \beta_1 CE_t + \beta_2 GDP_t + \beta_3 I_t + e_t$ eql 4

Description :

CE : CO2 emission
GDP : Gross domestic product
I : Investment
E : Education
e : error term
t : time series
β : the magnitude of the effect of causality
eql: equation
This study uses vector calculations where each regression relationship will be brought together so that each variable will alternately become the dependent variable and the independent variable. The zero theory of Dickey-Fuller, taken from the PP test, and p=1 is the formula in Δyt = (ρ – 1)yt-1 + ut, in which Δ – for the first time different operators. This research used the following equation for the "unit root test":

$\Delta Y1 = \alpha 0 + \beta 0T + \beta 1Yt\text{-}1 + \sum\_(i\text{-}1)\text{^}q\ \alpha 1\Delta Yt\text{-}1 + et$

Description:

Y as the variable is being examined for unit root
T as the variable which indicates the “linear trend,” the “lag difference” means is $\Delta Yt-1$, $\alpha 0$ are shown as “constant term,” with the "t" as a "time trend" indicator. The null and alternative hypotheses for the "unit root test" are as follows:
H0: α=0
H1: α≠0

Result and Discussion

A stationarity test must be done before a causality or VAR assumption may be fulfilled. The Augmented Dickey-Fuller test may be used to detect if a series is non-stationary. After doing the unit root test, the following observations were discovered:

Table 1: ADF's Unit Root Test on CE, GDP, I, and E data.

Variable	Unit Root	Include in the examination Equation	Statistics for the ADF Test	5% Critical Value	Description
CO2 emission (CE)	Level	Intercept	-0.152050	0.9303	
	First Diff	Intercept	-3.501360	0.0197	Stationer
Gross domestic product (GDP)	Level	Intercept	-0.527808	0.8660	
	First Diff	Intercept	-1.929268	0.3129	
	Second	Intercept	-3.319458	0.0293	Stationer

	Diff				
Investment (I)	Level	Intercept	-2.619887	0.1056	
	First Diff	Intercept	-6.547377	0.0000	Stationer
Education (E)	Level	Intercept	0.011282	0.9491	
	First Diff	Intercept	-4.861012	0.0012	Stationer

CE, I, and E data are stationary at the first difference, while GDP data are stationary at the second difference. The Augmented Dickey-Fuller test is -3.501360 with a critical value of 0.0197. Smaller than the p-value, in this case, the CE data shows stationary at the first difference compared to the original data. From here, we can take the next step in defining vector analysis.

The causality test and the VAR test both require adequate lag length sensitivity. It is very important to select the most suitable time lag for the scenario before conducting a VAR analysis or causality test. The Akaike Information Criteria (AIC) was used to determine the appropriate time lag in this investigation. the following are the results of the lag test :

Table 2 : AIC value at Lag 0 to 2 CE, GDP, I, and E data.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-149.5823	NA	123.4008	16.16656	16.36539	16.20021
1	-124.2153	37.38293*	48.41319*	15.18056	16.17470*	15.34881*
2	-107.5555	17.53663	59.65634	15.11110*	16.90057	15.41395

Table 2 shows the findings of the Optimum Lag test. The AIC value at Lag 0 to 2 indicates that the length of the Lag variable CE, GDP, I, and E is at LR, FPE, SC, and HQ at Lag 1. Because the results of the four criteria are the same, the first lag will be chosen. So that according to the test requirements, the best lag lies in lag 1.

The cointegration test is one method to determine whether the variables in a model have a long-term relationship or not. The results of the cointegration test using the cointegration test are as follows:

Tabel 3 : Cointegration test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.653487	37.53325	47.85613	0.3228
At most 1	0.444936	17.39637	29.79707	0.6107
At most 2	0.261777	6.211622	15.49471	0.6705
At most 3	0.023146	0.444950	3.841466	0.5047

Because the likelihood is larger than 0.05, the cointegration test results in table three reveal that there is no cointegration.

Table 4 : Vector Model Analysis

	CE	GDP	I	E
CE	0.236198	-0.018333	0.056446	0.145557
	(0.36844)	(0.12960)	(0.03735)	(0.16533)
	[0.64107]	[-0.14146]	[1.51128]	[0.88039]
GDP	-1.276346	0.344910	-0.105840	-0.569509
	(1.81771)	(0.63938)	(0.18427)	(0.81567)
	[-0.70217]	[0.53945]	[-0.57439]	[-0.69821]
I	0.982691	-0.332860	0.223427	-2.366706
	(2.29384)	(0.80685)	(0.23253)	(1.02933)
	[0.42840]	[-0.41254]	[0.96085]	[-2.29927]
E	-1.246753	-0.308620	-0.010476	0.962921
	(0.38834)	(0.13660)	(0.03937)	(0.17426)
	[-3.21048]	[-2.25935]	[-0.26610]	[5.52574]
C	93.54557	18.25993	-0.173961	3.183205
	(34.1983)	(12.0292)	(3.46676)	(15.3460)
	[2.73538]	[1.51797]	[-0.05018]	[0.20743]
R-squared	0.629704	0.362671	0.472049	0.800173
Adj. R-squared	0.530958	0.192716	0.331263	0.746886
Sum sq. resids	308.8380	38.21146	3.173719	62.18859
S.E. equation	4.537532	1.596067	0.459980	2.036150
F-statistic	6.377030	2.133929	3.352938	15.01627
Log likelihood	-55.74962	-34.85280	-9.970489	-39.72316
Akaike AIC	6.074962	3.985280	1.497049	4.472316
Schwarz SC	6.323895	4.234213	1.745982	4.721249
Mean dependent	44.38413	4.911251	1.840299	44.98821
S.D. dependent	6.625429	1.776389	0.562485	4.047175

The relationship between CE and CE itself is significantly positive, with a coefficient of 0.236198 and a t-statistic of 0.64107, the relationship between CE and GDP is significantly negative, with a coefficient of -0.018333 and a t-statistic of -0.14146, which means the lower the CE, the higher the GDP. Likewise, the relationship between CE and I was significantly positive with a coefficient of 0.056446 and a t-statistic of 1.51128, meaning that the higher the CE, the higher the I. The relationship between CE and E was significantly positive, as evidenced by the coefficient of 0.145557 and the t-statistic of 0.88039. This shows that a low level of CO2 emissions will encourage economic growth which is represented by the gross domestic product

variable, when the level of CO2 emissions is high, it will also encourage high investment and education.

Table 5 : Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause CE	20	0.04409	0.8362
CE does not Granger Cause GDP		1.46746	0.2423
I does not Granger Cause CE	20	0.18584	0.6718
CE does not Granger Cause I		4.31770	0.0532
E does not Granger Cause CE	20	10.4271	0.0049
CE does not Granger Cause E		0.02576	0.8744
I does not Granger Cause GDP	20	0.20837	0.6538
GDP does not Granger Cause I		0.33216	0.5719
E does not Granger Cause GDP	20	7.35363	0.0148
GDP does not Granger Cause E		0.01829	0.8940
E does not Granger Cause I	20	0.99725	0.3320
I does not Granger Cause E		3.78763	0.0684

The results of Granger causality analysis with variables CE, GDP, I, and E show that there is a one-way relationship between variables E to CE, E to GDP, and variable I to E, this happens because of the level of significance (p-value) is smaller. or equal to 0.05.

Conclusion

CO2 emission has a negative causal relationship with economic growth where the higher CO2 emission will further suppress the country's productivity as indicated by GDP. Green investment has not been strong enough to encourage economic growth in Indonesia. Likewise, environmental education still needs to be developed to increase public awareness of the importance of environmental sustainability. In Indonesia, the economy and environmental sustainability have become a trade-off that requires practical solutions in the form of awareness of the importance of environmental sustainability and green investment based on environmental sustainability.

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