

Research article

Does Globalization Worsen Environmental Quality in ASEAN Countries?

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Abstract: The era of globalization, which is characterized by integration between economies, increases world output, but environmental damage becomes an important concern to achieve sustainable growth. Therefore, this study intends to estimate the impact of globalization in economic, social side and political terms together with the variables of GDP per capita, financial development and energy spending on carbon emissions and to prove the presence of Kuznets Environmental Curve Hypothesis in ASEAN using panel data over 2000-2019 period. The results of the study proved that globalization, especially social globalization, and energy consumption have role in escalating environmental damage. GDP per capita is found in the reduction of carbon emissions but financial development was discovered to have no significant impact on increasing carbon emissions. This study does not prove the presence of EKC. Hence, this proposes crucial implications for policy makers. These findings suggest that the policy makers to make sustainable energy development strategies while increasing regional income and economic development through globalization.

Keywords: Globalization, economic growth, financial development, environmental degradation, EKC

JEL Classification: F64, O44, Q56

Abstrak: Era globalisasi ditandai dengan adanya integrasi antar negara akan meningkatkan output dunia, namun kerusakan lingkungan juga menjadi masalah yang penting dalam mencapai pertumbuhan yang berkelanjutan. Oleh karena itu, penelitian ini mengestimasi dampak dari globalisasi ekonomi, sosial dan politik dan variabel lainnya seperti GDP per kapita, financial development dan konsumsi energi terhadap emisi karbon serta ingin membuktikan adanya EKC (Kuznets Environmental Curve Hypothesis) di ASEAN dengan menggunakan data panel tahun 2000-2019. Hasil estimasi menunjukkan bahwa globalisasi terutama globalisasi sosial dan konsumsi energi berdampak pada peningkatan kerusakan lingkungan. GDP per kapita membantu dalam perbaikan kualitas lingkungan namun financial development tidak berdampak secara signifikan terhadap emisi karbon. Penelitian ini juga tidak membuktikan adanya EKC di beberapa negara ASEAN tahun 2000-2019. Penemuan ini memberikan implikasi bagi pemangku kebijakan. Penemuan ini berimplikasi bagi pemerintah untuk membuat kebijakan pembangunan energy yang berkelanjutan dalam proses peningkatan pendapatan dan ekonomi wilayah melalui globalisasi.

Kata Kunci: Globalisasi, pertumbuhan ekonomi, financial development, degradasi lingkungan, EKC

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1. INTRODUCTION

Economic growth is a goal as well as a challenge for countries in the world. Economic growth can be encouraged through increased trade openness, government development policies, technological developments, investment, capital flows and other factors. The increase in trade growth cannot be separated from the accelerated globalization process. Globalization determines the level of economic growth of a country, because it drives growth through policies (Akadiri, 2019).

Globalization occurs through international cooperation between governments, which indicates that the integration between countries in the world is getting higher. This integration causes growth in all aspects, especially economic, social and political (Akadiri, 2019). By increasing of current globalization level, the purchasing power of the world's people is relatively higher than in the past. But the growth in consumption and industry becomes a challenge for all countries. How this rise does not have an impact on environmental damage. This is one of the reasons some people disagree with this openness or globalization. Some people think that globalization has played a major role in environmental pollution.

On the other hand, globalization has significantly increased foreign direct investment and economic growth. Brahmasrene & Lee (2017) stated that tourism, urbanization, and globalization increase economic growth in Southeast Asia. Foreign direct investment can be made more environmentally friendly and leads to green technology as a transfer from developed countries to emerging countries as a result of the dissemination of information about awareness of environmental issues, but the positive impact of this globalization can only occur if there are strong institutions in the country (Zaidi et al., 2019).

Globalization paved the way for financial sector improvements for both developed and developing countries by allocating more funds to innovative companies to manage risk, reduce costs and improve energy sector efficiency. Baloch et al. (2021) states that financial development increases energy innovation and improves environmental quality. Environmental pollution is a difficult problem for both developed and developing countries (Muhammad & Khan, 2021). Climate risks associated with economic risks threaten to collapse as in 2008 unless carbon emissions are reduced to 50% by 2030 and net zero by 2050. Achieving this mission will require serious strategies in planning for interacting economies and social transitions at the macro level while in the micro level will depends on technological innovation and commitment from the government and companies (World Economic Forum, 2020).

Several studies related to globalization and its impact on environmental pollution still give mixed results. Other studies have been conducted to look at the role of globalization and other economic variables on changes in environmental quality from different contexts. Zaidi et al. (2019) and Zhuo & Qamruzzaman (2022) found that globalization helps lessen carbon emissions even though economic development and energy intensity increase environmental pollution. Baloch et al. (2021) also found that globalization has a long-term relationship with energy innovation and reducing greenhouse gas (GHG) emissions. However, study by Akadiri (2019) and Haseeb (2019) found that globalization increases the number of carbon productions in some archipelagic countries but in the long term one aspect of globalization seen from international tourism helps reduce carbon emissions. Then according to Wang et al. (2019) globalization has a long-term correlation with economic growth but does not have a substantial impact on carbon releases. Study by Zaidi et al. (2019) found that globalization and financial development significantly reduce carbon emissions, but economic growth and energy intensity will increase carbon emissions.

Environmental degradation has become a global challenge that raises awareness of environmental protection. Research on the factors that influence environmental degradation and validation of the EKC hypothesis will have implications for policymakers and relevant stakeholders in drafting related regulations on promoting an environmentally friendly economy (Le, 2020). Therefore, this study also wants to examine and analyze whether the EKC hypothesis applies in ASEAN. In addition to testing the EKC hypothesis, the correlation among financial development, economic growth and the environment is also an important topic to achieve sustainable development. Therefore, this study intends to see the effect of globalization upon environmental degradation, with other supporting variables including financial development, energy consumption and economic growth.

2. RESEARCH METHODS

This study identifies the effects of globalization, economic growth, financial development and energy consumption in several ASEAN countries consisting of Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. The data used is in the form of panel data from 2000 to 2019. This

study uses CO₂ emissions as a proxy that describes the environmental pollution of carbon emissions. As an independent variable, this study used the KOF Globalization Index as a proxy for globalization which is also used by Baloch et al. (2021); Danish & Wang (2018); and Haseeb (2019). Other economic variables are the Financial development index (Baloch et al., 2021), GDP per capita and its square to prove the existence of the EKC hypothesis and energy consumption (Baloch et al., 2021; Lestari et al., 2020). To see the impact of globalization, financial development, energy consumption as well as to test the existence of the Kuznets Environmental Curve (EKC), this study adopts the carbon emission model also used by Phong (2019). The estimation of the panel data model is written as follows:

$$CE_{i,t} = \beta_0 + \beta_1 KOFGL_{i,t} + \beta_2 GDP_{i,t} + \beta_3 GDPSQ_{i,t} + \beta_4 FDEV_{i,t} + \beta_5 CENERGY_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$CE_{i,t} = \beta_0 + \beta_1 KOFGL_{i,t} + \beta_2 KOFSoGL_{i,t} + \beta_3 KOFPoGL_{i,t} + \beta_4 GDP_{i,t} + \beta_5 GDPSQ_{i,t} + \beta_6 FDEV_{i,t} + \beta_7 CENERGY_{i,t} + \varepsilon_{i,t} \quad (2)$$

where, *CE* is carbon emissions per capita (metric tons) which is used as a determinant of environmental degradation; *KOFGL* is the explanatory variable as a determinant of overall globalization (index); *KOFGL* is economic globalization (index); *KOFSoGL* is social globalization (index); *KOFPoGL* is a determinant of political globalization; *GDP* is GDP per capita (constant 2015 US\$); *GDPSQ* as squared economic growth to test the EKC hypothesis (constant 2015 US\$); *FDEV* is financial development (index); *CENERGY* is energy consumption (exajoules), *t* is time series in year, *i* is cross-section in region, ε is error term.

3. RESULTS AND DISCUSSION

3.1. Descriptive statistics

Table 1 shows the descriptive statistics of the data used. The average value for the carbon emission indicator in this research sample is 3,894. The minimum average value for this indicator is found in Vietnam with a value of 0.640, while the maximum value of 10,457 is found in Singapore. For the value of globalization, Singapore recorded a maximum value of 84,468 then recorded a minimum globalization value of 42.63. Then for financial development, the largest value is in Singapore with the value of 0.793 and Indonesia with a minimum value of 0.268. For energy consumption, Indonesia has a maximum value of 8.746, then Vietnam has a minimum value of 0.770.

Table 1. Descriptive statistics of variables

Descriptive	CE	KOFGL	KOFGL	KOFSoGL	KOFPoGL	GDP	GDPSQ	FDEV	CENERGY
Mean	3.894	67.996	66.985	61.256	75.572	11417.93	4.12 x 10 ⁸	0.495	3.309
Median	2.800	64.958	63.695	59.060	78.641	3698.829	13682494	0.450	3.109
Max	10.457	84.468	94.959	88.356	87.456	61373.65	3.77 x 10 ⁹	0.793	8.746
Min	0.640	42.63	48.484	23.686	50.929	1170.496	1370061	0.268	0.770
Std. Dev.	2.972	10.325	14.054	16.917	9.148	16847.73	9.37 x 10 ⁸	0.169	1.793
Skewness	0.647	-0.195	0.8120	-0.0060	-1.097	1.891	2.301	0.220	0.721
Kurtosis	1.886	2.612	2.5436	2.0839	3.365	4.992	7.027	1.403	3.021
Obs.	120	120	120	120	120	120	120	120	120

Source: Authors calculation

Based on the calculation data that has been done, there are 30 observations (data) used. From the 120-sample data in Table 1 and Table 2 show the mean and standard deviation of each variable in each country. The mean value (average) is greater than the standard deviation value, so that the data of each variable has a good value distribution (evenly) and the deviant data can be said to be low.

Table 2. Descriptive statistics of variables each country

Country	Indonesia	Malaysia	Phillipines	Singapore	Thailand	Vietnam
Mean±SD						
CE	1.728± 0.257	6.906± 0.834	0.969± 0.171	8.690± 0.758	3.416± 0.378	1.652± 0.778
KOFGI	61.500± 2.183	77.950± 3.170	63.800± 1.507	81.900± 2.198	68.000± 3.479	54.800± 8.439
KOFaGI	55.250± 5.883	74.550± 1.431	57.600± 3.912	93.400± 1.231	64.950± 1.877	56.400± 4.465
KOFSoGI	45.400± 7.036	77.450± 5.817	53.100± 4.822	84.850± 3.013	60.700± 7.392	46.000± 13.314
KOFPoGI	82.800± 3.707	81.900± 3.024	80.800± 2.166	67.800± 3.994	78.450± 2.235	61.400± 8.425
GDP	2737.458± 645.658	8467.814± 1610.046	2520.154± 572.041	47679.60± 9063.343	5059.967± 943.940	2042.599± 629.867
GDPSQ	7889705± 3654755	74166508± 28248082	6662046± 3082653	2.35 x 10 ⁹ ± 8.64 x 10 ⁸	26449734± 9563741	4549105± 2736854
FDEV	0.324±0 .031	0.623± 0.045	0.327± 0.021	0.728± 0.028	0.604± 0.092	0.366± 0.045
CENERGY	6.139± 1.269	3.389± 0.717	1.353± 0.32	2.652± 0.702	4.255± 0.901	2.070± 1.064

Source: Authors calculation

3.2. Results

The Chow test and Hausman test can be seen in Table 3, where the best model chosen is the fixed effect model. The results of the model estimation to see the effect of globalization, economic growth, financial development, and energy consumption can be seen in Table 4. The first model shows the effect of the overall level of globalization, the second model uses a globalization index which is seen from economic globalization, social globalization, and political globalization.

The first model report that globalization found to have a significant positive impact on CO2 emissions, the positive impact of globalization is in line with (Bataka, 2021; Haseeb, 2019; Phong, 2019). An overall increase in globalization by 1 index unit will increase carbon emissions by 0.043 metric tons per capita, *ceteris paribus*. The second model reports that economic globalization does not have a significant impact, while social globalization has a significant positive impact on carbon emissions, with a coefficient value of 0.151. This shows that globalization increases economic activity through social globalization such as international tourism to high-tech exports and political globalization such as embassies and world peace missions which can have an impact on environmental damage. In model (2) political globalization is found to have a negative effect on globalization where an increase in globalization by 1 unit of index will reduce carbon emissions by 0.068 metric tons per capita, *ceteris paribus*. This means that globalization through national embassies, world peace missions and international non-governmental organizations plays a role in improving environmental quality. (Muhammad & Khan, 2021) also found that emissions reduce to political globalization. Alataş (2021) stated that good international cooperation is very important.

Table 3. The results of Chow and Hausman test

Model	Model (1)	Model (2)
Chow Test (Prob.)	0.0000	0.0085
Hausman Test (Prob.)	0.0389	0.0000

Source: Authors calculation

For the variables GDP per capita and GDP per capita squared, in model (1) GDP per capita has a positive value but does not have a significant impact and GDP per capita square has a negative value on carbon emissions. In model (2) GDP per capita has a negative and significant impact and

GDP per capita square has a negative and significant value. Therefore, this study did not confirm or did not find any environmental Kuznets curve in several ASEAN countries in 2000-2019. This is not in accordance with (Akadiri, 2019; Danish, 2018; Lestari et al., 2020; Liu et al., 2019; Phong, 2019) which confirmed the presence of EKC. However, this study is in line with research conducted by (Rahman et al., 2021) which did not find any EKC in the BRICS country analysis and (Osuntuyi & Lean, 2022) which also could not confirm the EKC hypothesis for lower middle-income countries and lower income countries. (Nikensari et al., 2019) also did not confirm the EKC in the several high-income countries studied but found that EKC will occur when a country has reached USD 51.44 thousand per capita.

As for ASEAN countries, (Azwar, 2019) found that EKC Hypothesis does not exist in Indonesia. (Pratama, 2021) found the different turning point and EKC shape in ASEAN countries. The non-validity of the EKC hypothesis implies that economic growth is not a solution to environmental degradation. Therefore, effective policies are essential to realize significant and timely results in reducing environmental degradation. However, the government should also not hinder economic growth by enforcing strict environmental regulations that would jeopardize the possibility of future economic growth. Governments can devise methods to shift from consumption of non-renewable energy to use of renewable energy. In model 2 where GDP per capita and GDP per capita square have a negative direction, it is possible for some of these ASEAN countries to be at a level of development where an increase in GDP per capita will have an impact on improving environmental quality. This can happen when the use of technology and energy is used efficiently which will increase environmental efficiency.

Table 4. The regression results with fixed effects method

Dependent variable: CE		
Variables	Model (1)	Model (2)
Constant	0.208 (0.689)	-3.383*** (0.000)
KOFGI	0.0438*** (0.000)	
KOFEGI		0.023 (0.280)
KOFSoGI		0.151*** (0.000)
KOFPoGI		-0.068*** (0.000)
GDP	4.15E-05 (0.350)	-0.068*** (0.000)
GDPSQ	-1.26E-09*** (0.001)	-1.95E-09*** (0.000)
FDEV	-0.212 (0.645)	-0.389 (0.665)
CENERGY	0.258*** (0.000)	0.368*** (0.000)
R ²	0.988	0.968

Notes: *** is 0.01 significance level, ** is 0.05 significance level, * is 0.1 significance level

Source: Authors calculation

For financial development variables, models (1) and (2) financial developments have a negative value but do not have a significant impact. The direction of the negative variable is in accordance with study by Zaidi (2019) which found that financial development can reduce carbon emissions. Study by Baloch et al. (2021) found that financial development increases energy innovation and environmental quality. The insignificant effect of financial development on carbon emissions in this study is in line with Lestari et al. (2020) that did not find a relationship between financial development using stock market turnover as a proxy for carbon emissions in Asian emerging market

countries, this is because the capital market in Asian emerging markets is less developed than the capital market in developed countries. Study by Sari & Prasetya (2022) found that stock-based financial sector has increasing effect on carbon emissions in Indonesia. Study by Tahir et al. (2020) found that financial development contributes to carbon emissions but globalization has potential to control them in South Asia.

Energy consumption found to have a significant positive impact on carbon emissions in both models with coefficient values of 0.258 and 0.368, respectively. This is in accordance with the findings of study by Le (2020); Muhammad & Khan (2021); Phong (2019); Rahman et al. (2021); Rauf et al. (2020); and Sun et al. (2019) which states that there is a positive and significant relationship between energy consumption and carbon emissions which proves that energy consumption is a fundamental cause of carbon emissions. Study by Rauf et al. (2020) found that energy consumption, high-tech industry and economic growth are damaging to the environment. Nathaniel & Khan (2020) also found that renewable energy contributed to ASEAN environmental degradation.

4. CONCLUSIONS

The objective of this study is to analyze the impact of globalization, economic growth, financial development, and energy consumption on environmental damage and to validate the application of EKC in several ASEAN countries using panel data regression in 2000-2019. There are two models in this study where the first model looks at the overall level of globalization, GDP per capita, GDP per capita squared, financial development and energy consumption on carbon emissions, while the second model looks at the effects of globalization from the economic, social and political side. This study finds that globalization increases carbon emissions, especially social globalization, and political globalization. EKC is also not found in several ASEAN countries consisting of Indonesia, Malaysia, Thailand, Singapore, Vietnam, and the Philippines. An increase in GDP per capita was found to have a negative effect on carbon emissions. Financial development was found to have no significant effect on carbon emissions and energy consumption was found to have a significant positive effect on environmental damage.

The results of this study have implications for reducing carbon emissions along with increasing economic growth. From the findings, ASEAN should concern about economic globalization activities that can increase the carbon emissions, political globalization through international summits and agreements can facilitate this to make various regulations about consumption energy and environmental restoration. The policy implications in to make strategies in sustainable energy development to maintain a clean environment in line with increasing economic growth. Economic development can be pursued using energy effectively and efficiently with the improvement of more modern and environmentally friendly technologies. Research on renewable energy and green energy can also help reduce the impact of energy *consumption* on environmental damage.

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