

Nexus of Exports and Economic Growth on the Carbon Emissions in Thailand

Andik Kurniawan¹, Eny Lestari Widarni², Danyswara Madyasta³
^{1,2,3}STIE Jaya Negara Tamansiswa Malang, Indonesia

Abstract

This research objective is to determine how Thailand's carbon emissions are impacted by exports and economic growth. We use the World Bank as a complementary source of statistical data, namely data from 2000 to 2020, the variables we use are carbon emissions, economic growth, and export. We found that the economic growth variable has a beneficial positive effect on carbon emissions. This means that the higher the level of economic growth of a country, the higher the amount of carbon emissions produced. The export factor has a negative influence on carbon emissions. This means that the more countries export goods and services, the lower the amount of carbon emissions released into the atmosphere. The previous year's carbon emission variable also has a beneficial positive effect on current carbon emissions, meaning that high energy consumption in the previous year will increase carbon emissions in the following year.

Keyword : Carbon emissions, economic growth, export, thailand

JEL Classification : C31, F14, O40.

DOI : 10.54204/splashmagzvol2no12022006

Background

Thailand is one of the countries in Southeast Asia that has a fairly advanced and diverse economy. This country is known as the rice granary of Southeast Asia, due to its rapidly growing agricultural sector. In addition, the tourism sector is also one of the largest sources of foreign exchange earnings, because it has many attractive tourist destinations and rich culture. However, behind its economic progress, Thailand also faces environmental challenges, particularly related to carbon emissions or CO₂, which is one of the greenhouse gases that causes global warming (Arunrat, Sreenonchai, Chaowiwat, & Wang, 2022; Rusminingsih, Askar, Mutia, Fitria, Wahyudi, 2023). The quantity of CO₂ gas released into the atmosphere as a result of human activity, such as the burning of fossil fuels, the use of electricity, transportation, industry, and other activities, is known as carbon emissions. Carbon emissions can have negative impacts on the environment, such as increasing air temperature, melting polar ice, rising sea levels, changes in rain patterns, and damage to ecosystems. Therefore, many countries in the world are trying to reduce their carbon emissions in various ways, such as using renewable energy, increasing energy efficiency, adopting environmentally friendly technologies, and conducting international cooperation (Abbasi, Adedoyin, Abbas, & Hussain, 2021; Irawan, Sasongko, Mukhlis, Yanto, & Wulandari, 2022).

Thailand's energy demands are largely met by fossil fuels, however there are evidence that energy intensity and CO₂ emissions are declining. Thailand has started to refocus its energy strategy on energy efficiency and the transition to renewable energy as a result of the aggressive GHG emission reduction target it committed to under the Paris Agreement. Setting a carbon price would significantly and economically speed up its progress toward that goal. Thailand has also experienced rapid economic growth since the 1960s, with GDP per capita increasing more than 20 times. However, this has also led to an increase in CO₂ emissions per capita from 0.5 tons in 1960 to 4.6 tons in 2019. Nonetheless, Thailand has managed to reduce the intensity of CO₂ emissions per unit of GDP from 0.8 kg in 1990 to 0.4 kg in 2019, indicating efforts to separate economic growth from carbon emissions (Raihan, et al., 2023; Priyanto, Widarni, & Bawono, 2022).

Thailand has great potential to increase the value of its exports through the development of a voluntary carbon market and a national emissions trading mechanism. This can provide incentives for key sectors such as energy, transport, industry, agriculture, and forestry to reduce their GHG emissions and increase their energy efficiency. In addition, this can also help Thailand achieve its target of reducing GHG emissions by 20.8% below normal business levels by 2030 (Adebayo, Pata, & Akadiri, 2022).

One theory that is often used to analyze the relationship between carbon emissions and the economy is the Environmental Kuznets Curve (EKC) theory. This theory illustrates that in the early stages of economic development, carbon emissions will increase along with growth in per capita income. However, after reaching a certain point, carbon emissions will decrease as per capita income increases. This is caused by changes in economic structure from the primary sector to the secondary and tertiary sectors, improvements in technology and infrastructure, increased environmental awareness, and implementation of environmental regulations (Bunnag, 2023; Priyanto, Widarni, & Bawono, 2022).

The results of related research show that there is no empirical evidence about the existence of EKC in the four countries. That is, there is no tipping point when, after achieving a particular amount of wealth, carbon emissions start to decline. This is due to the fact that each nation's energy and transportation strategies have failed to stop environmental degradation. In addition, this study also found that there is a one-way positive effect from carbon emissions to GDP in the four countries. That is, the higher the carbon emissions, the higher the GDP. This shows that economic growth still depends on polluting energy sources (Takashi, 2023; Sasongko, Nehruddin, Musriyatun, Siswanto, 2023). Other research shows that population, income, and technology have a significant effect on increasing carbon emissions partially and simultaneously. This shows that population growth and income increase the demand for energy, while technology has not been able to reduce emission intensity. From the two studies above, we can conclude that exports and economic growth have a positive effect on carbon emissions in Thailand. That is, the higher exports and economic growth, the higher carbon emissions. This shows that Thailand still relies on polluting energy sources to support its economic activities, especially in the agriculture and tourism sectors (Fethi & Senyuçel, 2021).

The effect of the role of exports and economic growth on carbon emissions is becoming an increasingly relevant topic in global discussions on sustainable development and climate change. A focus on these relationships, particularly in the context of Thailand, has far-reaching implications for efforts to reduce carbon footprints and maintain a balance between economic growth and environmental protection. One viewpoint in this study is the role of exports in shaping Thailand's carbon emission patterns. Exports can affect carbon emissions through various mechanisms. Increased exports can lead to increased production in certain sectors, which in turn can increase demand for energy and raw materials. This can lead to higher carbon emissions. However, on the other hand, exports can also encourage the adoption of more efficient and environmentally friendly technologies. Companies that wish to meet international standards and enter export markets tend to be more careful in adopting technologies that contribute to reducing emissions (Salman, Long, Dauda, & Mensah, 2019). A study by Ansari (2022) in the context of Southeast Asia found that export growth had a positive impact on productivity and production efficiency. However, the impact on carbon emissions is not always linear. The positive effect on production efficiency can be offset by increases in export-related energy and transport demand.

On the one hand, rapid economic growth can result in increased industrial activity and energy consumption, which contribute to increased carbon emissions. However, on the other hand, strong economic growth can also provide countries with the resources to invest in clean technologies and innovations that contribute to reducing emissions. According to a study by Li, Suryadi, Yan, Feng, & Bhaskoro (2023) in the long term, higher economic growth can help Thailand to invest in renewable energy and clean technology, which in turn can reduce carbon emissions. However, this study also acknowledges that in the short term, high economic growth is often accompanied by increased energy consumption and industrial activity, which can increase carbon emissions. Contextual factors such as

economic structure, environmental policies, and level of industrialization also influence the relationship between exports, economic growth, and carbon emissions in Thailand. Environmental policies implemented by governments can shape the direction of exports and economic growth. Incentives and regulations that support clean technologies and green production can lead to a more positive impact on carbon emissions. This research objective is to determine how Thailand's carbon emissions are impacted by exports and economic growth.

Research Method

We use the World Bank as a complementary source of statistical data, namely data from 2000 to 2020, the variables we use are carbon emissions, economic growth, and export. We use the following econometric model:

$$COE_t = \beta_0 + \beta_1 COE_{t-1} + \beta_2 EGR_t + \beta_3 EX_t + e_t$$

Where the carbon emissions is COE, EGR is economic growth, and export is EX, the error term is e, and time series is t.

Result and Discussion

The stationarity test results are displayed in Table 1.

Table 1. ADF 1st stationary tets

Variable	ADF Test stat.	Signif.	Description
Carbon emissions (COE)	-4.967012	0.0009	Stationer
Economic growth (EGR)	-6.364216	0.0001	Stationer
Export (EX)	-5.304700	0.0006	Stationer

The data for COE, EGR and EX are stationary in the first difference data, as can be seen from the table above. We may continue with the ARDL estimate because all the data are steady.

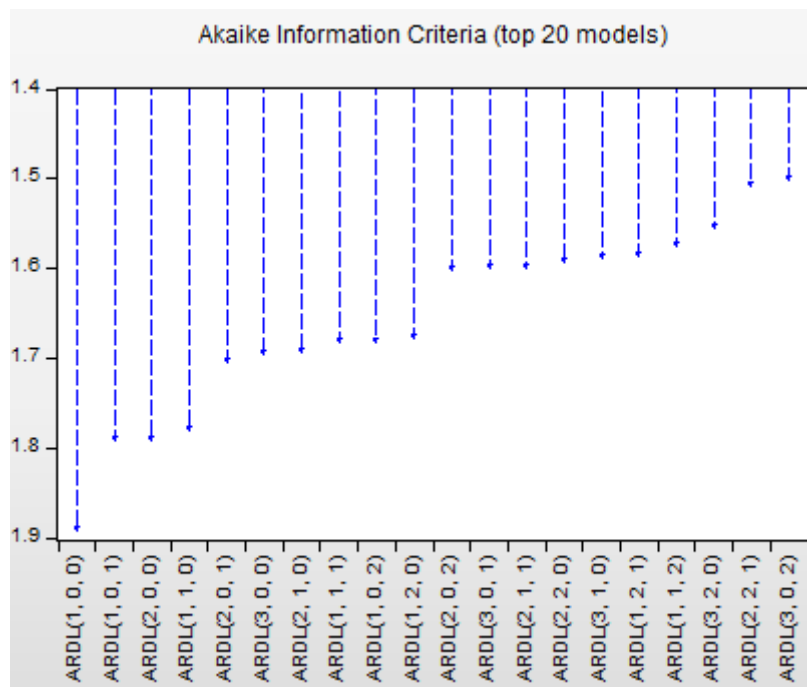


Figure 1. Optimum Lag Test

The lag test findings indicate that lag 1,0,0 is best lag. Now that the ideal latency has been identified, and next we perform an ARDL analysis.

Tabel 2. ARDL analysis results

	Coef.	Std. Error	t-Stat.	Prob.*
COE(-1)	0.943594	0.064277	14.68015	0.0000
EGR	0.025829	0.007778	3.320863	0.0043
EX	-0.003537	0.004674	-0.756683	0.4602
C	0.389251	0.311248	1.250614	0.2291
R-squared	0.941914	Adjusted R-squared		0.931023

From the estimation results of the ARDL model, it is known that adj R-sq. and R-sq. values vary between 0.94 and 0.93. With an R-squared of 0.93, the independent variable of the ARDL model can explain fluctuations in the dependent variable, carbon emissions, by 93 percent. This shows the suitability of this research model for use in research.

Economic growth variables have a positive beneficial effect on carbon emissions with a coef value of 0.025829. The export factor represented by the EX variable is significantly impacted inversely by carbon emissions, with a coef of -0.003537. COE variable (-1) also has a positive beneficial effect on carbon emissions.

Table 3. The long and short term test

	Coef.	Std. Error	t-Stat.	Prob.
C	0.389251	0.311248	1.250614	0.2291
COE(-1)*	-0.056406	0.064277	-0.877549	0.3932
EGR**	0.025829	0.007778	3.320863	0.0043
EX**	-0.003537	0.004674	-0.756683	0.4602

As seen in the table above, economic growth has a beneficial positive effect on carbon emissions in the long run. However, the export variable is significantly impacted inversely by carbon emissions. That is, the higher the economic growth, the higher the rate of increase in carbon emissions. The lower the export will also make the carbon emission higher.

Conclusion

We found that the economic growth variable has a beneficial positive effect on carbon emissions. This means that the higher the level of economic growth of a country, the higher the amount of carbon emissions produced. The export factor has a negative influence on carbon emissions. This means that the more countries export goods and services, the lower the amount of carbon emissions released into the atmosphere. The previous year's carbon emission variable also has a beneficial positive effect on current carbon emissions, meaning that high energy consumption in the previous year will increase carbon emissions in the following year.

References

- Abbasi, K. R., Adedoyin, F. F., Abbas, J., & Hussain, K. (2021). The impact of energy depletion and renewable energy on CO₂ emissions in Thailand: fresh evidence from the novel dynamic ARDL simulation. *Renewable Energy*, *180* (1), 1439-1450.
- Adebayo, T. S., Pata, U. K., & Akadiri, S. S. (2022). A comparison of CO₂ emissions, load capacity factor, and ecological footprint for Thailand's environmental sustainability. *Environment, Development and Sustainability*, *1* (1), 1-21.
- Ansari, M. A. (2022). Re-visiting the Environmental Kuznets curve for ASEAN: A comparison between ecological footprint and carbon dioxide emissions. *Renewable and Sustainable Energy Reviews*, *168* (1), 1-15.
- Arunrat, N., Sereenonchai, S., Chaowiwat, W., & Wang, C. (2022). Climate change impact on major crop yield and water footprint under CMIP6 climate projections in repeated drought and flood areas in Thailand. *Science of the Total Environment*, *807* (1), 1-18.
- Bunnag, T. (2023). Analyzing Short-run and Long-run Causality Relationship among CO₂ Emission, Energy Consumption, GDP, Square of GDP, and Foreign Direct Investment in Environmental Kuznets Curve for Thailand. *International Journal of Energy Economics and Policy*, *13* (2), 1-16.
- Fethi, S., & Senyucel, E. (2021). The role of tourism development on CO₂ emission reduction in an extended version of the environmental Kuznets curve: Evidence from top 50 tourist destination countries. *Environment, Development and Sustainability*, *23* (1), 1-18.
- Irawan, C. B., Sasongko, B., Mukhlis, M., Yanto, D. D. G. F., & Wulandari, M. W. (2022). Trade and Foreign Direct Investment on Economic Growth in Indonesia: ARDL Approach: English. *Tamansiswa Accounting Journal International*, *5*(1), 70-75.
- Li, Y., Suryadi, B., Yan, J., Feng, J., & Bhaskoro, A. G. (2023). A strategic roadmap for ASEAN to develop hydrogen energy: Economic prospects and carbon emission reduction. *International Journal of Hydrogen Energy*, *48* (30), 11113-11130.
- Priyanto, E., Widarni, E. L., & Bawono, S. (2022). The Effect of Internet Inclusion on Financial Inclusion in P2P Lending in Indonesia Based on Human Capital Point of View. In *Modeling Economic Growth in Contemporary Indonesia* (pp. 107-121). Emerald Publishing Limited.
- Raihan, A., Muhtasim, D. A., Farhana, S., Rahman, M., Hasan, M. A., Paul, A., & Faruk, O. (2023). Dynamic linkages between environmental factors and carbon emissions in Thailand. *Environmental Processes*, *10* (1), 1-19.
- Rusminingsih, D., Askar, Mutia, D.K, Fitria, L., Wahyudi, M.I. (2023). Pembudidayaan Budidaya Hidroponik Sayur Organik Di Desa Kampung Putih Kelurahan Klojen Kecamatan Klojen Malang. *Jurnal Abdimas Jayanegara*, *1*(1), 1-8.
- Salman, M., Long, X., Dauda, L., & Mensah, C. N. (2019). The impact of institutional quality on economic growth and carbon emissions: Evidence from Indonesia, South Korea and Thailand. *Journal of Cleaner Production*, *241* (1), 1-16.
- Sasongko, B., Nehruddin, Musriyatun, Siswanto, N.H. (2023). Peningkatan Nilai Ekonomis Di Bidang Lingkungan Di Desa Jenggolo Kecamatan Kepanjen Kabupaten Malang. *Jurnal Abdimas Jayanegara*, *1*(1), 21-28
- Takashi, F. (2023). Empirical assessment of the environmental Kuznets curve hypothesis in Indonesia, Malaysia, the Philippines, and Thailand using the ARDL and FMOLS techniques. *Energy Economics Letters*, *10* (1), 19-34.