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AGBA Brief:

Academy for Global Business Advancement (AGBA) is a global association of professionals in the fields of business administration, commerce, economics, entrepreneurship, information technology, tourism, and hospitality management.

AGBA is an independent, non-aligned and not-for-profit, charitable NGO registered in the state of Texas (USA) with a worldwide network of over 1000 members based across more than 50 countries that include scholars from reputed academic institutions, corporate leaders, governmental officials, policy makers, entrepreneurs and consultants hailing from both western and emerging countries.

AGBA, as a global organization, aims to help academics and scholars at business schools across emerging countries to connect with the western (developed) world for mutual benefit. Such collaboration would accelerate the process of globalization by furnishing ample opportunities to scholars in emerging countries to get recognition, disseminate new knowledge and assert themselves on the global stage.

AGBA's Vision

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Building on the dynamics of the ongoing globalization process, AGBA is committed to provide a global platform aimed at assisting academics, scholars, professionals, officials, entrepreneurs and consultants of emerging countries to assert themselves on the global stage for recognition, networking and dissemination of knowledge.

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- Offer customized training and professional development programs globally;

- Act as a platform for the advancement of "Global Entrepreneurship". And

- Act as a platform for the publications of scholarship in globally respected and world-class journals.

PREFACE

These AGBA's "*Pro ceedings"* (Advances in Global Business Research) contain all papers that have been accepted for presentation at the 15th Annual World Congress of the Academy for Global Business Advancement (AGBA) that is being hosted by the AACSB accredited National Institute of Development Administration (NIDA), Bangkok, Thailand on July 2 --- 4, 2018.

All papers contained in these proceedings were subjected to anonymous (blind review) process and were subsequently improved by the authors before accepted for inclusion within these referred American proceedings.

AGBA would like to express its appreciation and gratitude to Prof. Dr. Pradit Wanarat, President, National Institute of Development Administration (NIDA), Bangkok, Thailand for his dynamic leadership, appreciable patronage and admirable support in organizing this fabulous global conference.

AGBA also wishes to extend its heartfelt thanks to Conference Organizing Committee chaired by Mr. Wayne (John) Shabita for organizing a fabulous conference.

We place on record our sincere thanks to all delegates and authors for their participation and support, and look forward to having them with us next year at AGBA's 16th Annual World Congress.

Thank you very much.

Sincerely,

Christopher J. Marquette
Gary L. Frankwick
Viput Ongsakul
Zafar U. Ahmed

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An Analysis of he Impacts of International Trade, Foreign Direct Investment (FDI), Energy Consumption, and Gross Domestic Product (GDP) on Carbon Dioxide Emission in Thailand[Memo1]

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Abstract

This study aims to analyze the impacts of international trade, Foreign Direct Investment, energy consumption, and GDP on carbon dioxide emission in Thailand during the period of 1981-2015. The method used in this research is Vector Autoreggresive (VAR). The findings show that international trade has a significant negative effect on carbon dioxide emission. This means an increase in international trade will reduce the amount of carbon dioxide in Thailand. Then, energy consumption and GDP show a significant positive effect on carbon dioxide emission. This means that increased energy consumption and GDP will increase carbon dioxide in Thailand. The research results have policy implications for the effort to reduce carbon dioxide emission primarily in the industrial sector to support green economic growth in Thailand. The originality of this study derives from the fact that the research was only conducted in Thailand which has economic growth closely related to the level of environmental degradation.

Keywords: International trade, FDI, Energy consumption, GDP, Carbon dioxide emissions, VAR.

1. INTRODUCTION

One of the most significant events in the last decade to date is global warming (Jafari et al., 2012). The occurrence of global warming is the result of the increasing average temperature of the atmosphere, ocean and land on earth caused by the increasing concentrations of greenhouse gases such as water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrogen oxide (N_2O) produced by human activities. This can lead to threats to climate change that will have a devastating impact on life on earth. Based on a report from the Intergovernmental Panel on Climate Change (IPCC) in 2007, it is estimated that the average global temperature has increased between 1.1 degrees Celsius and 6.4 degrees centigrade in the next 100 years.[Memo2] It is also estimated that only a 2 degree Celsius temperature rise will lead to considerable changes in life on Earth, especially environmental ecosystems and rising sea levels that have a major impact on the lives of the world's population in coastal areas (Liu et al. 2016). In addition, most studies recognize carbon dioxide (CO_2) as the most common and the largest factor contributing to global warming as a result of agropogenics (Zhu, et al., 2016). Agropogenic is a term for pollution that occurs unnaturally or arises as a result of human activities. Zhu, et al (2016) also mention that one of the most important anthropogenic sources is industrialization which takes place globally. Carbon dioxide is the largest contributor of greenhouse gas concentrations that have the longest cycle in the Earth's atmosphere. The high carbon dioxide is one of the benchmarks of the rate of environmental degradation. Many previous studies have shown that carbon dioxide emission levels are closely related to economic growth and energy consumption in a country.

Salim, et al. (2008) in their research describe the economic growth that causes and affects the amount of energy consumption in a country. Although the standard of economic growth does not include energy variables, the importance of energy in modern economic activities cannot be denied. In the increasing economic activity, energy is needed to run the wheels of growth.

Along with the economic growth, people's income will also increase. This also leads to higher energy demands in support of community activities. Therefore, it is necessary to regulate the use of fossil energy in order to achieve economic growth which does not sacrifice the environment.

The phenomenon of the relationship between environment and growth has been studied and explained by Salmon Kuznets in his theory commonly referred to as the Kuznets Curve (EKC) theory (Shahzad et al., 2014). The EKC hypothesis explains that the economic growth of a country will be followed by the level of environmental degradation where a country with low income level will be more focused on its economic growth than its environmental quality problem to a certain point of achievement of economic growth; the level of environmental damage will decrease with a marked decrease in the inverted U curve (Lean and Shahbaz, 2011). Although the EKC hypothesis postulates an inverted U-shaped relationship to economic growth with environmental degradation, there is some evidence that the EKC hypothesis has a linear relationship (Khalid and Muhammad, 2013). Research conducted by He and Richard (2010) found that the EKC hypothesis is invalid. This occurs due to several reasons that make a difference to the conclusions of each study. For example, the samples used are different, and the control variables included in the modeling are also varied.

The awareness of the importance of protecting the environment brings about a number of efforts undertaken in different countries such as the reduction of fossil fuel use, the development of environmentally friendly energy, to the formation of community as a form of concern for the world[Memo3] to reduce the carbon dioxide content in the atmosphere. One of interesting areas to do research in this case is Thailand. Thailand is a country with a rapidly growing economy over the past three decades in the ASEAN region, where the economic growth is associated with a sharp rise in energy consumption that is a major source of carbon dioxide emission. Increasing carbon dioxide emission annually encoraged Thailand to join the 2004-2009 ASEA

N Plan of Action for Energy Cooperation (APAEC), the ASEAN Socio-Cultural Comunity (ASCC) Blueprint 2009-2015 and the ASEAN Cooperation on Climate aimed at reducing emission levels of carbon dioxide (Sahraie, 2011; Hooi-Hooi and Russell, 2010). However, in reality, the development of carbon dioxide emission in Thailand continues to increase every year (Figure 1). Therefore, this is an interesting issue to investigate.

Thailand is a country in Southeast Asia that has rapidly growing economy over the last three decades. Thailand is the second largest economy after Indonesia in Southeast Asia. Thailand's GDP per capita was 5,907 USD in 2016 with the second largest population in Southeast Asia of 68,863,514 residents. The ability of the Thai government to eradicate national poverty from 1988 to 2011 has allowed the state to be recognized by the World Bank as "*one of the broadest development success stories*" in development and social indicators so as to make Thailand an economically upward country (Overview Thailand, 2011). The rapid increase in economic growth has also been attributed to the level of environmental degradation occurring in Thailand.

Figure 1. International Trade, FDI, Energy Consumption, and GDP, CO2 in Thailand

The relationship of economic growth and energy consumption to carbon dioxide emissions has become an interesting topic to research. Given that in Thailand, to increase its economic activity, energy is one of important factors to run the wheels of economic growth in the country. The economic growth will be followed by the higher energy consumption for supporting activities of community needs. However, the high consumption of energy, especially fossil fuels (crude oil, natural gas and coal) will cause adverse effects on the increase of carbon dioxide gas in the earth's atmosphere. Meanwhile, in the last few decades, many developing countries, including Thailand, have been trying to increase the number of FDI entry to improve their ec

onomy. This makes FDI increasingly important in a country, causing some countries to ignore the quality of the environment so that FDI easily enters the country. This phenomenon can lead to an understanding of FDI that can lead to a decrease in environmental quality. However, increased FDI may also be reversed if low-carbon technologies used in an economic activity on FDI are able to reduce the level of carbon dioxide emission in the country. So, this raises an important question, whether or not the level of FDI can affect the quality of the environment in a country that receives the FDI. Therefore, this study aims at identifying the influence of international trade, Foreign Direct Investment (FDI), energy consumption, and Gross Domestic Product (GDP) on carbon dioxide emissions in Thailand from 1981 to 2015.

2. REVIEW OF LITERATURE

Research on carbon dioxide (CO_2) emissions, energy consumption and economic growth in ASEAN countries including Thailand has been done by Behnaz Saboori and Jamalludin Sulaiman in 2012. The research was done to find out the cointegration and causal relationship between economic growth, CO_2 emissions and energy consumption in ASEAN countries such as Indonesia, Malaysia, Philippines, Singapore and Thailand in the period of 1971-2009 using Autoregressive Distributed Lag (ARDL) and Vector Error-Correction Model (VECM). The results show that there was a positive and significant cointegration relationship between the carbon dioxide emission variable and the energy consumption both in the short and long term in all countries studied. Long-term elasticity on energy consumption associated with carbon dioxide emissions has a higher effect than short-term elasticity. This means that carbon dioxide emission levels are found to increase with respect to energy consumption over time in selected ASEAN countries. Meanwhile, with regard to the variable of economic growth and CO_2 emissions, significant non-linear relationships are found in the country of Indonesia, Singapore, and Thailand in the long term that support the hypothesis of EKC. Granger causality results s

how a causal relationship between consumption energy and CO2 emissions in all ASEAN-5 countries, meaning that CO2 emissions and energy consumption are interrelated with each other.

Research on the impact of the dynamics of GDP growth, energy consumption and population growth on CO2 emissions using the econometric approach of Dynamic OLS in Malaysia has been done by Bagum, et al. (2014) under the title "*CO2 emission, energy consumption, economic and population growth in Malaysia*". The results of this study show that the EKC hypothesis during the study period is not applicable in Malaysia and that both per capita GDP and energy consumption have a long-term positive impact on CO2 emissions; meanwhile, the population growth variable does not have a significant impact on CO2 emissions. However, this study also shows that in the long term, economic growth has a negative impact on CO2 emissions in Malaysia.

In general, researchers conduct research on the emission of carbon dioxide (CO2) by linking the consumption of fossil energy in a country, where fossil energy is the main factor contributing to CO2 emissions in economic activities. However, different things are done by some researchers who associate CO2 emissions with electricity consumption in a country; one of which is Hooi Hooi Lean and Russell Smyth in 2009 under the title "*CO2 Emission, Electricity Consumption, and Output in ASEAN*". The study was conducted by to determine the causal relationship between carbon dioxide emissions (CO2), electricity consumption and economic growth using the Vector Autoreggretion (VAR) method, and to test Granger data causality in five ASEAN countries during the 1980- 2006. The estimation results show that in ASEAN-5 countries, there is a significant non-linear relationship between CO2 emissions and income, and a positive relationship between electricity consumption and CO2 emissions. In a long term, Granger causality test results indicate a direct relationship of electricity consumption and CO2 emissions to economic growth. This means that the ASEAN-5 the economy depends on energy

, where increases in electricity consumption will produce higher GDP.

Research on the testing of the dynamic relationship between carbon dioxide (CO2) emissions, economic growth, energy consumption and international trade based on EKC hypothesis was done by Behnaz Saboori and Abdorreza Soleymani (2011) in Indonesia during the period 1971-2007 using Autoregressive Distributed Lag (ARDL). The study, entitled "Enviromental Kuznets curve in Indonesia, the role of energy consumption and foreign trade" proves that it does not support the existence of the EKC hypothesis in Indonesia, which illustrates an inverse U relationship between income and environmental degradation. In the long run, it shows that international trade is the most significant variable influencing carbon dioxide emissions (CO2), which is then followed by energy consumption and economic growth in Indonesia. To see the stability of variables used in the model, Behnaz Saboori and Abdorreza Soleymani also examined the variables, and the results show that the variables in the estimate model are stable during the use of the sempel period.

3. METHODOLOGY

The data used in this study is secondary data in the form of time series data from the period of 1981-2015 presented in the form of annual data.[Memo4] The main object used in this study is the country of Thailand. The data used in this research are sourced from several sources, including World Bank, BP Statistic, Global Carbon Atlas, EIA and also other data sources supporting this research. The determination of the time span of the study is based on important events occurring in that timeframe, namely the global financial crisis that occurred in 1997-1998 and 2008 which affected almost all economic activities of countries around the world, including Thailand. Variables in this research are carbon dioxide emissions (metric ton) international trade (percent), Foreign Direct Investment (percent), energy consumption (million tons), and Gross Domestic Product (percent). This research uses Vector Autoregression (VAR) method.

The basic model adopted from the research of Kazman and Duman (2014) is as follows:

The above equation is transformed into econometric model; the research becomes:

where :

CO2	= Carbon dioxide emissions	GDP	= *Gross Domestic Product*
TRD	= International trade	*t*	= Time Period
FDI	= *Foreign Direc Investment*	ε	= *Error Term*
EC	= Energy Consumption		

4. EMPIRICAL RESULTS

This study aims to identify the influence of international trade (%), Foreign Direct Investment (%), energy consumption (million tons), and Gross Domestic Product (%) on environmental degradation rate which will be proxied by the level of carbon dioxide emissions (metric tons) in Thailand from the periode 1981 to 2015. The method of analysis used in this research is Vector Autoreggretion (VAR) method by using time series data.

4.1 *Unit Root Test*

The stationarity test of the data was done in the research to see the kestality of data of each variable used to avoid spurious regression. Test stationarity of data in this study employed the ADF test (*Augmented Dickey - Fuller* test). Stationary data are data that have a probability value smaller than the value of α and vice versa. The α values used in this study were 1%, 5%, and 10%. The results of the stationarity test of the data in Table 1 show that the data used in this

study are generally not stationary at the level level. [Memo5]In order for all variables to be stationary at the same level, it is necessary to decrease at the 1st *difference* level. At the stage of stationarity testing at the 1st level, the result difference shows that all variables are carbon dioxide (CO2), international trade (TRD), Foreign Direct Investment (FDI), energy consumption (EC), and Gross Domestic Product (GDP) in Thailand stationary at the level 1st *difference.*

4.2 Cointegration Test

Cointegration test is a test conducted to determine whether or not there is a balance in the long term in the time series data used in the study by comparing the value of *Trace Statistic* with *Critical Value*. Cointegration test in this research was used by using *Johansen-Cointegration* test. The data can be said to achieve cointegration [Memo6]if *Trace Statistic* value is greater than *Critical Value*.

Table 1. Cointegration Test Results

Level	*T-statistic*	*Critical Value*	Cointegration
1%	83.90466	77.81884	Yes
5%	83.90466	65.81970	Yes
10%	83.90466	69.81889	Yes

The result of cointegration test presented in Table 1 states that in this research, cointegration occurred at the level of 1%, 5%, and 10% in all variables in Thailand. This shows that in Thailand, there is long-term relationships among the research variables.[Memo7]

4.3 Optimum Lag

Optimum lag test is a test conducted to determine the optimum lag so that a good model of Vector Autoregression (VAR) in the research model can be obtained. The function of lag use in

the research is to identify the length of period of ketpengaruhan[Memo8] between variables. In this research, optimum lag determination employed AIC (*Akaike Information Criteration*) value because AIC can give additional variable hose [Memo9]to be able to decrease degree of freedom so that in VAR model, with minimum AIC value, optimal hose will be found on specification of built model. Based on the minimum AIC value approach, it is known that Thailand has a minimum lag of 1 with a value of 6.319260. Then, the lag to be used in the VAR model is lag 1.

4.4 Granger Causality Test

Testing in granger causality was done to find out whether or not the variables have reciprocal relationship in the same direction or two directions. In this study, a variable can be said to have a causality relationship if the probability value is smaller than α of 0.05, but if the probability value is greater than the value of α, then there is no relationship between variables in the study. Based on the results of the Granger causality test in Thailand, using lag 1, there are eight relationships between variables, namely the variable of carbon dioxide with international trade variable, carbon dioxide variable with FDI, carbon dioxide variable with energy consumption, international trade variable with FDI, variable of energy consumption with international trade, energy consumption variable with FDI, GDP variable with FDI, and variable of GDP with energy consumption.

4.5 Estimation Model Vector Autoregressive (VAR)

After going through several stages in VAR testing and the optimum lag of the research model had been known, the estimation results from the Vector Autoregression model (VAR) can be seen. The results of the VAR empirical model will be presented. The determination of the significant level of VAR model in this study is reflected by the probability value less than the va

lue of $\alpha = 5\%$. The VAR model which will be presented is only the model of carbon dioxide emissions (CO2) in Thailand, while other models are not written down.[Memo10]

$$CO2_t = 0.40773 + 0.533852CO2_{t-1} - 0.002116TRD_{t-1} + 0.002304FDI_{t-1} + 0.53855EC_{t-1}$$

$$[0.0276] \qquad [0.0001] \qquad [0.0003] \qquad [0.6161] \qquad [0.0000]$$

$$+ 0.007218GDP_{t-1} +$$

$$[0.0002]$$

From the VAR estimation result, it is found that international trade variable has an influence with negative direction toward carbon dioxide emission. Then, the carbon dioxide emissions, energy consumption, and GDP also showed significant results on CO2 emissions but with a positive direction in 1981-2015. The FDI variable does not show any effect on carbondixide emission. It is known based on probability value of FDI variable which has a value of more than $\alpha = 5\%$.

4.6 Impulse Response Functions (IRF) and Variance Decomposition (VD)

IRF is used in this research to know the shock that can affect other variables. Then, it will be followed by testing *Variance Decomposition* (VD) to determine the magnitude of influence on each variable. In this case, IRF testing is supported by VD testing, where IRF testing only describes the shock through a graph which will be supported by the VD test to know the magnitude of the effect. Here are the results of IRF and VD testing in Thailand, showing various responses to the effects of shock or shock from the variables used in this study.

Figure 2. IRF Test Results

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of CO2 to CO2

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of CO2 to TRD

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of CO2 to FDI

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of CO2 to EC

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of CO2 to GDP
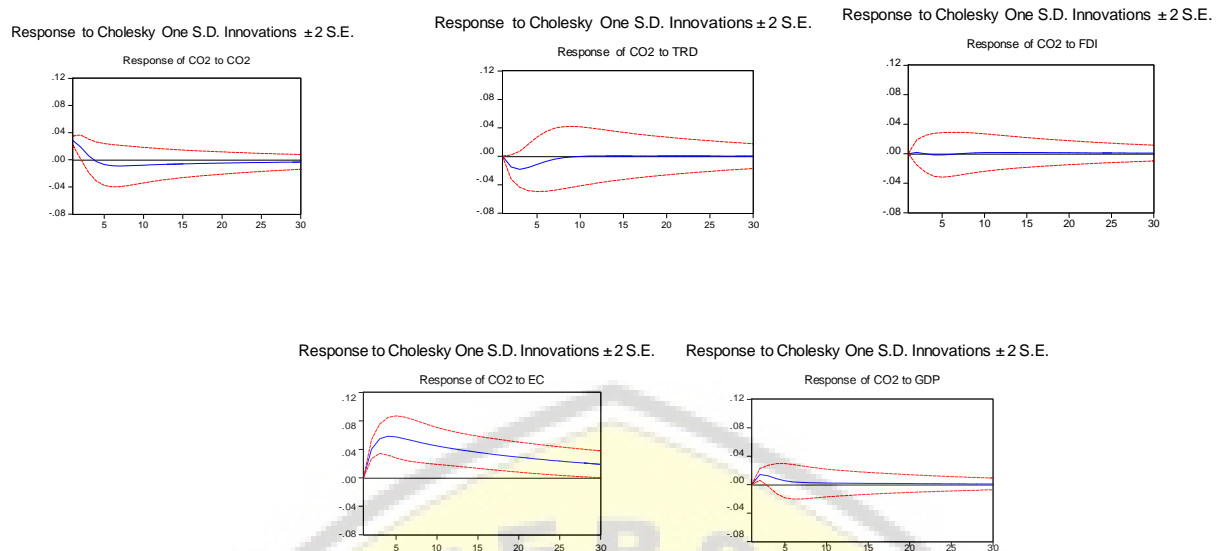
The IRF test results indicate that the variable of energy consumption is the variable that has the greatest shock to carbon dioxide emissions. Figure 1 shows that it takes a long time to stabilize the carbon dioxide emissions associated with shocks that occur in energy consumption. This is also shown by the results of the VD test which indicates that the energy consumption variable in the 30th period of 91.82108 percent in Thailand is the variable that contributed the highest to the carbon dioxide emission level in 1981-2015.

4.7 The effect of International Trade, Foreign Direct Investment (FDI), Energy Consumption, and Gross Domestic Product (GDP) on Carbon Dioxide Emissions in Thailand with VAR

VAR method performed in Thailand in 1981-2015 show that international trade variable has a significant influence on carbon dioxide emissions in a negative direction. An increase of international trade will reduce the amount of carbon dioxide emissions. This is in line with the research of Antweiler, et al (2001) conducted in 44 countries using panel data analysis, indicating that international trade will decrease carbon dioxide emissions. Improvement in international trade also means an increase in the scale of production of a company within a country. An increase in international trade will make a company increase the amount of its production to

meet the demand in the international trade. Conditions like this will encourage the company to use advanced technology that is energy efficient and environmentally friendly. So, the increase in international trade will reduce the level of environmental degradation, especially carbon dioxide emissions. Then, on the energy consumption variables, GDP also shows a significant effect on carbon dioxide emissions but with a positive direction. This means that an increase in energy consumption and GDP in Thailand will affect the increase in carbon dioxide emissions. This result is in line with research conducted by Ramping and Smyth (2010) which shows that energy consumption and GDP have a positive relationship with carbon dioxide emissions in 5 ASEAN countries, including Indonesia, Malaysia, Philippines, Singapore and Thailand during the period of 1980-2006 using data VAR panel.

Energy has an important role in the life of the world community, including in Thailand. The use of energy in industrial and household activities makes it easy for the community to support their activities. In addition, energy consumption in productivity activities will also encourage economic growth in a country. So, this will encourage a country to increase its energy consumption. Consequently, an increase in energy consumption will have an impact on the increase in carbon dioxide emissions that causes global warming effects (Nuryanto and Rifai, 2017). It is said that extraction and burning that occur in the energy of fossil fuels can produce carbon dioxide gas in the earth's atmosphere. This condition is in line with the results of research conducted by Haliciouglu (2008) and Chibueze, et al (2013), suggesting that energy consumption is one of the largest factors that contributes to the generation of carbon dioxide gas in the Earth's atmosphere that causes global warming.

Economic growth and energy consumption are interrelated variables. An increase in energy consumption can lead to an increase in economic growth through productivity within a country. According to Kuznet (1970) in Jhingan (2002), economic growth is a process of increasing

production capacity undertaken by a country in order to improve the fulfillment of the needs of its people. To improve the fulfillment of the needs of the community, a country will increase the amount of energy consumption to support production activities in the country. This is what causes environmental degradation, especially carbon dioxide emissions when there is a rise in economic growth and energy consumption in a country. This condition is in line with Kuznets Curve's Enviromental theory that explains the relationship between economic growth and the level of environmental degradation of a country. The low economic growth in the first stage will encourage a country to increase its economic growth through various economic activities regardless of the quality of the environment. So, the results of economic growth in a country will be followed by the level of environmental degradation. Meanwhile, the FDI variable does not show any positive or negative effects on carbondixide emissions in Thailand. This is known based on the probability value of FDI variable, which is more than $\alpha = 5\%$.

4.8 Policy Implications

The increasing carbon dioxide emissions in Thailand encourage the efforts to reduce the emissions. In this regard, the Government of Thailand has targeted to cut carbon dioxide emissions by 20% by 2030 and make policies related to the use of renewable energy. The policy is the Alternative Energy Development Plan 2008-2022 which aims to achieve 30% share of renewable energy in total final energy consumption in 2036, the government formed a strategy, that is by promoting environmentally friendly technology with the use of alternative energy such as biofuel, biomass, and biogas. In addition, the Thailand government also made a policy on the Energy Efficiency Development Plan (EEDP) 2011-2030. Under the policy, the Thailand government sets short and long-term energy conservation targets at both national and regional levels in all sectors in Thailand. For the industrial sector, EEDP implementation is conducted by the Thailand government with a strategy focusing on R & D to improve energy efficiency

of production processes using renewable alternative energy technologies, providing support f

or all industrial energy efficiency activities listed in EEDP, and creating cooperation between

public and private sectors, as well as educational / research institutions in energy efficiency d

evelopment efforts in Thailand.

5. CONCLUSION

Based on the results of data analysis using the Vector Autoregretion (VAR) method to determ

ine the effect of international trade, Foreign Direct Investment (FDI), energy consumption, an

d Gross Domestic Product (GDP) on carbon dioxide emissions in Thailand in 1981-2015, it is

found that carbon dioxide emissions in Thailand are affected by international trade with a ne

gative direction. In addition, carbon dioxide emissions in Thailand are also significantly influ

enced by energy consumption variables, and GDP but with a positive direction. This is reflect

ed by a probability value less than the value of $\alpha = 5\%$ of energy consumption and GDP.

REFERENCE

Abidin, I., et al. 2015. Foreign Direct Investment, Financial Development, International Trad

e and Energy Consumption: Panel Data Evidence from Selected ASEAN Countries. *Interna

tional Journal of Energy Economics and Policy*, 2015, 5(3), 841-850.

Antweiler, W., Copeland, B., dan Taylor, MS. 2001. Is Free Trade Good for the Enviroment?.

America Economic Review. 91(4), 877-908.

Bagum, R., Sohag, Kazi., Abdullah, SMS., Jaafar, M. 2014. CO_2 emissions, energy consumpt

ion, Economic and population Growth in Malaysia. *Renewable and Sustainable Energy Revi

ews*. Vol. 41(2015) 594–601.

BP. 2017. BP Statistical Review of world Energy. *British Petroleum,* London, UK.

Chibueze, E.N., Chukwu, J.O., Moses, Nnaji. 2013. Electricity Supply, Fosil Fuel Consumpti

on, CO_2 emissions and Economic Growth: Implications and Policy Options for Sustainable

Development in Nigeria. *International Journal of Energy Economics and Policy,* 3(3), 262-271.

Diartho, H.C. 2017. Enviromental Tax as an Instrument to Restore Coastal Pollution in Banyuwangi Regency. *American Journal of Economics*, 7(5), 240-248.

Gujarati, Damodar N., dan Potter Dawn C. 2009. Basic Econometrica, 5th ed. *McGraw-Hill Education* (Asia).

Halicioglu, Ferda. 2008. An econometric study of CO2 emissions, energy consumption, income and foreign trade in Turkey. *Energy Policy* 37, 1156e1164.

He, J., Richard, P. 2010. Enviromental Kuznets Curve for Co2 in Canada. *Ecological Economics*, 69, 1083-1093.

IPCC. 2007. Climate Change 2007: the Physical Science Basic. Contribution of Working Group I to the Fourth Assessment Report of the Intergovermental Panel on Climate Change, Paris.

Jafari, Y., Othman, J., Hassan Shaari Mohd Nor, Abu. 2012. Energy Consumption, Economic Growth and Environmental Pollutants in Indonesia. *Jurnal of Policy Modeling* 34 (2012) 879-889.

Kazman, A., dan Duman, YS. 2014. CO2 Emissions, Economic Growth, Energy Consumption, Trade and Urbanization in New EU Member and Candidate Countries: A Panel Data Analysis. *Econ Model* 2015;44:97–103.

Khalid, A., dan Muhammad, J. 2013. Energy Consumption, Carbon Emissions and Economic Growth in Saudi Arabia: an Aggregate and Disaggregate Analysis. *Energy Policy*. 62, 1525-1532.

Lean, Hooi Hooi., dan Symth, Russell. 2010. CO2 Emissions, Electricity Consumption and Output in ASEAN. *Applied Energy,* 87, 1858-1864.

Lin, Boqiang., dan Sun, Chuanwang. 2009. Evaluating Carbon Dioxide Emissions in Internati

onal Trade of China. China Center for Energy Economics Reserce, Xiamen Univercity. *ELS EVIER journal Energy Policy* 38 (2010) 613-621.

Liu, Y., Zhou, X., Yang, JH., Hoepner, A. 2016. Corporate Carbon Emission and Financial Performce: Does Carbon Disclosure Mediate the Relationship in the UK?. *ICMA Centre*: ICM-2016-03.

Luthfi, A., Maryunani, M., Saleh, M., dan Dirtho, H.C. 2018. Analysis of Sustainable Ground water Resources Management in Jember District (Study in Sumberjati Village, Silo Sub-District).

Luthfi, A., Saleh, M., Maryunani, M., dan Diartho, H.C. 2017. Ability to Pay and Willingness to Pay Analisys of Clean Water Needs From Dusun Sepuran, Jember Regency. *Journal of Indonesian Applied Economics,* 7(2), 190-200.

Nuryanto, Nunung., dan Rifai, Muhamad Amin. 2017. Analysis of Causality between Economic Growth, Energy Consumption and Carbon Dioxide Emissions in 4 ASEAN Countries. *International Journal of Energy Economics and Policy,*7(6), 141-152.

Saboori, Behnaz, dan Solaemany, A. 2011. Environmental Kuznets Curve in Indonesia, the Role of Energy Consumption and Foreign Trade. *Munich Person RePEc Archive (MPRA) Paper* No. 3153.

Saboori, Behnaz., dan Sulaiman, Jamalludin. 2012. CO_2 Emissions, Energy Consumption and Economic Growth in Assosiation of South East Asian Nations (ASEAN) Countries: A Cointegration Approach. Economic Programme, School of Social Sciences, Universiti Sains Malaysia, 11800 USM Penang, Malaysia. *Energy* 55 (2013) 813e822.

Sahraie, Melodoe. 2011. The ASEAN Action on Climate Change: Recognizing or Pro Actively Addressing the Issue?. *IDLO Sustainable Development Law on Climate Change Working Paper Series 2011.*

Salim, R.., Rafiq, S., Hassan, K. 2008. Causality and Dynamics of Energy Consumption and

Output: Evidence from non-EOCD Asian Countries. *Journal Economic Development.* 33, 1 -26.

Shahbaz, Muhammad., Hye, QMA., Tiwary, AK. 2011. Economic Growth, Energy Consumption, Financial Development, International Trade and CO_2 Emissions in Indonesia. *ScienDirect - Renewable and Sustainable Energy Reviews* 25 (2013) 109-121.

Shahzad, S., Rehman, MU., Hurr, Maryam., Zakaria, M. 2014. DO Economic and Financial Development Increase Carbon Emission in Pakistan: Ampirical Analysisi Through ARDL Cointegration and VECM Causality. *Munich Person RePEc Archive (MPRA) Paper* No. 60310.

Zhu, Huiming., Duan, Lijun., Guo, Yawei., Yu, Kening. 2016. The Effects of FDI, Economic Growth and Energy Consumption on Carbon Emissions in ASEAN-5: Evidence from Panel Quantile Regression. *Economic Modelling* 58 (2016) 237–248.