The Effect of World Oil Price Fluctuations, CO_2 Emissions, GDP Per Capita, Government Expenditures and Trade Openness on Income Inequality in ASEAN

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Abstract. Income inequality is an economic problem that arises due to rapid economic growth. ASEAN is one region with stable economic growth and development dynamics. This steady economic growth and development are not accompanied by an improvement in the income distribution received by the community. Many factors cause this to happen. This study aims to determine the effect of world oil prices, carbon dioxide emissions, GDP per capita, government spending, and trade openness on income inequality using the Gini index indicator in ASEAN in 2009–2020. This research uses secondary data from panel data consisting of cross sections eight countries in ASEAN and the 2009–2020 time series. The approach method used in estimating panel data for this study is the Fixed Effect Model (FEM). The panel data regression results show that world oil prices have a positive and significant effect on income inequality, and government expenditure and trade openness have a negative and significant impact on income inequality. In contrast, the variable GDP per capita and carbon dioxide emissions have a negative and insignificant effect on income inequality.

Keywords: Income Inequality · World Oil Price · Carbon Dioxide Emissions · GDP per Percapita · Government Expenditure · Trade Openness

1 Introduction

Economic development is a step to increase economic growth to achieve social welfare through rising per capita income. However, rapid economic growth will significantly affect Inequality and income distribution. Economic development has trade-offs between income distribution and rapid economic growth. As economic development moves towards more excellent income distribution, economic growth will not reach high growth rates for some time. Instead, the more emphasis on development to achieve a faster growth rate, the greater the possibility of unequal income distribution [1].

Income inequality is an economic problem that arises from differences in income between groups with high and low incomes. The economy is said to be unequal when

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Inequality persists between high-income and low-income groups. Income inequality is not only a problem in developing countries but can be a problem in developed countries. The difference lies in how high the level of Inequality is and how difficult it is to overcome through the area and population. The instrument for measuring income inequality is the Gini ratio which is assisted by using the Lorentz curve [2]. The Gini value of the balance ranges from zero to one. The income distribution is very even when the Gini ratio is zero because each group has an even income distribution. Instead, a Gini coefficient of one proves a total imbalance in income distribution because one person has all the income.

ASEAN stands for Association of Southeast Asian Nations, a geopolitical and economic organization whose members consist of countries in the Southeast Asian region. ASEAN countries include Indonesia, Malaysia, Singapore, the Philippines, Thailand, Brunei Darussalam, Vietnam, Laos, Myanmar, and Cambodia. According to [3], ASEAN's economic movement is exceedingly stable compared to other regions. While other areas struggle to survive the crisis, ASEAN has the most dynamic economic growth, with an average annual growth rate of 5%. However, this steady economic expansion has yet to be accompanied by improvements in how people's income is distributed. This issue is reflected in the level of Inequality that fluctuates in line with economic growth. The Gini ratio is several indicators that can determine the degree of income inequality.

World Bank and Standard World Income Inequality Database mentioned that economic growth and development and income inequality in ASEAN constantly fluctuate yearly. Economic growth rose from 4.08% in 2015 to 5.09% in 2017. However, the increase in economic growth is also accompanied by the rise in ASEAN income inequality. The number went from 39.86 in 2015 to 39.99 in 2017. In 2016, the economic growth in Thailand increased from 3.23% (2015) to 3.43% 2016. Income inequality also increased from 36.00 in 2015 to 36.90 in 2016.

According to [4], Inequality has not been eliminated but can be minimized to a tolerable level for a particular social system. This situation is to maintain harmony between the design and its development. Therefore, it is unsurprising that imbalances are still found in developing and developed countries. What sets it apart is the many disparities. Based on several factors that influence the change in income inequality, one of which is GDP per capita. GDP per capita affects income inequality, as shown by the Kuznets curve. The Kuznets curve illustrates its relationship to GDP per capita and income inequality. The higher GDP per capita will increase income inequality which is depicted by the Gini ratio until, at a certain peak point, the level of income inequality will decrease. The process of growing and reducing causes the inverted U-shaped Kuznets curve. [5] noted, GDP per capita in ASEAN countries has grown year on year. However, during the 2020 pandemic, the GDP per capita of ASEAN countries has simultaneously decreased from the previous year.

The fluctuation in world oil prices is considered capable of influencing the income imbalance in ASEAN. The increase in world oil prices can increase income inequality because the burden of public expenditure has also increased. [6], indicating that world crude oil prices have fluctuated from 2009–2020. If we look at the data on the increase in world oil prices in 2017, world oil prices have far increased from the previous year, namely 50.91 US Dollars/barrel. This situation was due to a global decrease in crude oil inventories and liquid materials. In 2018 world oil prices also increased from the previous

year, namely 64.82 US Dollars/barrel. This increase in crude oil prices occurred due to a reduction in supplies that OPEC and the implementation of United States sanctions against Iran and Venezuela had carried out.

Based on the background stated above, ASEAN has a variety of capabilities and issues related to income inequality. Especially world oil prices, where world oil prices fluctuate yearly, as is known if world oil prices continue to increase, it will increase income inequality due to an increased expenditure burden Public. GDP per capita can also increase income inequality when viewed from the kuznet curve. Government expenditure and trade openness can reduce income inequality because increasing government expenditure and trade openness can improve people's job opportunities. Carbon dioxide emissions can also reduce income inequality because the increase in carbon emissions indicates that economic development continues to increase due to additional economic activities. This study aims to determine the effect of variables on world oil prices, carbon dioxide emissions, GDP per capita, government expenditure, and trade openness on income inequality in ASEAN during the 2009–2020 period.

2 Literature Review

2.1 Inequality Theory

Income inequality can be understood as Inequality between the rich and the poor. The disparities between regions within a country are expected. This issue happened because of a mismatch in the acquisition of resources and demographic conditions. This disparity causes differences in regional advantages when supporting the course of development. Therefore, there are generally developed and underdeveloped areas everywhere [7].

[8] argues that Inequality is the relative standard of living of various classes of society due to differences in regions within the country resulting in differences in resources and their factors of production in each area. Having different resources and factors of production causes differences in the distribution of income and the level of development in each room, which results in a gap between rich and poor or Inequality in the different regions.

The inverted "U" curve explains that income distribution tends to worsen at the start of growth and will improve later. This concept shows that income will initially weigh but will be evenly distributed after reaching a certain level of growth. We cannot avoid the stages of increase and decrease in revenue; all of them follow the development procedures of each country [2].

According to [9], Inequality can be caused by several factors: inflation, credit pressure, gross domestic product, government spending, human development index, consumption, unemployment, urbanization growth, poor health, domestic saving, and minimum wages.

[10] The research found that fiscal decentralization is a factor that affects income inequality, and economic growth can mediate the effect of investment on regional Inequality.

2.2 Income Inequality

According to [11], income distribution is a concept related to income distribution to all people; or households in a society.

According to [2], economists usually distinguish two main income distribution measures for further qualitative and quantitative research. The two measurements are the size distribution and the Lorenz curve.

The indicator that economists like to use is the size distribution which describes the share of income per person (personal distribution of income) or the size distribution of income (size distribution of payment). This measure directly calculates the amount of revenue per person or household. This indicator mainly focuses on how much income a person receives, regardless of the source of income [2].

Another technique that is often used to analyze personal income statistically is to use the Lorenz curve. According to [2], the Lorenz curve describes the real quantitative relationship between the percentage of the population that earns a certain income and the rate of money earned from the total income of one year. The Lorenz curve is increasingly unequal (unequal wealth distribution). The more it deviates from the diagonal line, it is a line of perfect equality.

While the functional distribution is often described as the ownership of the factors of production, the size distribution is usually defined as a measure of the share of income each person receives. According to [2], this index focuses on national income for each factor of production (land, labor, and capital). This idea compares the percentage of the total income distributed in the form of rent, interest, and profit to the income of the labor force as a whole rather than a particular business unit or individual means of production.

A standard measure of Inequality in a region is the Gini ratio. The Gini ratio value ranges between 0 and 1. A Gini ratio of 0 means that the income distribution is very even because each group has the same portion of income. This situation is shown graphically by overlapping the Lorenz curve with perfect evenness. However, a Gini coefficient of 1 indicates a total inequality in the income distribution because one person has all the income. In short, the higher the Gini coefficient, the more unequal the income distribution in a country will be.

2.3 World Oil Price

World oil prices are determined by supply and demand for these commodities. In international oil markets, crude oil is measured in spot prices; West Texas Intermediate (WTI) or Brent is typically used as the benchmark. Crude oil traded on the WTI market is high quality and contains little sulfur. Because this oil is so good for burning as a fuel, its price has become the standard for international trade.

The increase in oil demand and the arrival of newly industrialized countries directly impact world oil prices. When connected, it will affect the national economy. For oil-producing (exporting) countries, rising oil prices can increase real national income by increasing export income. On the other hand, in the case of oil-importing countries, rising oil prices cause domestic prices and inflation to increase. Inflation will reduce demand for non-oil and gas commodities and minimize investment in oil-importing countries. Producers will reduce their production, and its cuts will reduce tax revenues while

increasing unemployment. Rising unemployment will exacerbate income inequality in the country.

[12] using multiple regression analysis, OLS (Ordinary Least Square) found that world oil prices and capital expenditures positively and significantly impacted income inequality in Indonesia during 1985-2015 with regression coefficient values of 0.0784 and -0.0521, respectively. Along with empirical significance (ρ), t are 0.0000 (<0.05) and 0.0000 (<0.05). Income inequality has no impact on economic growth, as evidenced by the empirical significance value (ρ) t of 0.3924 (>0.10).

2.4 Carbon Dioxide Emissions

All greenhouse gas emissions for which companies, goods, activities, or individuals are responsible, directly or indirectly, are measured as "carbon emissions." Most greenhouse gases, especially carbon dioxide, are often created by human activities and are obtained from burning fossil fuels for transportation, heating, and electricity.

An increase in carbon dioxide emissions will reduce income inequality because an increase in carbon dioxide emissions indicates better economic development due to more productive businesses in a country. In developing countries, economic development is increasing, and the increasing number of business units in an area indicates this. Increased carbon dioxide emissions from the production process and labor transportation will accompany the increase in business units. An increase in business units will require many workers to increase employment absorption and reduce unemployment, which in turn causes income inequality to improve or people's income to become more evenly distributed.

Some of the previous studies [13] using the corrected standard error panel regression model with the Fixed Effects Longitudinal model selected found that carbon dioxide emissions significantly and negatively affected income inequality in the United States during 1997–2012. On the contrary, [14] found that carbon dioxide emissions have a negative and insignificant effect on income inequality in China for the period 2000-2018

2.5 GDP Percapita

The average income society receives for its value-added output during a year is known as GDP per capita. GDP per capita measures a country's economic health at current or constant prices over a certain period. GDP per capita, or GDP per person, is defined as GDP at current prices. Meanwhile, GDP per capita is based on constant prices for estimating the growth and development of a country's real economy per capita [15].

High economic growth is reflected in the high GDP per capita, which is expected to reduce poverty and income inequality in a country. Economic development can also increase at an increase in GDP per capita, reducing income disparities in a country. GDP per capita also determines the capacity of a region for economic development.

Study [16] using panel data regression analysis on the selected FEM model found that GDP per capita had a negative and significant effect on income inequality in ASEAN during 1995-2016 to the regression coefficient value of -0.000163, along with empirical significance (ρ) t is 0.0006 (<0.05). On the contrary, [17] use of path analysis found per

capita income to have a negative and insignificant effect on income inequality in DKI Jakarta province during the 2000–2013 period.

2.6 Government Expenditure

Government expenditure is the government's purchase of goods and services to benefit the community and finance development [11]. There are two main types of government expenditure on goods and services. The first is government expenditure on consumer goods and services, such as employee salaries, maintenance costs, expenditure on goods, and others. Second, the cost of infrastructure development as a form of government investment [11].

According to Wagner's argument, relative government expenditure increases when the per capita income of an economy increases. Government expenditure that improves the quality of infrastructure and public facilities and special initiatives can boost a country's business sector and community productivity. With a rational distribution of government expenditure, improvements in government infrastructure and public facilities will remain good, thereby increasing state productivity, people's income, and welfare.

Some previous studies, including [18] using path analysis, found that government expenditure negatively and significantly affected Inequality in Income inequality in Bali during 2013-2018. With an empirical significance (p) t of -0.015 (<0.05) and investment did not affect the Imbalance of Income Distribution to practical value (p) t of 0.116 (>0.10). Meanwhile, Government Expenditure and Investment affect Public Welfare, each with a reasonable value (p) t of 0.001 (>0.05) and 0.007 (>0.05). Study [19], using panel data regression analysis of the selected model FEM, found that government expenditure did not affect income imbalances in Manokwari district, West Papua Province, during 2015-2020 with a regression coefficient value of -0.048289, along with empirical significance (ρ) t is 0.1086 (>0.05).

2.7 Trade Openness

According to [20], Trade Openness (TO) is the ratio of products and services exported and imported from other countries as a percentage of gross domestic product (GDP). According to [21], trade openness measures the relationship between international trade and the average total trade (imports and exports of goods and services) as a percentage of GDP.

[22] Payments for production elements are entered into the model to create the Heckscher-Ohlin model. There will be a production movement towards commodities with abundant production elements and away from goods using scarce production components because exports and imports are based on the abundance and scarcity of production factors. When there is trade, the factor costs of production, wages, and rent paid to produce goods in the two countries will be the same. Wages for skilled workers will fall when the government seeks to increase trade openness, for example, by lowering tariffs, while the income of low-skilled workers will increase. Reducing income disparities will be affected by changes in earnings between low- and high-income workers [23].

During the 2000-2020 period, in Indonesia, through multiple linear regression analysis, we found economic growth, foreign investment, and trade openness to affect

income distribution inequality, each with a regression coefficient of 0.5184, 0.1852, and -0.17735, and the empirical significance (p) t of 0.0152 (<0.05), 0.0004 (<0.05) and 0.0024 (<0.05). The relationship pattern used to relate this variable to Inequality in the Income Distribution is linear. Inflation was found to not affect income distribution inequality, with an empirical significance of (p) t of 0.5619 (>0.10) [24]. Different studies found by [16] that trade openness has a positive and significant effect on income inequality in ASEAN during the period 1995–1996, with a regression coefficient value of 0.018717, along with empirical significance (ρ) t is 0.00000 (<0.05).

3 Methods

The data found in this research is secondary or indirect, and the data comes from the results of a literature study. The data collected in this survey was provided by the World Bank, the Standard World Income Inequality Database (SWIID), and Our World in Data (OWID). When we complete the data processing process, we can take the title information from the literature and articles from Google Scholar. The forms of this secondary data are time series and cross-section. We collected the time series data for this study from 2009 to 2020. Then we took the cross-section data from 8 countries in ASEAN. This research uses panel data regression analysis over the 2009-2020 period in 8 ASEAN countries, with the econometric model as follows:

$$GINI_{it} = \beta_0 + \beta_1 COP_{it} - \beta_2 CO2_{it} - \beta_3 GDPPC_{it} - \beta_4 GOV_{it} - \beta_5 TO_{it} + \varepsilon_{it}$$

where:

GINI : Income Inequality
COP : World Oil Price (US Dollar/barrel)
CO2 : Carbon Dioxide Emissions (metric tons per capita)
GDPPC : GDP per capita (thousands of US Dollars)
GOV : Government Expenditure (billion US Dollars)
TO : Trade Openness (Percent)
ε : Error term (error factor)
β_0 : Constant
$\beta_{1...}\beta_5$: Regression coefficient of the independent variable
i : Cross Section (8 Countries in ASEAN)
t : Time Series (2009–2020 Period)

4 Analysis

The hypothesis testing aims to determine the results obtained from the appropriate regression. Then the results of the Panel Data Regression Estimation are carried out using the PLS (pooled ordinary least square) approach, then FEM (fixed effect model), and using REM (random effect model) according to Table 1.

Table 1. Estimation Results of Panel Data Regression Econometric Model – Cross section

Variable	Regression Coefficient		
	PLS	FEM	REM
C	43.89013	56.79851	49.06610
COP	0.038484	0.044629	0.036782
CO2	-0.464424	-0.086998	-0.251072
GDPPC	-6.76E-05	-0.000116	-6.48E-05
GOV	7.93E-12	-9.95E-11	-5.91E-11
TO	0.017082	-0.075294	-0.016623
R2	0.560156	0.825667	0.213097
adjusted. R2	0.535720	0.80462	0.169380
F stats	22,92357	32.75840	4.874490
Prob. F statistics	0.000000	0.000000	0.000543
Model Selection Test			
(1) Chow			
Cross-Section F(7.83) = 18.058599;			
Prob.F(7.84) = 0.0000			
(2) Hausman			
Cross-Section random $\chi 2$ (5) = 20.630415;			
Prob.$\chi 2$ = 0.0010			

Source: Attachment

4.1 Estimated Model Selection Test

The chow test and the Hausman test serve as a selector for a better-estimated model than the PLS (pooled least squares), and then the FEM (fixed effect model) is performed if going to test the chow. Then a Hausman test will be carried out which is carried out for the selection of REM. Thus, an additional examination must be carried out. The LM (Lagrange multiplier) test is used to select a model with a reasonable estimate, namely using PLS (pooled least squares), or it can be done using REM (random effect model).

4.2 Chow Test

The Chow test is used to find PLS or FEM estimates. The model, H0 for the Chow test, is PLS, and the model for HA: is FEM. H_0 is accepted if found probability $F < \alpha$. H_0 can be rejected if the probability $F < \alpha$. The results of the Chow test are shown in Table 1.

From Table 1, we can see that the probability of the F statistic is 0.0000 (<0.05), so H_0 is rejected. So the estimated model is FEM.

4.3 Hausman Test

The Hausman test is usually performed to allow a choice between the FEM or REM models. Hausmann H_0 test: The Estimation Model is a form of REM, and the H_A: An

Table 2. Fixed Effect Model (FEM) Estimation Model

$\widehat{GINI_{it}}$ =56.7985 + 0,0446COP_{it} − 0,0870CO2$_{it}$ − 0,0001$GDPPC_{it}$ − 9.95E-11GOV_{it} − 0,0753TO_{it}
(0.0006)*(0.5844)(0.1162)(0.0001)* (0.0001)*
R2=0.825667; DW = 1.012122; F. = 32.75840 ; Prob. F = 0.000000

Source: Appendix 1. Information: *Significant at = 0.01; **Significant at = 0.05; ***Significant at = 0.10; The number in brackets is the probability value of the t statistic.

Estimation Model is FEM. H_0 is acceptable if the value of probability $\chi 2 < \alpha$. The Hausmann test results are shown in Table 2. From Table 2, the likelihood of $\chi 2$ 0.0010 (<0.05) can be seen, so H_0 is rejected, and the estimated model is FEM. The Hausmann test results are shown in Table 2.

4.4 Existence Test of FEM Estimated Model

An accurate model is when at least one independent variable affects the dependent variable (not all regression coefficients are zero). The F test is if the model is actual. H_0 will be accepted if the probability of F > α; H_0 will be rejected if the probability of F < α.

From Table 2, it can be seen that the probability of the F statistic is 0.0000 (<0.05), so H_0, the conclusion of the model used for research, exists.

4.5 Interpretation of the Coefficient of Determination (R2)

The coefficient of determination (R2) determines the predictive power of the estimated model. From Table 2, the value of R2 for the Fixed Effect Model (FEM) is 0.825667. This result means that world oil prices can explain 82.67% of the variation in income inequality variables, carbon dioxide emissions, GDP per capita, government spending, and trade openness. The rest, amounting to 17.43%, is influenced by other variables.

4.6 Test the Validity of the Effect of Independent Variables on the FEM Estimated Model

The effect validity test evaluates the significance of individual or partial effects of the independent variables. Test the validity of the effect using the t-test. H_0: the independent variable I to the estimated model has no significant effect; H_A: independent variable I to the estimated model has a significant effect. H_0 will be accepted if the probability t > α; H_0 will be rejected if the probability t < α. We can find the results of the validity of the effect in Table 3.

Table 3. Validity Test Results for the Effect of Independent Variables

Variable	Sig.t	Criteria	Conclusion
COP	0.0006	<0.05	Significant at = 0.05
CO2	0.5844	>0.05	Not significant
GDPPC	0.1162	>0.05	Not significant
GOV	0.0020	<0.05	Significant at = 0.05
TO	0.0001	<0.05	Significant at = 0.05

Source: Appendix, processed

5 Discussion

5.1 The Effect of World Oil Price on Income Inequality

The results of the study determine that world oil prices have a positive and significant influence on income inequality when the regression coefficient is 0.044629 bas well as empirical significance (ρ) of 0.0006 (<0.05). This result means that if the world oil price increases by 1 USD/barrel, it can increase the income imbalance by 0.044629 points. The results of this research follow the results of the study conducted [12] on the use of OLS (Ordinary Least Square) multiple regression analysis found that world oil prices and capital expenditures had a positive and significant influence on income inequality in Indonesia during 1985–2015.

Rising world oil prices can increase income inequality because the public expenditure burden also increases. A country's domestic oil prices will follow an increase in world oil prices. This result will cause goods distribution costs to grow as well. An increase in distribution costs will increase the overall output price, which can cause inflation. For people with high incomes, this is fine. However, for middle and lower-class people, this problem makes people in the lower middle class contribute less or save on expenses. There is a shift in contribution in spending on economic needs between high-income and lower-middle groups, which will affect the Gini index as a measure of income inequality.

5.2 The Effect of Carbon Dioxide Emissions on Income Inequality

The results show that carbon dioxide emissions have a negative and insignificant effect on income inequality with a regression coefficient of - 0.086998 bas well as empirical significance (ρ) t of 0.5844 (>0.05). This result means that if carbon dioxide emissions go up or down, it will not affect income inequality. This result contradicts the initial hypothesis that carbon dioxide emissions will reduce income inequality. The insignificant effect of carbon dioxide emissions on income inequality may be related to fuel oil which is now more environmentally friendly, and the replanting of trees in deforested forests.

This research follows the research conducted by [14] that found that carbon dioxide emissions had a negative and insignificant effect on income inequality in China from 2000 to 2018. Different studies found [13] that carbon dioxide emissions negatively and significantly affected income inequality in the United States during 1997–2012.

5.3 The Effect of GDP Per Capita on Income Inequality

The results of the study determine that GDP per capita has a negative and insignificant effect on income inequality on the regression coefficient of -0.000116 as well as empirical significance (ρ) t of 0.1162 (>0.05). If GDP per capita increases or decreases, it will not affect income inequality. This case does not agree with the initial hypothesis that per capita GDP will increase income inequality. The non-influence of GDP per capita on income inequality is related to the inability of a region to increase its economic development.

This research is suitable for the study conducted by [17], who found that per capita income had a negative and insignificant effect on income inequality in DKI Jakarta province during the 2000-2013 period. Different studies found [16] that GDP per capita negatively and significantly affected income inequality in ASEAN during 1995–2016.

5.4 The Effect of Government Expenditure on Income Inequality

The results of the study determine that government expenditure has a significant and negative effect on income inequality with a regression coefficient of -9.95E-11 as well as empirical significance (ρ) t of 0.0020 (<0.05). This result means that if government expenditure increases by 1 billion US Dollars, income inequality will decrease by -9.95E-11 points. The results align with the research conducted by [18], where there is evidence that government expenditure harms income disparities. We successfully validated the first hypothesis. This result shows that an appropriate government expenditure allocation can reduce income disparity.

Government expenditure in the form of public goods can encourage production efficiency and trade and provide equal access to job opportunities. This issue is intended to increase incomes and stimulate the economy to create more jobs that will pay wages, especially for those with low incomes. Income growth will eventually lead to a decrease in income inequality.

Different studies found [19] that government expenditure has a negative and insignificant effect on income inequality in Manokwari Regency, West Papua Province, during 2015–2020.

5.5 The Effect of Trade Openness on Income Inequality

The results of the study determine that trade openness has a negative and significant effect on income inequality with a regression coefficient of -0.075294 as well as empirical significance (ρ) t of 0.0001 (<0.05). This result means that if trade openness increases by 1%, it will reduce income inequality by 0.075294 points. This research follows research conducted by [24], who found that trade openness negatively and significantly affected income inequality in Indonesia during the 2000–2020 period. Increased openness of trade (Trade openness) means increased exports and imports in a country. Increased exports and imports will require many workers to carry out their production so employment will increase. Increased absorption of labor causes the unemployment rate to decrease. A decrease in the unemployment rate will accompany a reduction in income inequality in

a country because the income of low-income and high-income people is more evenly distributed.

Different studies found [16] that trade openness positively and significantly affected income inequality in ASEAN from 1995–1996.

6 Conclusion

Based on the research that has been done, the independent variables of world oil prices, carbon dioxide emissions, GDP per capita, government expenditure, and trade openness have a simultaneous effect on the dependent variable of income inequality. This situation is seen from the probability F is 0.0000 (<0.05). The world oil price variable has a positive and significant effect on income inequality, and government expenditure and trade openness have a negative and significant impact on income inequality. In contrast, GDP per capita and carbon dioxide emissions have a negative and insignificant effect on income inequality in ASEAN during the 2009–2020 period.

This current study recommends that instead of just pursuing high economic growth that benefits especially high-income groups, the government should implement development policy measures that are more focused and successful in overcoming the problem of income inequality. Second, although carbon dioxide emissions only have a small impact on income inequality, given the worsening climate change, the authors suggest that the government prioritize low-income community groups in low carbon dioxide change. By levying emissions taxes on companies that produce goods to subsidize, the decline of low-income people in the low carbon dioxide changed. Third, the government needs to provide expansion of social assistance programs to reduce income inequality due to the increase in world oil prices.

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