



## THE EFFECT OF ECONOMIC GROWTH ON INCOME INEQUALITY: PANEL DATA ANALYSIS FROM FIFTY COUNTRIES

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### ABSTRACT

*This paper examines the effect of economic growth on income inequality by analysing a panel data set of fifty countries from 2000 to 2018. Using the Pooled OLS, Fixed Effect, and Random Effect Model, this paper finds that economic growth has a positive significant impact on income inequality, which means the higher the economic growth, the bigger the gap between the rich and the poor. The empirical evidence suggests that a one-point increase in GDP growth will increase the Gini Index by 0.082 to 0.085 points on average. Moreover, the paper finds that the effect of economic growth in increasing the incidence of income inequality seems to be higher in lower-middle and upper-middle income countries than in high-income countries.*

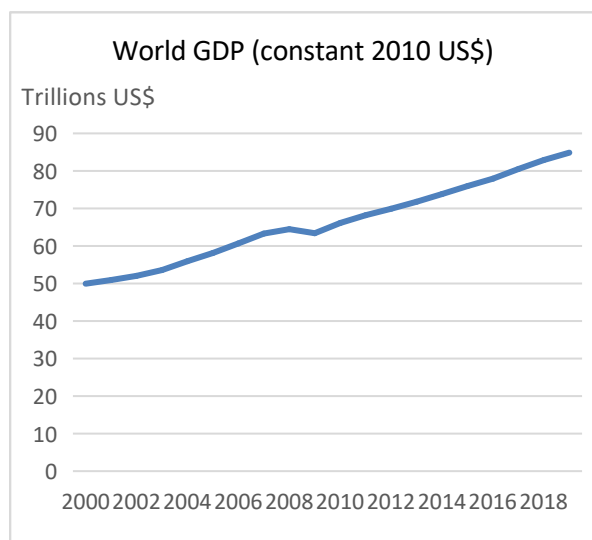
Penelitian ini memeriksa pengaruh pertumbuhan ekonomi terhadap ketimpangan pendapatan dengan menganalisis set data panel dari 50 negara sejak tahun 2000 sampai dengan 2018. Dengan menggunakan Pooled OLS, Fixed Effect, dan Random Effect Model, penelitian ini menemukan bahwa pertumbuhan ekonomi memiliki dampak positif yang signifikan terhadap ketimpangan pendapatan, yang berarti bahwa semakin tinggi pertumbuhan ekonomi, maka semakin besar jurang antara si kaya dan si miskin. Bukti empiris menunjukkan bahwa satu persen kenaikan pertumbuhan PDB akan meningkatkan Index Gini secara rata-rata sebesar 0.082 sampai dengan 0.085 poin. Selain itu, penelitian ini juga menemukan bahwa dampak pertumbuhan ekonomi dalam meningkatkan insiden ketimpangan pendapatan tampaknya lebih besar pada negara berpenghasilan menengah bawah dan menengah atas dibandingkan dengan negara berpenghasilan tinggi.

## 1. INTRODUCTION

The issue of income inequality has become one of the most important macroeconomics issues in the last few decades. In line with globalization, the gap between the rich and the poor seems to increase over time. OECD (2015) stated that there are several factors causing the rise of income inequality, such as the rising incomes of high wealth individuals, and the role of technology in the globalization era.

On the other hand, the world economy has risen quite well for the past two decades. Figure 1 illustrates an increase in the world GDP (constant 2010 US\$) from US\$50 Trillion in 2000 to US\$84.87 Trillion in 2019. However, the benefits of the growth have not been shared equally and left millions of people behind. According to the World Bank Data (2020), there is 9,2 percent population who still living on less than \$1.90 a day in 2017. It indicates that an increase in GDP does not necessarily give a positive impact on income inequality.

Figure 1. The World GDP



Source: World Bank Data (2020)

Even though income inequality has become a critical issue for many countries, there is still a continuing debate about the impact of economic growth on income inequality. Some claim that economic growth has an impact on decreasing income inequality (Amri and Nazamuddin, 2018). In contrast, other researchers defy this hypothesis. They argue that if economic growth increases, income inequality will also go up (Rubin and Segal, 2015; Scully, 2003). Some even claim that the effect of economic growth on income inequality could be positive or negative depending on the sources of growth. If the growth comes from employment growth, then it benefits mostly low-income households and has an equalizing effect. In contrast, if the growth is derived from labor productivity, it is likely to have an impact on rising income inequality (Hermansen et al., 2016).

Based on the description above, the impact

of economic growth on income inequality is still ambiguous. This is due to a few reasons. First, it depends on the data sample used in the research. A study using cross-countries panel data could have different results with research using national data. Similarly, studies using data from developed and developing countries could have a different outcome as well. Besides, control variables also play a role in defining the results.

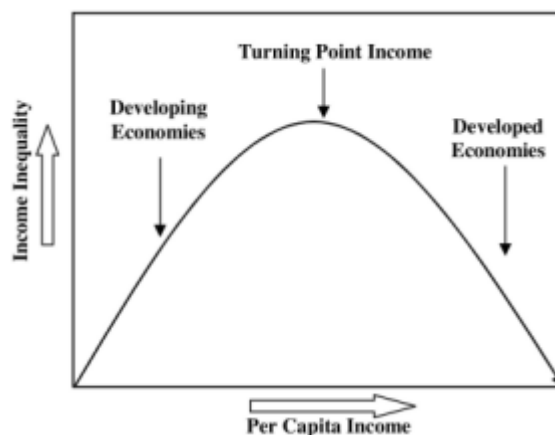
Despite the inconclusive evidence, as far as the author knows, research that differentiates the effect between lower-middle, upper-middle, and high-income countries is still minimum. Therefore, this study is going to examine not only the effect of economic growth on income inequality, but also its impact on different countries based on its GNI per capita. Moreover, the novelty of this research also lies in the comparison of the results between three different regression models: the Pooled OLS, the Fixed Effect, and the Random Effect model.

## 2. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

The purpose of this paper is to examine the effect of economic growth on income inequality in fifty countries. To accomplish this objective, this section will discuss the significant findings from prior research regarding the relationship between economic growth and income inequality.

There have been many studies that relate the economic growth with the incidence of income inequality. One of the earliest studies regarding the relationship between economic growth and inequality was pioneered by Kuznets (1955), who described that there is an inverted U-shaped relationship between economic growth and income inequality (as shown in Figure 2).

Figure 2. The Kuznets Curve



Source: Simon Kuznet (1955)

Figure 2 illustrates that inequality would rise in the beginning stages of growth and development

then declines in advanced economies. The inverted U-shaped demonstrates the process of an economy that undergoes industrialization. "In the early development of an economy, new investment opportunities increase for those who already have the capital to invest. These new investment opportunities mean that those who already hold the wealth have the opportunity to increase that wealth. Conversely, the influx of inexpensive rural labor to the cities keeps wages down for the working class thus widening the income gap and escalating economic inequality. However, economic inequality is expected to decrease when a certain level of average income is reached and the processes associated with industrialization, such as democratization and the development of a welfare state, take hold" (Moffatt, 2019).

In addition to the stage of development as explained by the Kuznets curve, the effect of economic growth on inequality also depends on which class of societies that are benefited the most from the growth. If the growth benefits the top-level income groups exclusively, then inequality will rise. In contrast, if the growth relaxes the financial constraints of the poor households, then inequality will decrease (Kakwani et al., 2003).

Following the Kuznet Theory, there are several important research that examine the relationship between economic growth and income inequality. Some economists believe that static economic growth could be happened because of income inequality. They think that high income inequality will slow the national income, and vice versa. According to Bruekner, Norris, and Gradstein (2015), the bigger GDP leads to smaller inequality. By using countries' trade-weighted world income and the fluctuation of oil price, they found that a 1% increase in GDP will diminish the Gini Coefficient by 0,08 percentage points. However, the result of this study should be explained with prudence since there may be other variables that affect GDP with feasibly heterogeneous effects on equality.

In addition, Amir and Nazamuddin (2018) found that there is a negative and significant relationship between economic growth and income inequality in the long run. However, in the short run, the economic growth is positively but insignificantly correlated with income inequality.

Moreover, another research has been conducted by Strassman (1956). The author used the data of household spending units from upper and lower family income groups to find the relationship between economic growth and income inequality in different countries for a period of 10 years. He found that in a developed country, low income inequality does not affect anything. However, when income inequality increases, it leads to a deficiency of capital in mass production.

In contrast, other researchers defy this hypothesis. They argue that if economic growth increases, income inequality will also go up. An application of the Auto Regressive Distributed Lag (ARDL) approach conducted by Sehrawat and Giri (2015) suggested that economic growth, inflation, and financial development aggravate the gap between the poor and the rich in India for both the short run and long run.

Another research using the United States of America data from 1953 to 2008 concludes that economic growth is more beneficial for the upper-part income distribution because their wealth and labour income are more sensitive to growth than lower-part income distribution's (Rubin and Segal 2015: 272).

In addition, according to Scully (2003), there is a clear positive relationship between economic growth and income inequality. The author used an OLS regression model to define the correlation between those two variables. The equation is formulated as  $EQ = h(S, FLR, U, t, G)$  where EQ (income inequality) as the dependent variable and the dependent variables are S (School Level), FLR (Female Labor Rate), U (Unemployment Rate), t (trends), and G (Growth Rate). From this model, he concluded that every time the economic growth rate increase by 1 point, it will lead to a rise in the Gini Coefficient by 0,075 percentage points.

In conclusion, the previous studies have shown the relationship between economic growth and income inequality, either it is a positive or negative depending on the sources of growth. If the growth comes from employment growth, then it benefits mostly low-income households and has an equalising effect. In contrast, if the growth is derived from labour productivity, it is likely to have an impact on rising income inequality (Hermansen et al., 2016). Therefore, the following research question is raised:

1. What is the effect of economic growth on income inequality?
2. What is the difference between the effect of economic growth on income inequality in lower-middle, upper-middle, and high-income countries?

To answer those questions, the following null hypotheses are the formulated:

- Ho : Economic growth does not affect income inequality  
Ha : Economic growth affects income inequality

### 3. METHODOLOGY

The present section corresponds to the methodology and the identification strategy to address the research questions. It includes data source, variable description, econometric model, and model specification test.

### 3.1. Data Source

This paper uses a panel data set of fifty countries from 2000 to 2018. The paper selects its sample data based on two criteria. First is the availability of the data for each variable used in the model. Second, the data set must include samples from lower-middle, upper-middle, and high-income economies (as shown in Table 1) in order to differentiate the impact of economic growth on income inequality for each country category.

**Table 1.** The List of 50 Countries as Sample Data

Category	Countries
Lower-Middle Income Country	Bolivia, Honduras, Kyrgyz Republic, Moldova, El Salvador, and Ukraine.
Upper-Middle Income Country	Argentina, Armenia, Belarus, Brazil, China, Colombia, Costa Rica, Dominican Republic, Georgia, Indonesia, Kazakhstan, Mexico, Bulgaria, Peru, Paraguay, Russian Federation, Thailand, and Turkey.
High Income Country	Austria, Belgium, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Canada, Spain, Estonia, Finland, France, United Kingdom, Greece, Hungary, Ireland, Iceland, Italy, Luxemburg, Netherlands, Norway, Portugal, Slovak Republic, Slovenia, Sweden, and Uruguay.

Furthermore, panel data is used in this research due to three reasons; first, panel data gives more data variation and more degree of freedom; second, it simplifies statistical inference and computation because it provides more data from both cross-section and time-series; and third, panel data allows the study of more complicated behavior (Hsiao 2005: 145-148).

The income inequality, as the dependent variable, is represented by the Gini Index, the most commonly used measure of income inequality (Gastwirth, 2017; Trapeznikova, 2019; The Guardian, 2017). The Gini Index is the most popular metrics for measuring income inequality because it aligns with three principles: (1) Anonymity: it does not disclose the identities of low-income and high-income individuals in a population; (2) Scale of independence: it does not depend on how wealthy a country is or how large the economy is, which means both rich and poor countries could have the same Gini Index due to similar income distribution; and (3) Population independence: it does not depend on the population size (Corporate Finance Institute, n.d.).

Meanwhile, the economic growth condition in fifty countries, as the independent variable, is measured by the GDP growth rate (IMF, 2020). Regarding the control variables, this paper uses tax ratio, the unemployment rate, and country classification based

on GNI per capita as dummy variables (Poterba, 2007; Scully and Slottje 1989). All data used for this study are secondary data from the World Bank Data.

### 3.2. Variables

There are seven variables used in the regression model. The first variable is the Gini Index as the dependent variable. Meanwhile, the focus independent variable is GDP growth. This paper also uses tax ratio, the unemployment rate, and dummy variables divided into three country classifications based on GNI per capita: Lower-Middle Income Country, Upper-Middle Income Country, and High-Income Country as control variables. Table 2 describes all variables that will be used in the regression model.

**Table 2.** Description of Variables

Variable	Description
Gini Index (GINI)	Gini Index has a value between 0 and 100. A Gini Index of zero represents perfect equality, it means everyone has the same income or wealth. In contrast, a Gini Index of one hundred expresses maximum inequality, where one person has all the income. So, the higher the Gini Index, the bigger the income inequality and vice versa.
GDP Growth (GDP)	GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. The annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars.
Tax Ratio (TAX)	The tax ratio represents the total amount of tax revenue collected as a percentage of total GDP.
Unemployment Rate (U)	The unemployment rate refers to the share of the labor force that is without work but available for and seeking employment.
Country Classification (C) as dummy variables	Lower-Middle Income Country with a GNI per capita between US\$1,036 to US\$4,045; Upper-Middle Income Country with a GNI per capita between US\$4,046 to US\$12,535; and High Income Country with a GNI per capita between US\$12,535 or more (as the baseline for dummy variable).

### 3.3. Econometric Model

A set of equation using a panel data approach is used to examine the impact of economic growth on

income inequality in fifty countries. This paper will analyze the data using the Pooled OLS, Fixed Effect Model (FEM) and Random Effect Model (REM). The Hausman test will be used to select the best model among those two models.

A regression model is defined as follow :

$$\text{GINI}_{it} = \beta_1 + \beta_2 \text{GDP}_{it} + \beta_3 \text{TAX}_{it} + \beta_4 \text{U}_{it} + \beta_5 \text{C} + \epsilon_{it}$$

where:

GINI = Income inequality, measured by Gini Index

GDP = GDP growth rate (%)

TAX = Tax Ratio (%)

U = Unemployment rate (%)

C = Country classification based on GNI per capita: Lower-Middle Income; Upper-Middle Income; and High-Income Country as the baseline.

$\epsilon$  = Error term

Based on previous studies, there may be several variables that cause inequality. The first is GDP growth. According to Sehwat and Giri (2015) and Scully (2003), there is a positive relationship between GDP growth and income inequality. They concluded that higher GDP growth leads to an increase in income inequality.

Another variable that may affect income inequality is taxation. According to Poterba (2007), tax systems play an important role in the analysis of income inequality. It is because tax systems have direct and indirect effects on income distribution. The direct effects stem from tax collection and the indirect effect appears from changes in taxpayer behavior that are induced by the tax systems. Lastly, studies show that the unemployment rate is one of the important determinants of income inequality. Scully and Slottje (1989) found that when the unemployment rate is high, the Gini Index also increases and vice versa (Scully and Slottje, 1989).

### 3.4. Model Specification Test

#### 3.4.1. The Classical Assumption Tests

The classical assumption tests are conducted to find the robust results for this paper. It includes autocorrelation test, heteroscedasticity test, and multicollinearity test.

Autocorrelation test is conducted to find whether there is correlation between observation in year  $t$  and previous year ( $t-1$ ). Meanwhile, the purpose of the heteroscedasticity is to see whether the variable variance in the model is same or not. Moreover, multicollinearity is to test whether there is a strong linear correlation between independent variables.

#### 3.4.2. Unit Root Test

A unit root test is needed to check the stationarity

of the data used in the model to get valid results. The stationarity test is applied to a level form of variables, to test the Null Hypothesis with the consideration of the panel data that is non-stationary. The purpose of this test is to determine which variables should enter the model in form of growth and which variables should enter the model in level form.

#### 3.4.3. Hausman Test

Hausman test is used to determine which model is better between the fixed effect model or random effect model. It tests whether the unique errors are correlated with regressors.

$H_0$  : The preferred model is Random Effect

$H_1$  : The preferred model is Fixed Effect

If P-value is insignificant, then it is safe to use the random effect model. If we get a significant P-value, however, we should use the fixed effect model.

## 4. RESULTS

This section presents the results of the regression analysis, whether using the Pooled OLS, Fixed Effect Model (FEM), and Random Effect Model. The structure of this section is divided into three sub-sections. The first section will describe the model specification test using the classical assumption tests, a unit root test, and the Hausman test. The second sub-section describes the statistics descriptive of the samples. Then the third sub-section will present the regression results of the economic growth's impact on the incidence of income inequality.

### 4.1. Model Specification Test

#### 4.1.1. The Classical Assumption Tests

The Wooldridge test is used to see whether there is autocorrelation in panel data. The null hypothesis for the test is that there is no serial correlation in the model. Based on the Wooldridge test, the result shows that we cannot reject the null hypothesis, which means there is no autocorrelation in the regression.

Regarding the heteroscedasticity test, the modified Wald test is used to see whether the variable variance in the regression model is homoskedasticity or heteroscedasticity. The null hypothesis is that the variance is homoskedasticity. Based on the Wald test, the result suggests that the null hypothesis cannot be rejected. It indicates that the variable variance in the model is same or homoskedasticity.

In addition, it is essential to ensure that there is no collinearity problem between variables in the regression, so that a stable and precise coefficient

estimate can be obtained. To address this issue, Evans (1996) categorization is used as a guideline to determine the strength of correlation among variables.

According to Evans (1996), the correlation between variables is defined as follow: very weak (0.00-0.19); weak (0.20-0.39); moderate (0.40-0.59); strong (0.60-0.79); and very strong (0.80-1.00). The collinearity problem does not exist in the regression if there is no strong correlation between the variables in the model. Therefore, the correlation between each variable should be less than 0.60.

Table 3 presents the correlation between each variable that will be used in the analysis. The coefficient of correlation can vary from -1 (a perfect negative correlation) to +1 (a perfect positive correlation), and a value of 0 (zero), which shows no correlation at all. Using Evans (1996) categorization as a guideline to determine the strength of correlation among variables, Table 4 shows that all correlation between each variable is less than 0.60. It indicates that there is no strong correlation that might influence the results.

**Table 3.** Correlation Table

	Gini Index	GDP Growth	Tax Ratio	Unemployment Rate
Gini Index	1.000	-	-	-
GDP Growth	0.137	1.000	-	-
Tax Ratio	-0.485	-0.152	1.000	-
Unemployment Rate	-0.018	-0.172	0.021	1.000

Source: Author's Calculation

**4.1.2. Unit-Root Test**

A unit root test is needed to check the stationarity of the data used in the model to get valid results. The purpose of this test is to determine which variables should enter the model in form of growth and which variables should enter the model in level form. The null hypothesis is that the data is non-stationary.

Based on Table 4, the Gini Index, GDP growth, tax ratio, and the unemployment rate are all stationary variables and can fit the proposed model with no change in the form of growth. It is aligned with the expectation that the data is stationer since all of the variables are already in index, growth, or percentage form.

**Table 4.** Unit Root Test Results at Level Variables

Variable	ADF-Fisher Chi-Square	
	Statistics	Probability
Gini Index	171.8001	0.0000***
GDP Growth	306.0519	0.0000***

Tax Ratio	160.0378	0.0001***
Unemployment Rate	319.4915	0.0000***

\*, \*\*, \*\*\* refers to significant at 10%, 5%, and 1% levels.

**4.1.3. Hausman Test**

To choose FEM or REM, the Hausman test should be used. The result of the Hausman test indicates that the coefficients estimated by the random effects and fixed effects model are not the same. The p-value is insignificant (larger than 0.05 or 5%) suggests that Random Effect Model (REM) is the preferred model for this case.

Moreover, this paper also uses the non-statistical consideration by comparing the time series unit and cross-section unit (the number of individuals). It is said that if the number of individuals is larger than the time series unit, then Random Effect Model is preferable. On the contrary, if the time series unit is larger than the number of individuals, then Fixed Effect Model is better (Baltagi 1995; Nachrowi and Usman 2006). Since this paper uses data of 50 countries in 19 years period, it means the number of individuals is larger than the time series unit. Therefore, both the Hausman test and non-statistical consideration suggest that Random Effect Model is the preferred model.

It is worth noting that even though the Hausman test suggests that random effect is the preferred model, this paper still reports the results of the fixed effect model and pooled OLS for comparative reasons and to enable result robustness.

**4.2. Statistics Descriptive**

The summary statistics for each variable are presented in Table 5.

**Table 5.** Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Gini Index	36.50	8.95	23.7	61.6
GDP Growth	3.23	3.65	-14.79	25.16
Tax Ratio	18.48	6.10	7.03	48.56
Unemployment Rate	7.59	4.11	0.49	27.47

Source: Author's Calculation

Number of observations: 50 countries (12% lower-middle income countries; 36% upper-middle income countries; and 52% high-income countries) within a period of 19 years (2000 - 2018)

Based on Table 5, it can be observed that the Gini Index on average is 36.5 with the highest inequality is in Bolivia in 2000. In contrast, Slovenia has the lowest inequality in 2008 (Gini Index=23.7). Moreover, the statistics suggest that income inequality is lower (Gini Index is low) on average in developed countries, such



benefited only the richest 20% of the population (The Conversation, 2018). Even though Indonesia's economy has performed very well with the average annual real GDP growth of approximately 5.27% for the last two decades (The World Bank Data 2021), the Indonesia's Gini Index increased to 37.8 in 2018 from 28.6 in 2000. It indicates that the benefits of the growth have not been shared equally and left millions of people behind.

Furthermore, these results confirm the findings of previous studies that state if economic growth increases, income inequality will also go up (Rubin and Segal, 2015; Scully, 2002; Sehrawat and Giri, 2015).

In contrast, the empirical evidence suggests that the tax ratio is negatively associated with the Gini Index at a significance level of one percent. Taxes are often designed as a tool to distribute the income from the rich to the poor (Duncan and Peter, 2012). Therefore, the more tax revenue, the higher the tax ratio, and the more money government can use to reduce the income inequality by providing the infrastructure, healthcare, and cash transfer. These findings also confirm that taxation has direct and indirect effects on income distribution (Poterba, 2007).

Regarding the unemployment rate, it can be observed from Table 6 that the unemployment rate has a significant impact on raising income inequality. This is aligned with the existing theory that an increase in unemployment will aggravate the gap between the rich and the poor (Scully and Slottje, 1989).

In addition, this paper also indicates that the effect of economic growth on increasing the incidence of income inequality seems to be higher in the lower and upper-middle income countries than high-income countries. This result confirms the Kuznets Theory (1955), which described that inequality would rise in the beginning stages of growth and development then declines in advanced economies.

The inverted U-shaped of Kuznets Curve (Figure 2) shows that in the early stage of development, in which the emerging economies (lower and upper-middle income countries) are usually located, economic activity centres start to shift from agricultural in rural areas to industrial in urban areas. It causes labour migration from rural to the cities looking for a higher-paying job. As a result, firm owners' profit would increase as well as the workers' but at a slower rate, while the income of the farmers decrease. Eventually, it increases the inequality gap between rural and urban people. However, inequality is expected to decrease once economies reach the industrialization, which is usually happened in developed or high-income countries, allowing rapid growth and increase in income per capita as overall. Therefore, the effect of economic growth on increasing the income inequality is more significant in lower and upper-middle countries than in high-income countries.

## 5. CONCLUSION AND RECOMMENDATION

### 5.1. Conclusion

This study's objective is to show the effect of economic growth on income inequality in fifty countries. To reach the objective, a set of panel data is used to examine the relationship between those variables.

Using the Pooled OLS, Fixed Effect, and Random Effect Model, we can conclude that economic growth has a positive relationship with the Gini Index, which means the higher economic growth, the bigger income inequality. The results also suggest that the unemployment rate has a positive relationship with income inequality. However, the tax ratio shows the contrary. The result indicates that an increase in tax ratio leads to a decrease in income inequality. Furthermore, this paper also finds that the effect of economic growth on income inequality is higher in the lower-middle and upper-middle income countries than in high-income countries.

These findings are very important because much previous research concludes that GDP growth has a negative effect on income inequality. However, this paper shows otherwise. An increase in GDP growth does not necessarily reduce inequality in society. It indicates that the benefits of the growth have not been shared equally, which means the benefits are enjoyed only by the rich people and left the poor behind.

### 5.2. Recommendation

GDP growth has become one of the most important goals for countries in the past decades. The growth rate of GDP is often used as a sign that the economy is doing well (IMF, 2020). It is also often used as an indicator for foreign investment and government performance. However, GDP growth also brings negative consequences such as aggravating the gap between the rich and the poor.

Therefore, the government needs to minimize this negative impact by increasing the tax ratio. The more tax revenue, the more money government can have to fund infrastructure, social aid, grant, education, and health expenditures. These types of expenditures could help the less fortunate society; thus, reducing the incidence of income inequality and minimizing the less desirable effect of economic growth.

### 5.3. Limitation and Future Research

Finally, in terms of the limitation of this paper, the main one is the lack of lower-middle income countries data. The data available for lower-middle income countries is limited compared to developed countries. Therefore, this paper only uses six lower-middle income countries as samples (only 12% of the total samples). Another limitation of the analysis is that there might



be other control variables that affect income inequality such as education, but it is not included in the model. This opens the opportunity for further research.

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