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Short-run and Long-run Relationship between Economic Growth, Foreign Direct Investment, Trade Liberalization and Education on Income Inequality: Evidence from Indonesia

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Abstract

The aim of this study is to examine the relationship between economic growth (GDP), Foreign Direct Investment (FDI), trade liberalization and education on income inequality in short-run and long-run for Indonesia over the period 1981-2015. Using the Vector Error Correction Model (VECM), this study found that in the long-run, GDP has a positive and significant effect on income inequality. The higher GDP in Indonesia will cause a higher income inequality. In contrast, GDP has a negative effect on income inequality in the short-run. The long-run result supports the Kuznets hypothesis that increasing in income inequality is caused by the initial increase in GDP per capita. Both trade and education have negative and significant effect in the long-run. Meanwhile, in short-run, both have different results. Increasing trade will escalate income inequality significantly, while increasing education will decrease income inequality.

Keywords: Economic growth, FDI, Income inequality, VECM, Indonesia

1. Introduction

In recent decade, Indonesia has achieved good economic growth due to the abundance natural resources as well as large labor force. On this notion, Indonesia could become a member of G20 countries. The implication of it is that it would make Indonesia as one of the countries with major economies in the world and has been predicted to become one of the top seven countries in term of economic size by 2030 (Wicaksono *et al*., 2017). However, Indonesia cannot avoid other problem i.e. the rise in its economic growth will subsequently contribute to income inequality. After the financial crisis 2008, the value of Gini Index as the proxy of income inequality escalated to 0.41 percent in 2015 (refer Figure 1). The increase of 10 percent over the period is considered high among the developing countries especially in Asia. Income inequality in Indonesia was evaluated to be worse comparative to Thailand, Vietnam, Cambodia and Laos, although it is still better than the Philippines and China (Zain, 2016).

Therefore, the widening gap in income inequality has been one of the crucial problems to be solved by the Indonesian government. In the medium term development of Indonesia, the government targets to reduce the Gini Index in 2019 (Wicaksono *et al*., 2017). Thus, to achieve this objective, the government has to identify major sources of problem on income inequality in order to formulate comprehensive policies to close the gap in income distribution. Many factors are found to have significant influence on income inequality such as the foreign direct investment (FDI). FDI enables Indonesia to source external capital from other countries. However, FDI in which foreigners can incorporate their companies in Indonesia can also affect the gap of income distribution in Indonesia. This is because more skilled workers are needed to fill the position in the newly incorporated foreign companies despite many people in Indonesia still have low skill and education. This in the long run is expected to further widen the income gap between the skilled and unskilled workers.

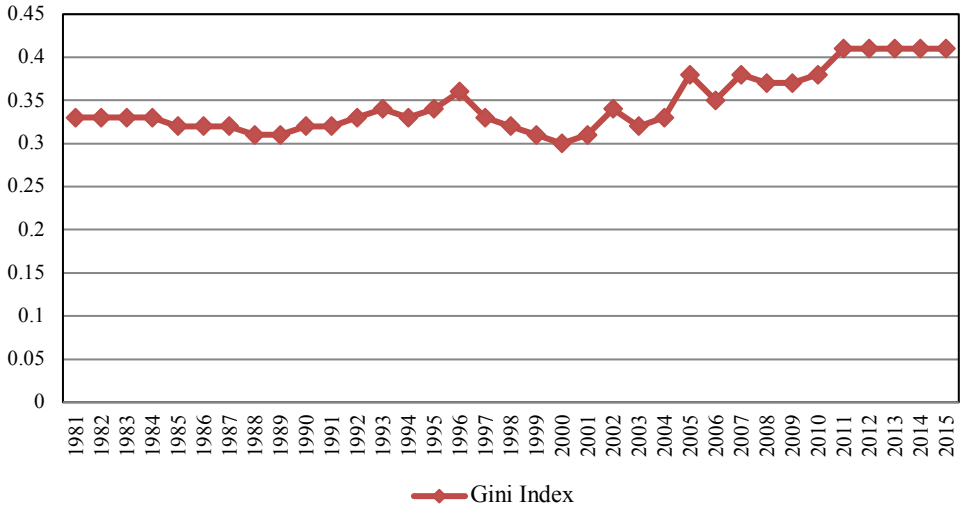

Figure 1: Gini Index of Indonesia
Source: Central Bureau of Statistics, Indonesia

Due to its importance, the issue of income inequality in a developing country such as Indonesia requires more attention from policy makers. Thus, this study aims to analyze the factors influencing the income inequality in Indonesia, Following this, the best policy to solve the gap in income distribution could then be recommended for policy implementation.

The organization of this paper is as follows. The background of the study is provided in section 1. Section 2 briefly explains some of the previous studies related to the economic growth, FDI, education, trade liberalization that may have influence on income inequality. Section 3 describes the methodology and data used for empirical tests while section 4 presents the results and analysis. Section 5 provides the conclusion and policy recommendations.

2. Literature Review

Kuznets suggested that the economic development of a country will eventually contribute to income inequality (Xu, 2018). Countries will have equal distribution of income due to low level of economic development despite the developing countries requiring more capital for driving its economic system and having more income and wealth (Tao *et al*., 2019). Eventually higher economic growth will contribute to income inequality. This problem however can be solved by implementing various possible redistribution mechanisms such as welfare programs. Thus, a country with higher income inequality will move back to lower level of income inequality through effective program (Sulaiman *et al*., 2017).

According to Kuznets, GDP as a representation of economic development is likely to affect income inequality. Previous study such as Halmos (2011) tested the relationship between FDI, export and GDP on income inequality in the Eastern European countries. He found that higher level of GDP influenced Gini Index as proxy of income inequality. Gordon and Resosudarmo (2019) stated that there is a positive impact on income inequality from both manufacturing and services sectors on the GDP of Indonesia, while agriculture has a negative impact on income inequality based on the study period from 2000 to 2010. In contrast, Chen (2016) found that economy and income per capita in China has negative effect on income inequality. He suggested that urban-rural income inequality reduces although the economy in China continues to rise.

In developing countries, FDI has a clear impact on growth that leads to the sustainability of economic growth (Alfaro *et al*., 2004; Hansen and Rand, 2006; Azman *et al*., 2010). Past studies however recorded that FDI has a different impact on income inequality in many countries. Tomohara and Takii (2005) found the impact of FDI on income inequality and argued that income inequality was due to multinational corporations. Mihaylova (2015) in her study on ten countries in Central and Eastern Europe (CEE) found

that FDI has potential influence on income inequality subject to the educational level and economic growth in the country. Meanwhile in Latin America, FDI has different implication on each country. While FDI may have a minor role in reducing income inequality in other Latin America countries, in Bolivia and Chile however, FDI contributes to income inequality (Willem, 2003). Moreover, Farhan *et al*. (2014) also found the different effect of FDI on ASEAN country subject to the economic environment of the respective country. Based on the quantile regression, they found that FDI inflows reduced income inequality in the case of Malaysia, the Philippines and Thailand while in Singapore and Indonesia, FDI escalated the income inequality. Bhandari (2007) reported that in the transnational countries of the Eastern Europe and Central Asia, FDI increased income inequality.

The globalization of economy can be defined as a growing integration of economies in the international market for goods, services and capital where there is a debate on the effect of economic globalization on income inequality. Since FDI and foreign trade (export-import) play important role in economic globalization (Enrhart, 2005), trade liberalization also acts as an important factor that may have implication on income inequality. In this case, Enrhart (2005) studied the openness of international trade and investment and its impact on income inequality in Latin America and East Asian countries and confirmed the significant impact of globalization on income distribution. He further concluded that foreign trade decreased income inequality while FDI increase income inequality. Hasan and Jandoc (2010) however found that trade liberalization is not an important factor in income inequality for the Philippines economy.

Wheeler (2005) found that income inequality is not only caused by external effect such as the FDI and trade liberalization, it can also be influenced by the wage gaps between workers with different level of education. According to Gregorio and Lee (2002), educational factor plays a significant role in reducing income inequality. In other words, higher education and more equal education distribution can push the income distribution more equal. Coady and Dizioli (2017) stated that there is positive relationship between income inequality and the average years of education. Thus, inequality in the education level causes income inequality especially in the developing economies. Breen and Chung (2015) however found that in the US, educational attainment and feasible educational policy have small contribution on income inequality.

Another study on FDI and other variables related with income inequality are conducted by Trinh (2016) in Vietnam. He found that FDI tends to decrease the gap in income inequality predominantly among the low-skilled workers, while secondary education and foreign trade has positive effect on income inequality. Chen (2016) concluded that FDI has directly contributed to lower urban-rural income inequality in China and this is done through employment creation and knowledge spillovers to economic growth. This is in contrast with a study by Baranwal (2017) in which he found through international trade, FDI in the manufacturing sector has increased the urban-rural income inequality in India.

In relation to Indonesia, several past studies such as Tomohara and Takii (2005) found that the inflow of FDI to the Indonesia manufacturing industry contributes to the increase in wage level in domestic manufacturing companies following the wages set by multinational companies. This eventually contributes to the wage gap between multinational and domestic manufacturing companies in Indonesia. Lipsey and Sjöholm (2002) stated that higher price for labor paid by foreign-owned firms to skilled workers (higher education) compared to the non-skilled workers (lower education) contributes to the increase in income equality between these groups of workers.

Study on the influence of GDP, FDI and other variables such as education level and trade liberalization on income equality is important considering its implication to the Indonesian economy, both short and long term. This study therefore aims to fill the gap in the literature by using relatively recent data in this aspect.

3. Data and Methodology

3.1 Empirical Specification

This study employs the Vector Error Correction Model (VECM) to analyse the relationship between variables in the short-run and long-run condition. This model also reveals the rate of change in the short-run as well as in the long-run to achieve equilibrium (Jaupllari and Zoto, 2013; Ayojimi and Haron, 2018). In order to establish the result on the relationship for each variable in time series, this study employs several steps as the following.

First, to determine the order of integration for each variable (stationary or non-stationary) by employing the Dickey Fuller (ADF) and Phillip-Perron (PP) test. If ADF or PP show the result where the probability on each variable is less than the critical value (5% or 1%) in any unit root tests, then the variable is stationary. The stationarity can either be at level (I(0)), first difference (I(1)) or second difference (I(2)).

Second, examining the best lag for the model. It can be done by using lag length criteria and chosen by the criterion of lag order. Generally, Akaike information criterion (AIC) and Schwarz information criterion (SIC) are used to determine the best lag (Haron and Ayojimi, 2018).

Third, to examine the long run relationship using the Johansen Method of cointegration if all variables are in the same order I(1). Lastly, if there is at least one cointegration, this study will then proceed with the VECM to study the relationship on variables.

The equation of the VECM for income inequality and other variables is as follow.

$$\Delta gini\_index_t = \alpha_0 + \alpha_1 \Delta lnGDP_{t-1} + \alpha_2 \Delta FDI_{t-1} + \alpha_3 \Delta lnTrade_{t-1} + \alpha_5 \Delta lnEduc\_tertiary_{t-1} + \pi (Gini\_index_t - \alpha_0 - lnGDP_{t-1} - FDI_{t-1} - lnTrade_{t-1} - lnEduc\_tertiary_{t-1}) + \mu_t \quad (1)$$

where gini_index, lnGDP, FDI, lnTrade and lnEducTertiary represent Income Inequality, Economic Growth, Foreign Direct Investment, Trade Liberalization (both imports and exports) and Education, respectively. The equation (1) represents the short-run as VAR equation and long-run as cointegration equation (CE). The short-run term is:

$$\Delta gini\_index_t = \alpha_0 + \alpha_1 \Delta lnGDP_{t-1} + \alpha_2 \Delta FDI_{t-1} + \alpha_3 \Delta lnTrade_{t-1} + \alpha_5 \Delta lnEduc\_tertiary_{t-1} + \mu_t \quad (2)$$

In order to specify the long-run equation, it can be shown from the general equation (1) as follow:

$$gini\_index_t = \alpha_0 + \beta_1 lnGDP_{t-1} + \beta_2 FDI_{t-1} + \beta_3 lnTrade_{t-1} + \beta_5 lnEduc\_tertiary_{t-1} + \mu_t \quad (3)$$

where the basic equation is:

$$\pi (Gini\_index_t - \alpha_0 - lnGDP_{t-1} - FDI_{t-1} - lnTrade_{t-1} - lnEduc\_tertiary_{t-1}) \quad (4)$$

Furthermore, to confirm that the residuals of the model is in standard condition, the various diagnostic tests are conducted and these include the Lagrange Multiplier (LM) test for serial correlation, white test for heteroskedasticity and Jarque-Bera test for normality of residuals (Haron and Ayojimi, 2019).

3.2 Data and Variables

The sample data in this study is sourced from the World Bank and the Central Bureau of Statistics Indonesia. A time series data set covering a period from 1981 to 2015 with yearly data is utilized. Some data are transformed into natural logarithm. The details on each variable are provided in Table 1.

Table 1: Data and Variables Explanation

Variable	Data explanation	Proxy	Measurement	Time	Sources of Data
Gini Index		Income Inequality	Percentage (%)	1981-2015	Central Bureau of Statistics
Real Gross Domestic Product (lnGDP)	The sum of gross value added by all resident produces in the economy.	Economic Growth	US Dollar	1981-2015	World Bank
Foreign Direct Investment (FDI)	The net inflows of investment value at a specific point in time.	FDI	Percentage (%)	1981-2015	World Bank
Trade Liberalization (lnTrade)	The sum of total export and import	Trade Liberalization	US dollar	1981-2015	World Bank
Education (lnEduc_tertiary)	Consists of the ratio of total enrollment on both sexes, regardless of age, to the population of age group that covers tertiary	Education	Percentage (%)	1981-2015	World Bank

4. Empirical Result

This study aims to examine the relationship between short-run and long-run term among the variables under study. To achieve its objective, the VECM is employed. The first stage is to ensure all variables are stationary at first difference. The stationarity is the key concept in time series process. If there is non-stationary, the shifting of time will cause the change in the distribution of data (Asteriou and Hall, 2011; Haron and Ayojimi, 2015) and the data will not in the same condition along the time. For testing of stationarity, ADF and PP test are used. The result as shown in Table 2 reveals that all variables are stationary at first difference based on both the ADF and PP (significant at 1%).

Table 2: Unit Root Test

Variable	ADF test statistics (trend and intercept)		P-P test statistics (trend and intercept)	
	Level	First different	Level	First different
Income Inequality (Gini_Index)	-2.294 (0.426)	-7.759*** (0.0000)	-2.20 (0.472)	-8.049*** (0.0000)
Real GDP (lnGDP)	-2.357 (0.394)	-5.775*** (0.0002)	-2.361 (0.391)	-5.775*** (0.0002)
Foreign Direct Investment (FDI)	-2.15 (0.498)	-4.957*** (0.0018)	-2.365 (0.389)	-4.932*** (0.0019)
Trade Liberalization (lnTrade)	-2.57 (0.292)	-4.408*** (0.0070)	-2.668 (0.255)	-4.408*** (0.0070)
Gross School Enrollment, Tertiary (lnEduc_Tertiary)	-1.968 (0.597)	-5.074*** (0.0013)	-1.757 (0.702)	-5.074*** (0.0013)

Notes:***significant at 1%; **significant at 5%; ( ) is probability

Based on results in Table 2, Johansen Cointegration test is required. Prior to that, the optimal number of lags need to be determined by using the lag length criteria. The best lag for this model is lag 1 based on all criteria with the exception on AIC.

Table 3: The Optimum Lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	50.66536	NA	4.32e-08	-2.767598	-2.540854	-2.69130
1	168.0188	192.0329*	1.64e-10*	-8.364775	-7.004313*	-7.9070*
2	193.8363	34.42340	1.74e-10	-8.414323*	-5.920144	-7.57510

The result on cointegration test is provided in Table 4 in which the Johansen test offers 1 cointegration (the trace and max-eigen statistic are higher than 0.05 critical value). Trace statistic value which is 95.31339 is higher than its critical value of 76.97277, as well as the max-eigen value of 42.73342, greater than the critical value of 34.80587.

Table 4: Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.726089	95.31229	76.97277	0.0010
At most 1	0.454564	52.57887	54.07904	0.0677

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.726089	42.73342	34.80587	0.0046
At most 1	0.454564	20.00363	28.58808	0.4119

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

4.1 Result on Long-run Relationship

The long-run relationship can be established after performing several stages. The VECM shows all variables, economic growth (lnGDP), trade liberalization (lnTrade) and education (lnEduc_tertiary) significantly influence income inequality, except Foreign Direct Investment (FDI) as shown in Table 5.

Table 5: Long-Run Model

Dependent Variable	Independent Variable				
Gini_Index	C	lnGDP	FDI	lnTrade	lnEduc_ tertiary
CointEq1	-1.174312*** [-10.7095]	0.113815*** [10.1032]	-0.001289 [-0.88580]	-0.053529*** [-4.67975]	-0.034479*** [-5.41510]

Notes: ***significant at 1%; **significant at 5%; *t*-table value alfa 5% = 1.697 and 1% = 2.457

Table 5 indicates that in the long-run, GDP associates positively (significant) with income inequality. Trade liberalization and education especially tertiary school level have negative affect (significant) on income inequality. Sulaiman *et al*. (2017) however found different results for several variables in their study on Malaysia. They stated that GDP has no impact on income inequality, while the economic openness has positive (significant) impact on income inequality. Meanwhile, FDI has negative influence (significant) on income inequality in support of past studies. Increase in FDI will reduce income inequality and higher inequality leads to diminish inflows of FDI (Herzer and Nunnenkamp, 2011).

4.2 Result on Short-run Relationship

To obtain the short-run relationship, VECM is estimated and the result for error correction model (ECM) is presented in Table 6. In general, the coefficient of ECM term reveals the speed of adjustment from short-run to long-run equilibrium. The value should be negative and significant at 1 per cent level. This is to support the existence of stable long-run model. From this result, the coefficient of error correction is -0.865048. This means the deviation from short-run in income inequality is corrected around 86 per cent for each period.

As in Table 6, the short-run relationship results also show that GDP has negative and significant relationship with Gini Index (income inequality). It means higher GDP in Indonesia will reduce income inequality in the short term period, consistent with the previous studies. In China, the economy and income per capita also has negative effect on income inequality (Chen, 2016). Sulaiman *et al*. (2017) also found that GDP significantly reduces income inequality.

Trade is proved to have positive and significant effect on income inequality. The previous study in China using time series data also record positive effect of trade liberalization on income inequality. It means, higher trade in China will increase income inequality (Xu, 2018). For education, in the short-run model, the impact is insignificant.

FDI in the short-run relationship is found to be insignificant on income inequality. This is in contrast to the finding on Malaysia, in which higher FDI will provide positive impact on income inequality (Sulaiman *et al*., 2017). Another study also reports that FDI inflows can diminish income inequality in ASEAN countries such as Malaysia, the Philippines and Thailand, while escalated income inequality in Singapore and Indonesia (Farhan *et al*., 2014). Moreover, Herzer and Nunnenkamp (2011) observed that FDI has positive short-run effect on income inequality in the Europe.

The diagnostic tests conducted in the model show that there is no problem of serial correlation and heteroskedasticity.

Table 6: Error Correction Model

Dependent Variable = D(Gini_Index)$_t$	
Error Correction	Coefficient
CointEq1	-0.865048 [-3.44452]***
C	-
D(GINI_INDEX(-1))	0.035703 [0.13934]
D(LNGDP(-1))	-0.048083 [-2.32577]**
D(FDI(-1))	0.000074 [0.01715]
D(LNTRADE(-1))	0.043905 [2.15475]**
D(LNEDUC_TERTIARY(-1))	-0.025173 [-0.99117]
R^2	0.476153
ADj R^2	0.379144
F-Statistic	4.908346**
Diagnostic test	
LM test for serial correlation	24.1024 (0.5135)
White test for heteroskedasticity	203.6504 (0.1093)
Jarque-Bera for normality	29.662 (0.0010)

Notes:***significant at 1%; **significant at 5%; *t*-table value alfa 5% = 1.697 and 1% = 2.457

5. Conclusion

The study examines the short-run and long-run relationship between economic growth, foreign direct investment, trade liberalization and education on income inequality in Indonesia based on the yearly data from 1981-2015 using VECM.

In the long-run relationship, GDP has positive and significant effect on income inequality. Higher GDP in Indonesia will cause income inequality. The long-run result supports the Kuznets hypothesis that increasing in income inequality is caused by the initial increase in GDP per capita. Both trade and education have negative and significant effect in the long-run. Meanwhile, in the short-run, increasing trade will escalate income inequality significantly.

This research has policy implication. The government should always keep attention in diminishing income inequality and poverty in Indonesia in which comprehensive policies are needed. Improving of education is crucial in reducing income inequality and this can be achieved by the availability of education to all in Indonesia. When people are more educated, so do the skills. Thus, this will increase income in lower segments of population and subsequently income inequality will be reduced.

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