

Foreign Investment And Economic Growth In Indonesia (Panel Data Approach, Granger Causality And Vecm)

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Summary

Foreign Investment (PMA) is one element that plays an important role as a source of state investment. FDI is becoming more important and is considered a catalyst for economic development, a source of transfer of technology and innovation from developed to developing countries.

This study aims to examine the relationship between FDI and GDP in Indonesia. The analysis tool used is the cointegration test to determine the long-term relationship between FDI and GDP, and the causality relationship between FDI and GDP using the Granger causality (GC) test which is based on VECM. This study uses data on FDI, GDP, and labour with a panel data approach from 33 provinces in Indonesia for the period 2010 - 2020.

The results of the study did not show a causal relationship between FDI and GDP, labour in Indonesia. From the results of the Impulse response from the VAR, it tends to diverge, the FDI response to GDP and labour is quite good. This shows that FDI brings externalities from technological innovation, increasing the ability of the workforce requires time for learning. The ability of human resources and the absorption capacity of local companies will affect the transfer of technology brought by FDI.

Keywords: FDI, GDP, Granger Causality, Labor, VECM.

1. Introduction

FDI includes physical capital, production techniques, managerial skills, products and services, marketing expertise, and business organizational processes. (Hussein & Thirlwall, 2000 dan (Zhang, 2001). FDI is a combination of capital stock, knowledge and technology that can increase the knowledge of recipient countries through training of workers and organizational arrangements.

In the endogenous growth model, FDI increases economic growth by producing technology diffusion from developed countries to host countries. The positive impact of FDI on the host economy is: it can increase national income, increase employment and increase the country's foreign exchange reserves.

Some research has evidence and considers FDI as a driver of growth but some research does not support it. In several developing countries FDI has a positive effect on economic growth. (Alshehry, 2015; Belloumi, 2014; Jacob et al., 2012; Herzer et al., 2008) who analyse that FDI has an important role in the economic growth of the host country by increasing investment, and technology transfer from developed countries to developing countries. Several studies have different research results that FDI negatively affects growth (Ayanwale, 2007; Carkovic & Levine, 2005; Lian & Ma, 2013).

The distribution of foreign investment in Indonesia in 2010 and 2019 is still concentrated in the Java Region. (Badan Koordinasi Penanaman Modal, 2019). In Indonesia economic growth is calculated from changes in GDP, in 2009 - 2010 there was an increase of 6.1 percent and Java contributed 57.8 percent of GDP with the main activities of the secondary and tertiary sectors. (Badan Pusat Statistik, 2011). The main sectors that are of interest to foreign investors are the electricity, gas and water sectors by 21 percent.

The positive impact of FDI aside from being able to increase national income and create jobs, foreign capital can also increase foreign exchange reserves. According to (Todaro & Smith, 2012), inflows of private foreign capital can not only reduce some or all of the deficit in the current balance of payments, but also serve to eliminate such deficits over time if foreign-owned enterprises can generate positive flows of export earnings, as well as contribute to filling the gaps between foreign exchange needs.

Empirically, several studies have discussed the problems and interrelationships in FDI and economic growth from the perspectives of many developing and developed countries. Existing research found and revealed gaps in the perspective of a causal relationship in FDI and economic growth in developing countries.

This research will examine the linkages in FDI and economic growth and perspectives for regions in Indonesia and the causal relationship between FDI and Indonesia's growth using the Granger causality test and the long-term relationship using the VECM.

The research uses panel data from 33 provinces for the period 2010 - 2020. Using panel data to be able to find out specific regions in absorbing technology, and other socio-economic factors.

2. Literature Review

FDI has an important growth effect to boost host economic growth. In general, the concept of productivity generated by FDI develops from the basic idea that FDI has macro and micro impacts on the economy of the destination country. On a macro level, FDI has contributed to increased capital accumulation, new jobs and tax revenues. Meanwhile, on a micro basis, FDI contributes in the form of knowledge externalities.

Knowledge externalities are indirect benefits that occur through non-market mechanisms (Liu, 2008). Based on the Exogenous Growth theory, FDI can boost the host country's economy through capital accumulation, introduction of new goods, and new technology. The new endogenous growth model explains long-term growth as a function of technological progress; therefore FDI is expected to increase economic growth through technology transfer, diffusion and externalities in the host country, (Nair-Reichert & Weinhold, 2001). Although both exogenous and endogenous growth theories argue that the accumulation or formation of capital is an important determinant of economic growth, they differ in their treatment of technological progress. The former treats technological progress as exogenous to the model; while the latter argues that technological progress is enhanced endogenously - by increased knowledge and innovation (Borensztein et al., 1998; De Mello, 1999; Elboiashi, 2011 dan Nasser, 2010). At the macro level FDI has a positive contribution that leads to high economic growth, (Zhao & Zhang, 2010), and from positive externalities to higher levels of output. (Wang, 2010).

In theory and empirically, there are different predictions about the effect of FDI on the host country's economy. By using the Neo-Classical growth model and the new endogenous growth model, experts examine the relationship between FDI and growth in four ways: (1) The determinants of growth, where FDI is placed as one of the explanatory variables; (2) determinants of FDI, where GDP is one of the explanatory variables; (3) the channels through which FDI affects growth; and (4) a causal relationship between the two variables (Asongu & Odhiambo, 2020).

Asheghian (2004) uses the Granger causality method to examine the causality relationship between FDI and economic

growth in the United States. The results of the study show that there is a causal relationship between FDI and economic growth in the United States.

Rahman (2007) using the ARDL technique to examine the effect of FDI and exports on real GDP in Pakistan, India, Sri Lanka and Bangladesh from 1976 to 2006. The results showed that there was an effect in three countries. For Bangladesh and India, the export effect is more effective on GDP than FDI.

Herzer et al., (2008) found that FDI has an important role in the host country's economic growth by increasing investable capital, and technology spillovers. Tang et al. (2008) found the research results that there is a causality relationship between FDI in the economy in China, and FDI encourages domestic investment in China. At the macro level, FDI has a positive contribution to economic growth.

Kalirajan et al. (2011) examines the causal relationship of exports, FDI and GDP using VECM in six developing countries (Chile, India, Mexico, Malaysia, Pakistan and Thailand). The results show that there is a long-term causal relationship from GDP to exports in Pakistan. Two-way causality relationship between GDP and FDI for Malaysia.

Zhao & Zhang, (2010), and positive output externalities (Wang, 2010). Bhatt, (2015) investigates the causal relationship in exports, FDI and GDP in Asian countries. By using the VAR model, the research results show that there is a long-term causality relationship. The study results also show that there is a one-sided causality relationship from FDI to GDP.

Moudatsou & Kyrkilis, (2011) examined the relationship between FDI and economic growth. Using panel data in EU and Asian countries for the period 1970 - 2003. Using the VECM methodology and finding results that there is a causal relationship between GDP and FDI and there is a unilateral causality relationship in Asia.

Tan & Tang, (2016) examines the relationship of FDI, trade and economic growth in Asian countries. The results of the study found that there is a long-term causality relationship in domestic investment and FDI, with increased growth.

Sothan, (2017) using data for the period 1980 - 2014 in Cambodia. Using the Granger causality test based on the Vector Error Correction Model (VECM), the results show that there is a causal impact of FDI on economic growth.

Several theoretical studies highlight the different relationship between FDI and economic growth. Alfaro, (2003) examines the effect of FDI and economic growth using cross-

country data for the period 1981-1999. The research results conclude that FDI has an ambiguous effect on economic growth.

(Hsiao & Shen, (2003) examined the Granger causality relationship between GDP, exports, and FDI in 23 developing countries using panel data for the period 1976 to 1997. Using the VAR panel causality found the results of the FDI panel causality to have a unidirectional direct effect on GDP and an indirect effect through exports. Two-way causality relationship between exports and GDP.

Alexiou & Tsaliki, (2007) examined the relationship between economic growth and FDI in Greece in 1945 – 2003 with the Granger causality test. The results of the study found that there was a long-term relationship between FDI but the causality relationship between economic growth and FDI was rejected.

Katircioglu, (2009) examines the causal relationship between economic growth and FDI inflows in Turkey in 1970-2005. Using the ARDL-Bounds test and the Granger causality test, the results show that there is a relationship between real GDP and FDI when real GDP is the dependent variable. The causality results show a unidirectional causality from GDP growth to FDI in the long run.

Srinivasan et al., (2011) used Johansen co-integration to analyze the linkages in FDI and growth for SAARC countries from 1970 to 2007. Using the VECM method to examine the causality relationship between FDI and economic growth, the results show that bilateral relations except India have a unilateral relationship with FDI and economic growth.

Maria & Ean (2012) investigated the effect of FDI on growth for the period 1991-2009 in Romania. Using the VAR model, the results find no effect of FDI on economic growth..

Belloumi, (2014) examines the causality relationship in trade, FDI and economic growth in Tunisia during the period 1970 to 2008. Using the ARDL from Granger causality analysis which builds on the VECM. The results of the study in the long run Granger causality is not significant. And in the short term it does not show that FDI generates positive spillover.

They believe that foreign direct investment can increase private investment, encourage the creation of new jobs, transfer knowledge and technological skills in the workforce and, in general, promote economic growth in host countries.

After going through the literature and empirically the results of the causality relationship between FDI and economic growth are still diverse and ambiguous. The use of different estimation techniques and data will affect the research results.

This study will use panel data from 33 provinces in Indonesia for the period 2010 -2020 using the Granger Causality, VECM method.

3. Methodology

A. Data dan Metode Estimasi

This study uses panel data, which is a combination of time series data and cross section data. This study uses data from 33 provinces in Indonesia from 2010 to 2019. The aim of the research is to examine the causality relationship in FDI and GDP and labor variables. Several variables according to the research consist of GDP (as a proxy for economic growth) as the dependent variable and as the independent variable FDI and the number of labour (L). The general form of the empirical model describes the relationship between economic growth, foreign direct investment and the number of workers.

Equation 1

$$PDB = f(PMA, L) \quad (1)$$

Equation 1 is converted into a natural log, the form of the equation is as follows :

$$\ln PDB = \beta_0 + \beta_1 \ln PMA + \beta_2 \ln L + \mu_t$$

Before estimating several steps that must be carried out, namely;

1. Panel Data Stationarity Test

In analyzing using time series data, one important concept is the stationary condition of the data. Completion with the econometric methodology that all variables must be stationary. There are a number of tests to check the stationarity of observable variable data using the Augmented Dickey Fuller (ADF) method, Dickey and Fuller test (1979), (PP) Phillips and Perron test (1988), with the decision criterion H_0 being rejected if the ADF statistic is less than the value critical at the significance level $(1 - \alpha)$ 100%, or the p value is smaller than the value α , if H_0 is rejected by stationary data.

This study used the ADF unit root test.

The ADF test equation is as follows,

$$\Delta P_t = \alpha + \beta P_{t-1} + \sum_{i=1}^p \gamma_i \Delta P_{t-i} + \varepsilon_t$$

From the equation above, α^0 as constant, β , γ as coefficient, P as variable, t is trend for waktu, Δ as first difference, ε_t as error. Unit roots are tested for coefficients P_{t-1} , if the coefficient is found to be different from zero ($\beta \neq 0$), after testing the unit root, the null hypothesis, the series has a unit root, to be rejected, the alternative hypothesis will be accepted, namely P does not have a unit root.

2. Panel Cointegration Test

The cointegration test is a combination of linear relationships of non-stationary variables, where all of these variables must be integrated at the same order/level. If it has a cointegration relationship, VECM analysis can be carried out. The cointegration test is basically to see the long-term balance between the variables observed by Ghali (1998).

The econometrics methodology says that to proceed to the cointegration test, all variables in the model must be integrated in levels. Fowowe (2011) explained that after testing the unit root there are two ways of testing causality that first is when the variables are integrated at order $I(1)$ then VECM is the best choice to use (Emirmahmutoglu & Kose, 2011; Fowowe, 2011; Moudatsou & Kyrkilis, 2011; Zhang, 2001) and if the variables in the model are not integrated at the same level then causality must be continued with the VAR approach, (Fowowe, 2011; Toda & Phillips, 1993).

2. Vector Error Correction Model (VECM)

The Vector Error Correction Model (VECM) is used to see the intensity and response of the variables in the research model. VECM is the development of a VAR model that is not stationary and has one or more cointegration relationships. Cointegration in VECM is known as an error, if there is a deviation from the long-term balance it will be corrected through gradual short-term partial adjustments.

When the variables are cointegrated, VECM is the right model to use. Sims, (1980). The VECM model does not determine the direction of causality in the variables, therefore Granger causality based on VECM will be used to examine the short-term and long-term relationships between variables in the equation.

This study will use the Johansen Cointegration test and the Granger Causality Test which is based on the Vector Error Correction Model (VECM) to examine the causal relationship between GDP, FDI and labor in provinces in Indonesia.

4. Causality Analysis (Granger Test)

Analysis of economic data often finds conditions of dependence between one or several variables with other variables in an equation (causal relationship between variables) in the model. This problem underlies the need for testing the causality relationship between variables in the model (granger causality test). This test is used to determine whether the lag of the independent variable affects the dependent variable or not.

Analysis of the causal relationship between the independent and dependent variables in the VECM model can be seen in the coefficient of the error correction term (ECT) using the t test statistic. The Granger causality test based on the VECM is used to determine whether there is a causal relationship between GDP, FDI and labor.

4. Empirical Results

4.1. Results

Data Panel Stationarity Result

The commonly used variable stationarity test is, (ADF) uji Dickey & Fuller (1979) (1979), (PP) uji Phillips & Perron, (1988). This study used the ADF unit root test with estimation results;

Table 1. Summary Unit Root Test

Variable	Probability PP – Fisher Chi-Square	Explanation
Ln_PDB	0,0000	Stationer pada tingkat level
Ln_PMA	0,0000	Stationer pada tingkat level
Ln_TK	0,0000	Stationer pada tingkat level

Source: Processed data by Eviews 10

The results of the unit root test using the PP method in table 1 show that all variables have a unit root at level 1 (0), namely; LnPDB, LnPMA, and LnTK are stationary at a level with a significant level of 5 percent. Furthermore, we do not continue the stationarity test for the level of difference, because all variables are stationary at the level. Next, estimate the vector error correction model (VECM).

Vector Error Correction Model Result (VECM)

Vector Error Correction Model (VECM) is the development of a VAR model that is not stationary and has one or more cointegration

relationships. When the variables are cointegrated, VECM is the right model to use. Sims, (1980) The VECM model does not determine the direction of causality in the variables, therefore Granger causality based on VECM will be used to examine the short-term and long-term relationships between variables in the equation.

Table 2. Vector Error Correction Model (VECM) Estimation Result

Cointegrating Eq:	CointEq1		
LN_PDB(-1)	1.000000		
LN_PMA(-1)	-0.858000 (0.12243) [-7.00797]		
LN_TK(-1)	-0.207915 (0.21104) [-0.98517]		
C	-3.480025		
Error Correction:	D(LN_PDB)	D(LN_PMA)	D(LN_TK)
CointEq1	-0.001276 (0.00157) [-0.81031]	0.296627 (0.05265) [5.63427]	-0.000585 (0.00211) [-0.27702]
D(LN_PDB(-1))	0.315628 (0.08591) [3.67400]	2.548878 (2.87309) [0.88716]	0.130439 (0.11524) [1.13193]
D(LN_PDB(-2))	0.089763 (0.07939) [1.13067]	0.519603 (2.65506) [0.19570]	-0.313435 (0.10649) [-2.94329]
D(LN_PMA(-1))	0.001560 (0.00171) [0.91178]	-0.496885 (0.05722) [-8.68301]	-0.002567 (0.00230) [-1.11825]
D(LN_PMA(-2))	0.000148 (0.00157) [0.09426]	-0.075487 (0.05257) [-1.43599]	-0.000565 (0.00211) [-0.26782]
D(LN_TK(-1))	-0.062121	-0.200589	-0.480917

	(0.05203)	(1.74012)	(0.06979)
	[-1.19391]	[-0.11527]	[-6.89050]
D(LN_TK(-2))	-0.081509	1.054096	-0.129235
	(0.04770)	(1.59513)	(0.06398)
	[-1.70891]	[0.66082]	[-2.01996]
C	0.032774	-0.017590	0.049277
	(0.00500)	(0.16737)	(0.00671)
	[6.54892]	[-0.10510]	[7.34076]
R-squared	0.128481	0.468161	0.217597
Adj. R-squared	0.101123	0.451466	0.193037
Sum sq. Resids	0.123712	138.3688	0.222596
S.E. equation	0.023553	0.787711	0.031594
F-statistic	4.696421	28.04282	8.859905
Log likelihood	542.1958	-268.5816	474.3513
Akaike AIC	-4.625072	2.394646	-4.037674
Schwarz SC	-4.505854	2.513864	-3.918456
Mean dependent	0.052239	0.077549	0.024629
S.D. dependent	0.024843	1.063567	0.035171

Source: Processed data by Eviews 10

Table 2 shows the results of the VECM estimation. VECM can be used to see the intensity and response of the variables in the model. The VECM regression results consist of two parts of the table, the upper part shows the long-term relationship and the bottom shows the short-term relationship. The results of the estimation above show that the FDI variable has a significant influence on GDP as indicated by an estimated value of -7.00797. While the labour statistically does not have a significant effect. The bottom section shows a short-run relationship where neither GDP nor labour is significant. The largest R-square value for the FDI variable is 0.468161.

Causality Estimation Result (Uji Granger)

Analysis of economic data often found that there is a causal relationship between the variables in the model. This underlies the need to test the causality relationship between variables in the model (granger causality test). This study will use the Johansen Cointegration test and the Granger Causality Test which is based on the Vector Error Correction Model (VECM) to examine the causal relationship between GDP, FDI and labour in provinces in Indonesia in 2010 - 2019.

Analysis of the causal relationship between the independent and dependent variables in the VECM model can be seen in the coefficient of the error correction term (ECT) using the t test statistic. Null hypothesis; independent variable lag does not affect the dependent variable. The null hypothesis is rejected if the chi-square probability is less than 5%.

Table 3. Causality Test Estimation Result (Granger Test)

Null Hypothesis:	Obs	F-Statistic	Prob.
LN_PMA does not Granger Cause LN_PDB	264	0.94204	0.3912
LN_PDB does not Granger Cause LN_PMA		6.68204	0.0015
LN_TK does not Granger Cause LN_PDB	264	2.10352	0.1241
LN_PDB does not Granger Cause LN_TK		2.50137	0.0840
LN_TK does not Granger Cause LN_PMA	264	4.17915	0.0164
LN_PMA does not Granger Cause LN_TK		2.08149	0.1268

Sumber: Eviews 2010.

The Estimation Results of the Granger Causality Test shown in table 3 can be used to determine the direction of the relationship between GDP, FDI and Labor. Granger's null hypothesis of causality; FDI causes economic growth, the Granger Causality Test Estimation Results show that the relationship between GDP and FDI has a smaller f-statistic than the f-table, which means that the null hypothesis is not rejected at the 5% confidence level. Conversely FDI to GDP has a larger f-statistic than the f-table so that the null hypothesis can be rejected. Thus the causality relationship between FDI and GDP has a one-way pattern of FDI pushing GDP.

The Estimation Results of the Granger Causality Test show that the relationship between TK and GDP has a greater f-statistic than the f-table, which means that the null hypothesis is rejected at the 5% confidence level. On the other hand, GDP to TK has a larger f-statistic than the f-table so that the null hypothesis can be rejected. Thus the causal relationship between GDP and TK has a one-way pattern. GDP increases the absorption of TK.

The Estimation Results of the Granger Causality Test show that the relationship between TK and FDI has a greater f-statistic than the f-table, which means that the null hypothesis is rejected at 5% confidence level. In contrast, TK to PMA has a

larger f-statistic than the f-table so that the null hypothesis can be rejected. Thus the causality relationship between FDI and TK has a one-way pattern. FDI encourages TK absorption.

Granger's null hypothesis of causality; FDI causes economic growth is not rejected. This means that in the long run there is no causal relationship between FDI and economic growth, but there is a unidirectional relationship between FDI and economic growth. If the variables in the model are not integrated at the same level then causality must be continued with the VAR approach, (Fowowe, 2011; Toda & Phillips, 1993).

Model Vector Autoregression Estimation Result (VAR)

The VAR method is an estimation method that explains the relationship between economic variables simply by assuming that all dependent variables are stationary, have an average of zero, no correlation between independent variables and constant variance. The VAR equation system where all the endogenous variables with their independent variables are in lag form. The VAR equation system which shows that each variable is a linear function of the constants and lag values of the variables in the system. The VAR system of equations is generally used to project a system of time series variables and the dynamic impact of disturbance factors on the variables in the system. VAR analysis can be used to assess the interrelationships between variables in the system..

Table 4. Model Vector Autoregression (VAR) Estimation Result

	LN_PDB	LN_PMA	LN_TK
LN_PDB(-1)	1.395264 (0.06291) [22.1770]	0.018119 (2.52947) [0.00716]	0.028115 (0.08602) [0.32682]
LN_PDB(-2)	-0.403049 (0.06230) [-6.46968]	0.259243 (2.50468) [0.10350]	-0.021048 (0.08518) [-0.24710]
LN_PMA(-1)	0.002059 (0.00139) [1.47863]	0.315001 (0.05598) [5.62657]	-0.002192 (0.00190) [-1.15120]

LN_PMA(-2)	-0.001093 (0.00130) [-0.84157]	0.397445 (0.05221) [7.61195]	0.002487 (0.00178) [1.40036]
LN_TK(-1)	-0.010023 (0.03914) [-0.25609]	-1.154062 (1.57353) [-0.73342]	0.593834 (0.05351) [11.0969]
LN_TK(-2)	0.016199 (0.03882) [0.41727]	1.111125 (1.56083) [0.71188]	0.394681 (0.05308) [7.43538]
C	0.068559 (0.01717) [3.99351]	-0.483481 (0.69021) [-0.70048]	0.035202 (0.02347) [1.49969]
R-squared	0.999639	0.735504	0.999073
Adj. R-squared	0.999631	0.729329	0.999051
Sum sq. Resids	0.128983	208.4907	0.241136
S.E. equation	0.022403	0.900693	0.030631
F-statistic	118636.1	119.1100	46164.02
Log likelihood	631.7712	-343.4405	549.1815
Akaike AIC	-4.733115	2.654853	-4.107435
Schwarz SC	-4.638299	2.749669	-4.012619
Mean dependent	11.83675	7.888124	7.607906
S.D. dependent	1.165694	1.731235	0.994525

Source: Data processed by Eviews 2010

In the VAR structural model, it shows important changes in adjusting short-term output. The estimation results of the VAR model in the variable column GDP on short-term FDI and Labor at lag 1 show a positive coefficient and at lag 2 with positive values for FDI and negative for Labor. The VAR estimation results for the variable FDI to GDP at lag 1 show positive and negative coefficients at lag 2, while labor at lag 1 has a negative value and positive at lag 2. The results of the VAR estimation, the labor variable on FDI in lag 1 with a negative value and in lag 2 with a positive value.

Impulse Response Function (IRF)

IRF analysis is a method to determine whether there is a shock from an endogenous variable to other variables and how long the shock occurs. IRF analysis can be carried out to find out the impact that occurs, through the amount of standard error. Estimation in the system with the assumption that each variable is not correlated with each other so that the movement of the shock effect can be direct.

The Impulse Response function is used to test the shock externality of PMA in the form of other variables in the system. The Impulse Response image shows the variable response for the next 10 periods so that you can see the duration of the shock effect from other variables. Movement Impulse Response indicates that if it approaches the point of balance (convergent) or returns to the previous balance, it means that the response due to shock to a variable within a certain time will disappear so that it does not leave a permanent effect on the variable.

Response to Cholesky One S.D. (d.f. adjusted) Innovations

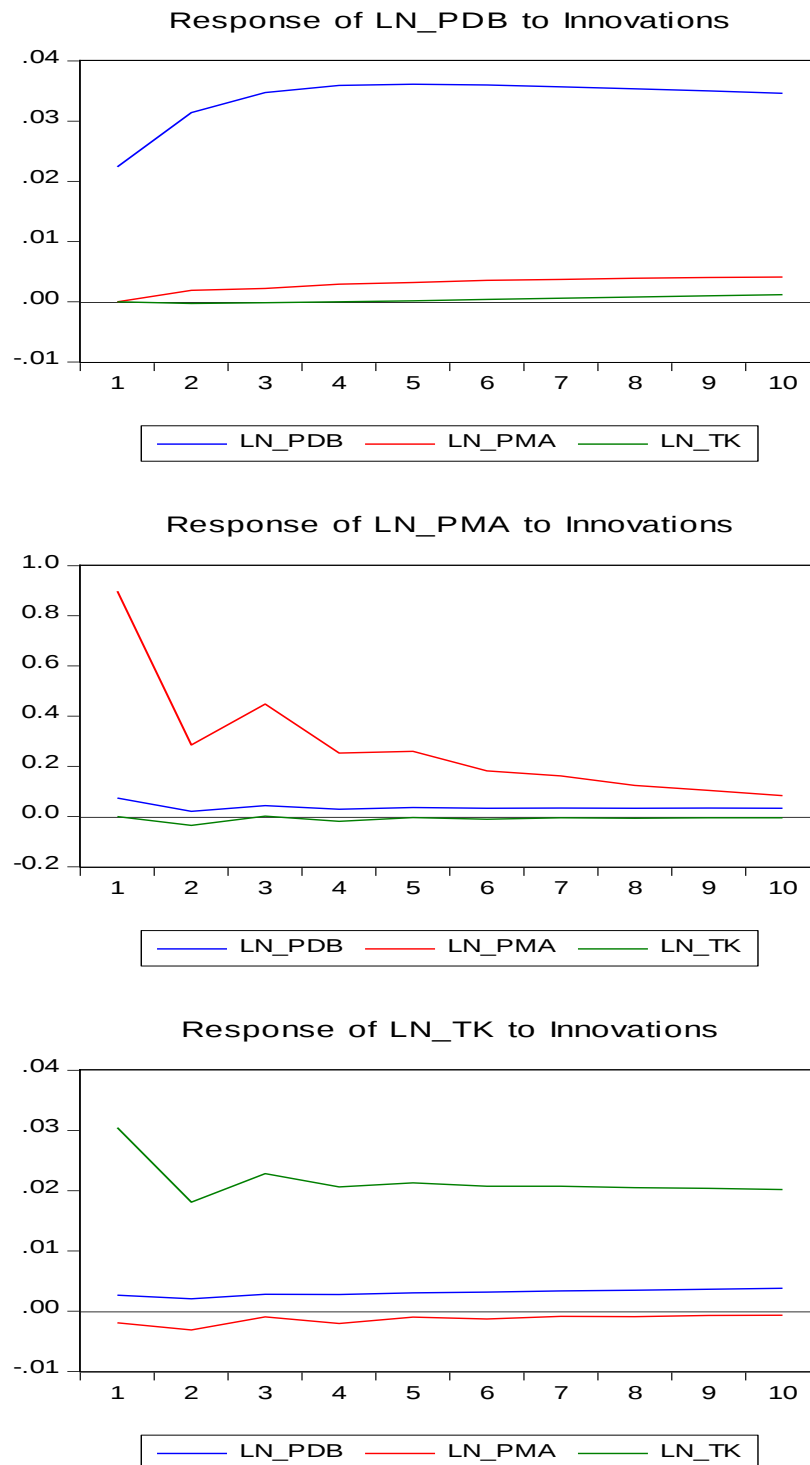


Figure 1 Impuls Respons Funtions

Source : Data processed

Figure 1 IRF plot for the next 10 years which explains the response of a variable to other variables that arise because there is a shock (impulse) of 1 standard deviation from both itself and other variables.

Based on Figure 1, the response to economic growth in the first year itself has increased quite substantially, the response to FDI has increased but not as big as the response to economic growth. The response of economic growth in the second year, both to oneself and to FDI, has increased, although not as big as the first year. The response to economic growth in the following year until the end of the observation year did not experience a significant response.

FDI's response to self-shocks from the first year to the last year of observation has decreased. The response of FDI shocks to economic and labour growth until the second year has decreased, the following year has not experienced a significant response. The response of labour to self-shocks until the second year decreased after that it increased until the third year and then slumped until the end of the observation year. The response of the workforce to economic growth shocks did not experience a significant response, while the response to FDI shocks was negative at the beginning of the study period and thereafter approached equilibrium.

4.2. Discussion

Estimation results of Stationarity Test Panel data shows that all variables are stationary at the level. The estimation results of the Granger causality test for the FDI variable on economic growth (GDP) have a causal relationship and are statistically significant with a one-way pattern where FDI drives economic growth. The causal relationship between GDP and TK has a one-way pattern, meaning that economic growth will increase employment absorption.

The results of the Granger Causality Test for FDI with labour, both FDI as the dependent variable and FDI as an independent variable are statistically significant and have a one-way pattern, FDI encourages the absorption of labour. Granger's null hypothesis of causality; FDI causes economic growth is not rejected. This means that both in the short term and in the long term there is no causal relationship between FDI and economic growth, but there is a unidirectional relationship between FDI and economic growth in the short and long term.

This research is in line with Bermejo Carbonell & Werner, (2018), that the effect of FDI is not statistically significant on economic growth in Spain, it is suspected that other factors besides FDI affect economic growth, one of which is the education factor. Bengoa & Sanchez-Robles, (2003)

found a positive relationship between FDI and economic growth for 18 Latin American countries. Research by Makiela & Ouattara, (2018), that there are other factors that affect economic growth besides FDI. The insignificance of FDI to economic growth implies the ability to absorb technological innovations brought by FDI.

In the VAR structural model, it shows important changes in adjusting short-term output. The estimation results of the VAR model on the FDI variable on economic growth and short-term labour at lag 1, the coefficient of the economic growth variable shows a positive value and the labour variable shows a negative value. In lag 2 for the economic growth variable with a negative value and a positive value for the Labour variable.

The results of the VAR estimation on the variable economic growth on FDI in lag 1 on economic growth show a positive coefficient and a negative value for the labour variable, in lag 2, it shows a positive coefficient for economic growth and the labour variable. This situation shows the long-term influence of FDI externalities on economic and labor growth. The influence of FDI externalities requires processes and adaptations both to human resource capabilities and to technology transfer.

Based on Impulse response of FDI from VAR tends to diverge, the Impulse Response movement shows a response due to externalities brought by FDI on economic growth and labor, which means that the response due to externality of FDI permanently affects the variables of economic growth and labor. In contrast to the convergent Impulse response function of economic growth, economic growth will continue to increase along with the externality of FDI.

The response of economic growth to FDI has increased until the second year, the next period until the end of the observation year tends to be close to balance. If there is an increase in FDI the response to economic growth does not occur at the same time but through increased productivity through production efficiency. FDI response to labour until the second year has decreased, the next year is close to balance. The response of the labour force to economic growth shocks did not experience a significant response, while the response to FDI shocks was negative at the beginning of the study period and thereafter it approached equilibrium.

From the IRF figure, it can be seen that the response tends to converge, both FDI and economic and labour growth.

The existence of FDI will provide an externality to the quality of the labour, management and technological innovation, especially in the manufacturing industry sector.

In general, FDI is from a Multi-National Corporation company, which brings technical innovation, improves labour skills, managerial so that it can absorb changes and improve technology, which will ultimately increase productivity.

The increase in FDI is expected to increase labour absorption. FDI through the Multi-National Corporation, generally requires good quality resources that are able to adopt technological innovations brought by FDI. So that at the beginning of the period of FDI, the response of labour has not yet occurred. The response of labour to the shocks of themselves and FDI until the second year has decreased and negative. Then, it has increased until the third year and converges to near balance.

The existence of a shock in the FDI variable will cause a negative response to economic growth. The declining response to economic growth occurred until the second period and increased until the end of the 10th period. This proves that the influence of FDI is still weak in economic growth.

On the other hand, the response to the variable economic growth due to the FDI shock showed a positive response. In the first and second periods it can be seen that the response that occurred in economic growth to changes in FDI was very small. Starting from the third period, the response of economic growth to the FDI shock has increased and moved to a balance point.

Through the endogenous growth model, the externality of technological progress, innovation and management brought by FDI. FDI externalities in the form of increased knowledge and skills lead to an increase in the quality of human resources and production efficiency (Elboiashi, 2011). FDI externalities in the form of technological innovation require time for the learning process, increase labor productivity production efficiency, so that the impact on economic growth in the long term, (Li et al., 2011). On the other hand, it requires the ability to absorb human resources for technological innovation brought by FDI to encourage economic growth in the host country.

FDI does not directly drive economic growth, but the externality of FDI will be interactions with human resources and the absorption of technological innovations. There is a positive interaction between FDI and human resources and a

negative interaction with the absorption capacity of technological innovations that will affect the economic growth of the host country.

Several studies have stated that human resource capability is an important factor in driving economic growth in Pakistan (Rehman & Khan, 2015) and economic growth in Malaysia (Fadhil & Almsafir, 2015).

Study by Lipsey & Sjöholm, (2011) about the impact of FDI on economic growth in Indonesia, the level of education in Indonesia is a factor that makes Indonesia's economy lagging behind countries in the East Asia region in 2010. Study by Millia et al., (2022), found that incoming FDI in Indonesia did not make a positive contribution to the local industry. Limited ability to absorb technology transfer from local companies brought by foreign companies through limited inflows from FDI.

There are many factors that need attention besides the ability to absorb technology, to attract FDI flows, such as government policies, infrastructure. In addition, it is necessary to pay attention to the ability of local companies to be able to absorb the transfer of technology and knowledge brought by FDI. The limited ability of human resources has an impact on the absorption of technology transfer brought by FDI.

The results of this study prove that there is a one-way relationship from FDI to economic growth to FDI. The results of this study indicate that in the long term and short term, there is no reciprocal relationship between FDI and economic growth. The case of Indonesia's education is an important factor that needs attention. Education affects the ability of human resources and local companies' absorption of technological innovations that accompany FDI towards economic growth.

Externalities in the form of technological innovation brought by FDI require time for the learning process. This study proves that based on the Granger causality test, there is no causal relationship between FDI and economic growth in the short and long term. The results of this study indicate that there is a unidirectional relationship from FDI to economic growth in the short and long term. This means that FDI externalities in the form of increased knowledge and skills lead to an increase in the quality of human resources and production efficiency which will ultimately increase economic growth. In addition, it is necessary to pay attention to the ability of local companies to be able to absorb the transfer of

technology and knowledge brought by PMA. Several factors need attention besides the ability to absorb technology, as an attraction for FDI flows, such as the government's macro policies and the availability of infrastructure, trade and investment activities.

5. Conclusions

This study discusses the causal relationship between FDI, economic growth and employment by province in Indonesia for the period 2010 – 2019. The results of the study show that there is no causal relationship between FDI and GDP in the short and long term. However, the results of this study indicate that there is a unidirectional causal relationship from economic growth to FDI in the short and long term. FDI is a source of investment and technology transfer which has a positive impact on the economic growth of the host country. From the results of the Impulse response from the VAR, it tends to diverge, the FDI response to GDP and Labor is quite good. FDI affects economic growth in one direction. FDI brings externalities from technological innovation, increases the ability of the workforce and this takes time for learning. Sothan, (2017), stated that there are many factors that can affect the flow of FDI to host countries, such as macroeconomic policies, infrastructure conditions, trade and investment activities.

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