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Analysis of the Relationship Between GDP and FDI on the Economic Growth of Laos

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In the current globalization stream, the foreign investment is an important role not only for developed country but at all especially the least developing country as Laos. This study aims to examine the relationship between the gross domestic product (GDP) and foreign direct investment (FDI) on economic growth of Laos by using data from 1985 to 2014. The long run relationship was analyzed by Johansen co-integration test and estimated the speed of adjustment by Vector Error Correction approach. Estimated results indicated that there was long run relationship running from FDI to GDP and the relation would return to the equilibrium in about 19 when it occurred. This study suggests that policy maker should improve the other factor for motivated FDI and accelerate Lao economy.

Keywords: GDP, FDI, Laos, co-integration, VECM

Introduction

Globalization is currently becoming an important role in the global economy. All countries are connected by invisible network in form of social network to increase convenient of connecting people in each region. The effects of Asian crisis in 1997, Hamburger crisis in 2008, European debt crisis in 2009, European Union leaving of England in 2016 have contributed to the fragile and instable of global economy that has to be cooperatively insulated.

One of the essential and necessary networks to connect economy of each state is investment particularly for foreign direct investment (FDI). Investment can be regarded as the instrument and policy to expand and distribute product as well as service via using massive input for manufacturing industries. Nevertheless, In the long run, the resources will not be enough and cost of utilization will be higher. As a result, the investment in other countries in terms of FDI may solve these problems by seeking lower input cost and optimal location for production or distribute product in other locations. Therefore, the sensitivity of economic changing environment and competition in each country will affect the linkage country of these countries not only home countries but also host countries.

FDI is attracted by many factors of host countries such as location, suitable economic policies and transparency competition environment as well as other related factors. Dunning (2001) proposed three advantages which motivate foreign investment such as location advantage, ownership advantage, and

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internationalization advantage in eclectic (LOI) paradigm of international production. Meanwhile, host labor countries will receive rent and they can buy their resource to increase investment. The win-win relation between host country and foreign investor can be emerged. This theory also supports the new opinion of Selma KURTISHI-KASTRATI in 2013 which explains the benefits of FDI for host country's economy. In addition, the costs of FDI to host country's economy such as adverse effects on employment and the net number of new jobs effected via FDI may not be great as initially claimed by an MNE (Kurtishi-Kastrati, 2013). This effect can be considered as adverse effects on competition. It may be monopolized market if the international organization has a lower average cost from the advantage and adverse effects on balance of payment because the outflow from profit of international organization returns to home countries.

There is insufficient of domestic investment in most developing countries to accelerate their economy growth because of both many low income and saving including capital accumulation. As a consequence, the need of FDI is of important concern. Borensztein, De Gregorio, and Lee (1988) found that the foreign investment effect is essential factor to drive technology development and support economic growth in developing countries. Moreover, FDI is more important than local investment in developing country. Carkovic and Levine (2002) found the effect of human resource development and foreign investment on economic growth. High performance of human resource counties and foreign direct investment play more important roles than other lower countries.

There is relationship between cost of home countries and benefits of host countries which are different from different countries. However, there is possibly negative relationship between FDI and GDP which could happen especially in developing countries. Therefore, this relationship should be proved by using empirical study particularly for the developing countries in Greater Mekong Sub-region such as Laos and by using appropriate econometric model estimation. The empirical results can be used as related policy implementations guideline for both Laos and Thailand's public and private organizations.

This study aims to investigate the relationship between FDI and GDP of Laos. It is divided into four sections: Introduction in section 1; the next section is methodology; results and discussion are proposed in section 3; the last section is conclusion; and policy is in section 4.

Methodology

This study examines the relationship between FDI and GDP of Laos by using time series data from 1985 to 2014. The data of FDI stock of Laos were collected from UNCTAD while GDP at constant price in 2005 was collected form World Bank. All time series data were tested stationary potential by Augment-Dickey Fuller test (ADF-test) and Phillip-Perron test (PP-test). In addition, the time series data were tested co-integration by using the Johansen co-integration approach to investigate long-run relationship. Short-run relationship and adjustment to equilibrium were examined by using Vector Error Correction Mechanism (VECM).

Stationary Test

Almost time series data have stochastic trend or unit root processes (Nelson & Kang, 1981). The results from ordinary least square (OLS) estimation can be spurious that is considerably high R^2 but low Durbin-Watson statistic. This problem is called spurious regression. Besides, the variables have stochastic trend are call non-stationary variables. Therefore, the first step of estimation time series by using OLS estimator has to detect the stationary potential and use method calls stationary test or unit root test.

This study investigated stationary potential by using ADF-test and PP-test which traditionally process for unit root testing. Estimated model can be present as follows:

$$\Delta X_t = aX_{t-1} + \sum_{i=1}^{p} \omega_i \Delta X_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta X_t = \delta + aX_{t-1} + \sum_{i=1}^{p} \omega_i \Delta X_{t-1} + \varepsilon_t \quad (2)$$

$$\Delta X_t = \delta + \gamma\theta + aX_{t-1} + \sum_{i=1}^{p} \omega_i \Delta X_{t-1} + \varepsilon_t \quad (3)$$

where X_t is explained variable, δ is constant, $\gamma\theta$ is time trend, ε_t is error term, $\sum_{i=1}^{p} \omega_i \Delta X_{t-1}$ is autoregressive process, and α is coefficient of X_t in the last previous. Non intercept and trending variables would be tested by equation (1), intercept variables would be tested by equation (2), and intercept and trending variable would be tested by equation (3). Coefficient (α) was transformed into ADF-t statistic as follows:

$$\text{ADF} = \frac{\hat{\alpha}}{\text{SE}(\hat{\alpha})} \quad (4)$$

ADF-t statistic has to be compared with McKinnon critical value for concluding stationary potential. Stationary potential can be accepted when ADF-t statistic was less than McKinnon critical value but the statistic was more than the critical value, the variable was non-stationary.

Although non-stationary potential was detected at level of integrated or I (0), the variable may be stationary at higher order of integrated (I (1) or I (2)). They probably have long-run relationship. Thus, they should be tested again at the higher order of integrated.

Co-integration

Time series variables are probably be co-integrated (Engle & Granger, 1987). Some variables may be moved with the others even though they had been affected by external factors. This phenomenon is long-run relationship between variables. Engle and Granger (1987) presented the approach to detect long-run relation as Engle Granger 2 step approach. Later, Johansen (1988) improved the method based on VAR process as the system-based reduced rank regression approach. The developed approach can be used to indicate the number of co-integration from the hypothesis about the rank of coefficient matrix in the model. However, both approaches remind the important condition of the stationary at the same order of integrated of tested variables. This study applied and considered the co-integration property by Johansen co-integration test as following:

$$\begin{bmatrix} \Delta FDI_t \\ \Delta GDP_t \end{bmatrix} = \begin{bmatrix} \beta_0 & \beta_1 \\ \vartheta_0 & \vartheta_1 \end{bmatrix} \begin{bmatrix} \Delta FDI_{t-1} \\ \Delta GDP_{t-1} \end{bmatrix} + \begin{bmatrix} u_t \\ v_t \end{bmatrix} \quad (5)$$

where $\begin{bmatrix} \beta_0 & \beta_1 \\ \vartheta_0 & \vartheta_1 \end{bmatrix}$ is vector of parameter, $\begin{bmatrix} u_t \\ v_t \end{bmatrix}$ is vector of error term. The co-integration can be accepted

when the rank of coefficient or vector of parameter is not zero. This concept can be proved by rank of vector of parameter with λ_{trace} and $\lambda_{\max}$ eigenvalue value. Null hypothesis of λ_{trace} eigenvalue is the number of co-integration vector which is rank < k while the alternative is rank = k. Null hypothesis of $\lambda_{\max}$ eigenvalue is rank < k while the alternative hypothesis is rank = k+1.

VECM

According to the previous process, long-run relationship of variables was verified by co-integrated testing. This process can be used to extend the property of long-run relation as speed of adjustment running from the deviation of explained variable when the external factor occurred to the long-run equilibrium, the short-run relation, and long-run relation of the interested variables. The method used to analyse is VECM by the followings:

$$\begin{bmatrix} \Delta FDI_t \\ \Delta GDP_t \end{bmatrix} = \begin{bmatrix} A_0 \\ B_0 \end{bmatrix} + \begin{bmatrix} A_1 \\ B_1 \end{bmatrix} EC_{t-1} + \begin{bmatrix} A_2 & A_3 \\ B_2 & B_3 \end{bmatrix} \begin{bmatrix} \Delta FDI_{t-1} \\ \Delta GDP_{t-1} \end{bmatrix} + \begin{bmatrix} p_t \\ q_t \end{bmatrix} \quad (6)$$

where $\begin{bmatrix} \Delta FDI_t \\ \Delta GDP_t \end{bmatrix}$ is constant matrix, $\begin{bmatrix} A_1 \\ B_1 \end{bmatrix}$ is coefficient matrix of error correction component and presented the speed of adjustment of model, $\begin{bmatrix} p_t \\ q_t \end{bmatrix}$ is error term in each model and EC_{t-1} is a vector of error term in the Johansen test. The long-run relation is accepted when the coefficient of vector error correction was negative significantly. Speed of adjustment is presented by value of parameter in the coefficient matrix of error correction.

Results and Discussion

According to the stationary results from Table 1 to Table 3, it is found that FDI and GDP are non-stationary but stationary at second difference. In Table 1, it can be affirmed that all estimated statistics from ADF-test and PP-test at level are more than the McKinnon critical value. This situation indicated that both variables were non-stationary at level.

Table 1

Stationary Test at Level

Variable	ADF-test			PP-test		
	None	Intercept	Intercept and tending	None	Intercept	Intercept and tending
FDI	2.9654	2.9735	3.5643	11.3005	8.3996	5.5402
GDP	3.2784	19.3751	5.4122	21.5481	21.5332	5.8120

Source: From the calculation.

From the results in Table 2, both variables were non-stationary at the first difference on ADF-test and PP-test. ADF-t statistics estimated by ADF and PP test were less than McKinnon statistic at all.

However, the stationary property was different from the second difference. Table 3 showed that FDI was stationary on ADF test by intercept and tending model and on PP test by without intercept and tending model. Moreover, GDP was stationary on ADF test by intercept model and intercept and tending model as PP test on without intercept and tending model and intercept and tending model.

Table 2

Stationary Test at Fist Difference

Variable	ADF-test			PP-test		
	None	Intercept	Intercept and tending	None	Intercept	Intercept and tending
FDI	3.0304	2.2941	0.8145	4.7464	3.8086	0.6521
GDP	2.1412	0.2796	-1.5091	3.0666	0.7566	-2.6849

Source: From the calculation.

Table 3

Stationary Test at Second Difference

Variable	ADF-test			PP-test		
	None	Intercept	Intercept and tending	None	Intercept	Intercept and tending
FDI	-0.1936	-0.6431	-3.8541**	-1.6560*	-1.7229	-1.7374
GDP	-2.7317	-7.4286***	-7.3909***	-6.4164***	-8.1668	-13.3229***

Notes. *** significant at 0.01; ** significant at 0.05; * significant at 0.1. Source: From the calculation.

The stationary results shows that FDI and GDP were stationary at the second difference and in the same order of integrated. Thus, both probably detect the long-run relationship by using Johansen co-integration test.

After detecting the stationary property, long-run relation of both variable was proved and presented in Table 4. The result shows that λ_{trace} and $\lambda_{\max}$ were 0.4743 and significantly at 0.05. Moreover, the results indicated that there is 1 co-integration in the system.

Table 4

Co-integration Result

Lag	Eigenvalue		Number of co-integration	
	Trace	Maximum	Trace	Maximum
1	0.4743**	0.4743**	1	1

Note. ** significant at 0.05. Source: From the calculation.

According the VECM results in Table 5, long-run relationship is confirmed by the value in coefficient of EC matrix. There is long-run relation running from FDI to GDP. On the other hand, there is no long-run relationship running from GDP to FDI. The relationship between FDI and GDP will return to equilibrium if there are occurrences by external factor about five percent of the year or about 19 days.

The VECM results conflict the eclectic paradigm of international production of Dunning (2001) in some factor on part of location advantage. Dunning presented that some factor in host country which created the advantage for foreign investor such as host country economy would attract foreign investor to invest on host country. In Lao case, this study was analysed by using the information during 1985 to 2015 (see Appendix 1) which included the effect on the earliest state of foreign investment in Lao as the low value of foreign investment and instability of investment policy while the scale of economy in Lao was very low because there was low domestic investment and saving. Thus, foreign investor was overlooked on the economy factor but attracted by the other factor which made the advantages in Lao. Moreover, this problem made the foreign investment in Laos as an important role for booting the economy presented in the results of VECM.

Table 5

Vector Error Correction Mechanism

Dependent variable	EC	
	Coefficient	t-statistic
FDI	-0.0012	-0.0483
GDP	-0.0518	4.5936***

Note. *** significant at 0.01. Source: From the calculation.

The situation is inconsistent with the effect of human capital and technology and on the relationship from FDI into GDP as Carkovic and Levine (2002) and Borensztein et al. (1998) explained. The foreign investment on the earliest stage is human intensive in the section without more skill labor as Freeman (2002) and Gunawardana (2008) presented. The effect of human capital and technology in this study is not the evidence, although the economic boost policies' implementation has more directly effects on employment than the value added from productivity of human capital or technology. In contrary, the relationship can probably be different if the earliest year is omitted.

Conclusion and Policy Implications

Based on the empirical results, this study found only the effect of FDI on GDP in the long run in case of Laos. The result is inconsistent with the other previous studies and theories because this study included the information in earliest contribute to the effect. As a consequence, the model improvement can be done by neglecting the earliest period estimation.

However, these results confirm that FDI attractive policies of Laos can accelerate economy and stimulate economic growth. Policy makers should concern the other factors to attract FDI as the foreign investment law adjustment to encourage the more transparency competition and the investment promotion policies. Investment tax rate should be lower. The infra-structure of transportation should be more developed. More specifically, it is strongly confirmed that Lao's economy remains high FDI dependent. Laos is natural resources and labor abundant country but low domestic capital formation compared to other GMS neighbor countries. Massive capital from aboard including Thailand moves to Laos to invest in different industries for risk diversification and decreasing cost of production. This policy leads to creating effective regional production hub and network as well as products distribution. Labor skill is crucial support policy implementation to upgrade the human resources potential. FDI in service sectors can be regarded as essential engine to enhance employment. Therefore, trade and investment liberalization and single market under the AEC ultimate goal is the most important supporting element. Furthermore, the effects of FDI in service sectors on employment and economic growth of Loas can be examined by further research to explore the results.

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Appendix 1

Table 1

Gross Domestic Product and Foreign Direct Investment Changing in Loa PDR Since 1985 to 2014

Year	Gross domestic product at 2005 price (US$ million)	Foreign direct investment (stock) (US$ million)
1985	899.28	0.55
1986	943.21	0.55
1987	929.76	0.55
1988	911.07	2.55
1989	1,040.36	6.55
1990	1,110.11	12.55
1991	1,157.81	19.45
1992	1,222.18	27.25
1993	1,294.44	57.15
1994	1,400.06	116.35
1995	1,498.5	211.45
1996	1,602.32	371.25
1997	1,712.43	457.55
1998	1,780.37	502.85
1999	1,910.46	554.458
2000	2,021.24	588.348
2001	2,137.49	612.248
2002	2,264	616.748
2003	2,401.36	636.148
2004	2,554.03	653.148
2005	2,735.56	680.848
2006	2,971.34	868.248
2007	3,197.07	1,191.748
2008	3,447.24	1,419.448
2009	3,705.84	1,608.948
2010	4,021.84	1,887.748
2011	4,345.14	2,188.498
2012	4,693.8	2,482.878
2013	5,091.42	2,909.548
2014	5,474.05	3,630.388

Source: CEIC DATABASE (2015).