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An Impact of Foreign Direct Investment on Real Gross Domestic Product

- Santa Prasad Bhusal[1]

Abstract

The objective of this article is to measure the impact of Foreign Direct Investment (RFDI) on Real Gross Domestic Product (RGDP) covering the sample period 1988- 2019 employing time-series data. Late 1980s has been the significant policy change in overall Nepalese economy. In this respect, first co-integration analysis was introduced to capture long-run relationships among variables. Second, to capture short-run relationship among variables Pairwise Engel Granger test, and Error Correction Mechanism (ECM) developed. On the paper RFDI contributes to RGDP, the coefficient is positive as well as significant at 5 percent level in the short run only. In the long run RFDI is not significant for the Nepalese RGDP growth. The research finds remittance, domestic capital and export are important tools for RGDP growth, and these variables are positive and significant at 5 percent level. All the stability and diagnostic test of the model has no symbols of misspecification and residuals are normally distributed, homoscedasticity and no serially correlated.

Key words: RGDP; RFDI; OLS; ECM; Co-integration; Pairwise Engel Granger test;

Introduction

Nepal is locked in a double constraint. First, it has low domestic revenue and donor financial support for infrastructure and social service delivery. Second, it has low private-sector capital and investment capacity due to poverty. In this respect, foreign direct investment (FDI) becomes an important source of private finance (UNCTAD, 2019).

To attract FDI, developing countries have established pro-investment policies that help firms to open subsidiaries in all parts of the world with relative ease. In this regard, policy makers in developing countries such as Nepal attract FDI to accelerate economic growth, job creation and

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poverty reduction. This is based on the premise that FDI is a way of obtaining capital and technology that is not available in the host country (Olusanya, 2013).

Efforts to transform Nepal economy, can be formally adopted the policy of liberalization, privatization and globalization after the restoration of multiparty democracy in the early 1990s as the forerunner of globalization in the South Asian region. The accession of Nepal to the WTO in 2004 accelerated the process of globalization. However, in the past two decades or so, Nepal has experienced a few success stories as well as cases of failure and frustrated expectations, which clearly highlight the need to assess the whole process of globalization.

FDI is an important driver of economic growth and prosperity. It helps to create jobs, facilitates technology transfer, and is a major source of capital for developing countries. FDI can lead to transfer technology and know-how, improve the access to international markets and spur competition. However FDI inflows cannot be taken as grant, as countries continue to liberalize, transnational corporations (TNCs) are attracted to locate that offer the most appropriate conditions. The increased importance of FDI for economic development has coupled with greater competition between locations has made investment promotion is a growing activity of a government; not only in developed countries, but also in developing countries for their economic in transition.

Literature Review

There have been many empirical studies examining the effect of FDI on economic growth of developing countries. Literature shows that such an effect of FDI inflows on economic growth differs depending on the countries examined. FDI can contribute to growth through several channels. It can directly affect growth through capital formation. As a part of private investment, an increase in FDI will, by itself, contribute to an increase in total investment.

Ronald (2017) empirically explain the impact of FDI on Uganda's economic growth, employment and poverty reduction. To achieve this end, the study brought together the dependent variables as well as FDI and other explanatory variables as a pioneer in economic analysis. He show 100 percent increase in FDI leads 2 percent increase in growth, 10 percent increase in employment and 5 percent decrease in poverty.

UNCTAD (2019) described FDI can play a key role in the economic growth and development process. FDI is considered to be an instrument through which economies are being integrated at the level of production into the world of globalization by bringing a package of assets, including, capital, technology, managerial capacities and skills, and access to foreign markets.

Bhusal (2021) empirical finding indicate that the RFDI contributes to economic growth the coefficient is positive as well as significant at 5 percent level in the short run only. In the long run FDI is not significant for the Nepalese economic growth. The study finds remittance, domestic capital and export are important tools for GDP growth, and these variables are positive and significant at 5 percent level

Objective of the Study

The general objective of the study is to identify the relationship between FDI and economic growth in Nepal. The specific objective is to examine the contribution of RFDI on RGDP in Nepal.

Hypothesis of the Study

Null Hypothesis (Ho): RFDI has no significant contribution to RGDP growth of Nepalese economy (RGDP).

Alternative Hypothesis (H1): RFDI has significant contribution to RGDP growth of Nepal.

Methodology

This entire research design followed the quantitative data. This study employs annual time series data covering of 32 years the period from 1989 to 2019. Late 1980s has been the significant policy change in overall Nepalese economy and latest updated data are available up to 2019AD. The model is developed based on the variable selected as RGDP, RFDI, Remittance, Export, Import, Domestic Capital of Nepal guided by the functional relation between growth and FDI received. All the data are based on secondary sources published by national and international agencies. Different econometrics and statistical tools and models have been used to analyze the data with the help of Excel, E-views-10 and Microfit software package.

Measures of FDI Impact on RGDP (Model -1)

RGDP = f (RFDI)……(1)

From the above functional relationship following stochastic model will specified.

$RGDP = \beta_0 + \beta_1(RFDI)$……(2)

Generally workings of model retested in its natural logarithm form as

$LnRGDP = \beta_0 + \beta_1 Ln(RFDI) + \mu$…….(3)

Where,

RGDP= Real Gross Domestic Product,

RFDI = Real Foreign Direct Investment,

B_0, β1…are model parameters μ is the stochastic error term.

Measure of FDI on others Variables Impact on RGDP (Model 2)

GDP = f(RFDI, RREM, RDK, REXP, RIMP)……(1)

From the above functional relationships, the following stochastic model is specified below:

$RGDP = \beta_0 + \beta_1(RFDI) + \beta_2 (RREM) + \beta_3(RDK) + \beta_4(REXP) + \beta_5(RIMP) + \mu$……(2)

Generally working model can be restated in its natural logarithm form as follows:

$LnRGDP = \beta o + \beta_1 Ln (RFDI) + \beta_2 Ln (RREM) + \beta_3 Ln (RDK) + \beta_4 Ln (REXP) + \beta_5 Ln (RIMP) + \mu$……(3)

Where,

RREM = Adjusted Remittance,

RDK = Real Domestic Capital,

REXP = Adjusted Export Value,

RIMP = Adjusted Import Value.

Unit Root Test

When we apply standard estimations and test procedures in the dynamic time series model, as the first step, its necessary to examine the stationary property of a series (Gujarati, etal. 2012). Accordingly, Augmented Dickey-Fuller test as suggested Dickey and Fuller (1979) has been applied to test the presence of a unit root in a time series data. There are three versions of ADF test.

$\Delta Y_t = \beta_1 + ZY_{t-1} + \alpha_i + e_t$……1 (Intercept only)

$\Delta Y_t = \beta_1 + \beta_{2t} + ZY_{t-1} + \alpha_i + e_t$ …….2 (Trend and intercept only)

$\Delta Y_t = ZY_{t-1} + \alpha_i + e_t$ ……3 (no trend, no intercept)

The basic objective of this test is to examine null hypothesis and alternative hypothesis.

Null hypothesis (Ho): Variables are not stationary or got unit root,

Alternative hypothesis (H1): Variables are stationary.

Engle-Granger Co-integration Test

Engle-Granger (1969) calculated critical values that are appropriate to estimate error terms. This approach checks for the mixed effect by checking the stationary of the error terms. If the error terms found to be stationary (I0) at their levels using the Engle and Granger critical values then the regression of the equation will not be spurious.

If the regression model with non-stationary variables is run the regression model may be spurious or nonsense like model 1.1

$LnRGDP = \beta o + \beta_1 Ln(RFDI) + \beta_2 Ln\ (RREM) + \beta_3 Ln\ (RDK) + \beta_4 Ln\ (REXP) + \beta_5 Ln\ (RIMP) + \mu$….. (Model 1.1)

The symptom of a spurious regression of R-squared value would be greater than Durbin Watson Statistics. After the test of ADF test at level series model variables got unit root or non-stationary. So from the Johansen Co- integration Test and some variables are co-integrating and they have long run relationship. So Engle-Granger Model (ECM) is to be used as given below.

$D(LnRGDP) = \beta o + \beta_1 D(LnRFDIt\text{-}1) + \beta_2 D(LnRREM) + \beta_3 D(LnRDK) + \beta_4 D(LnREXP) + \beta_5 D(LnRIMP) + \beta_6 * ECM_{t-1} + V$….. (Model 1.2)

V is white nose error terms is one period lag residual of model 1.1. ECM_{t-1} is an error correction term that guides the variables of the system to restore back to equilibrium. In other words, it corrects the disequilibrium.

Granger Causality Test

The standard Granger Causality Test seeks to determine whether past value of variable help to predict change in another variable. The definition states that in the conditional distribution, lag value of Y_t add no information to explanation of movement of X_t beyond the provided by lag value of itself.

Empirical Analysis

To examine the impact of RFDI, RGDP is assumed as a function of RFDI. The regression model has been employed to examine the impact of the variables. It was hypothesized that all the independent variables in the model have significant positive impact on Nepalese economy which is a proxy by RGDP and actually following results are obtained.

Following the ADF test, all series are non-stationary at level but stationary at first difference. However, ADF tests are often affected by the choice of the lag length (p) and lose power while estimating a large sample.

Log Level and Frist Difference

Variables	Log Level Form		First Difference	
	t-statistics	p-value	t-statistics	p-value
LnRGDP	-0.4791	0.8830	-6.7248	0.0000
LnRFDI	-2.0375	0.2701	-8.1474	0.0000
LnRREM	-0.9376	0.7624	-7.9007	0.0000
LnRDK	-0.0795	0.9427	-6.7774	0.0000
LnREXP	-2.3016	0.1778	-7.7146	0.0000
LnRIMP	-0.6758	0.8376	-6.6161	0.0000

Source: Author's estimation results using Eviews-10, 2021

Since all the variables are stationary at first difference we should use the OLS technique.

The results show that RFDI is significant at 5 percent meaning positive impact of RFDI meaning 100 percent increase in RFDI leads to about 62 percent change in RGDP. If we drop others all the variables there is positive relation between RGDP and RFDI.

LNRGDP = 8.13 + 0.62LNFDI

P- value = 0.0000

t-value = (23.4489) (9.9922)

R^2 = 0.7689, F – test 99.84, SD = 1.3050, DW = 1.90 (see Appendix)

In the second model the coefficient of LNRDK LNRREM, and LNREXP are positive as well as significant at 5% level but LNRFDI and LNRIMP are not significant at 5 percent. It may be due to larger portion of spending driven out towards consumption of foreign produce goods from import. It seems that very limited amount of FDI is being invested in productive sectors.

LNRGDP = 2.6436– 0.0012*LNRFDI + 0.0654*LNRREM + 0.9012*LNRDK + 0.3067*LNREXP – 0.3262*LNRIMP

P- value = 0.0000, 0.9357, 0.0003, 0.0000,0.0000, 0.0622

t-value = (12.6162) (-0.0815) (4.2174), (6.4499) (7.8044) (-1.9489)

R^2 = 0.9989, F – test 2056.84, SD = 1.3050, DW = 1.36 (see Appendix)

So to see the long run relation between the variable we approach Engle Granger that shows the residual term for stationary. P-value is less than 1% and t-statistics grater then Critical value. We reject null hypothesis and accept alternative hypothesis. So there is co-integration in order zero I(0). Thus residual term being stationary at level we can say there is existence of co-integration. Therefore we converted to the first difference for error correction.

Null Hypothesis: ECM has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.180942	0.0027
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

Note: An asterisk *indicates MacKinnon (1996).

In the third model we see the ECMt-1 is known equilibrium error its coefficient tells us what the rate that correct disequilibrium of previous period. The ECM coefficient must be negative for convergent equilibrium which is fulfilled in the model. Others coefficients of LNRDK LNRREM, and LNREXP are positive as well as significant at 5 percent level but LNRFDI(-1) is positive but insignificant at given level. LNRIMP is negative and not significant at 5 percent. It may be negative due to large amount of trade deficit with skyrocketed growth of import by spending foreign currency which shows by following table .

Dependent Variable: DLNRGDP
Method: Least Squares
Date: 08/14/21 Time: 09:29
Sample (adjusted): 1990 2019
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.010750	0.010209	-1.053028	0.3033
DLNRFDI(-1)	0.009550	0.007562	1.262831	0.0563
DLNRDK	0.655178	0.108620	6.031814	0.0000

DLNRREM	0.045734	0.018996	2.407568	0.0245
DLNREXP	0.335697	0.058657	5.723060	0.0000
DLNRIMP	-0.055564	0.130791	-0.424828	0.6749
ECM(-1)	-0.571510	0.190023	-3.007588	0.0063

R-squared	0.994041	Mean dependent var	0.136161
Adjusted R-squared	0.992486	S.D. dependent var	0.589868
S.E. of regression	0.051130	Akaike info criterion	-2.907910
Sum squared resid	0.060129	Schwarz criterion	-2.580964
Log likelihood	50.61864	Hannan-Quinn criter.	-2.803317
F-statistic	639.4426	Durbin-Watson stat	1.222534
Prob(F-statistic)	0.000000		

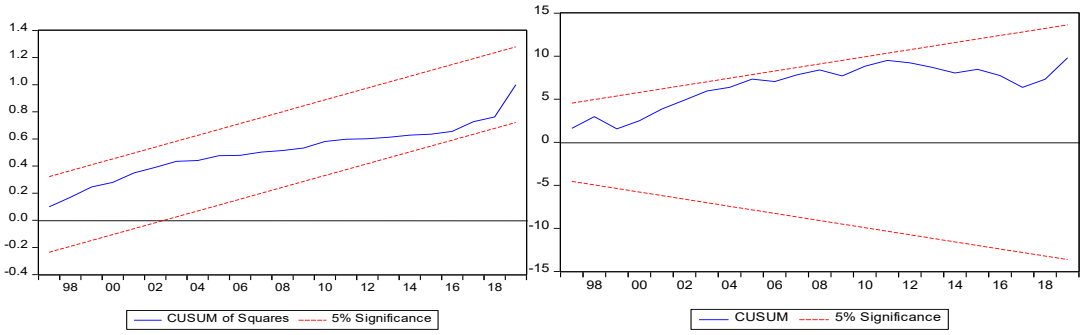
Source: Author's estimation results using Eviews-10, 2021

All the variables included in the model shows the existence of regression. The R^2 of the model estimation is obtained at 0.99 which indicates that 99 percent of the variation in RGDP can be explained by the variation of independent variables used in the model. The computed F test is 639.05 is higher than the table value. The model is best fit. It confirms the presence of relationship between RGDP and others variables.

Value of D-W is grater then R^2 indicating model is free from the auto-correlation; Augmented Dickey Fuller test has reviled non stationary at the level and stationary when the variables are converted into first difference. Similarly the Angle Granger approach shows the long run relation, the residual term is stationary at the level and p-value is less than 5 percent similarly Error Correction Term (ECM) has negative sign after estimation and significant at 5 percent level . The P-value is less than 5 percent it correct the error at the speed of 57 percent annually. Model stability is checked by normal distribution, by observing R^2 and corresponding and corresponding P-value which are all greater than 5 percent . CUSUM of square and CUSUM test has no structural break limiting within 5 percent boundary shown on the following figures.

Figure Residual Stability Test

CUSUM of Square **CUSUM**



Conclusion

The findings of the paper show that there is a positive but not significant relationship between foreign direct investment and economic growth in the long run, since FDI directed toward capital transfer, and service duplication. FDI priorities has shifted from production to non- production. However, the study shows that import has although not significant as well as negative relationship with RGDP. This may be due to use of consumption from national sources. It may be the case of production from imported raw materials. Meanwhile, export, remittance and domestic capital shows significant positive relationship with RGDP which implies that increasing export, remittance and domestic capital has led to increase in RGDP and RGDP from previous year is being used as capital in the current year.

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APPENDIX I

List of RGDP, RFDI, RREM RDK, REXP RIMP (Rs. Million)

Years	RGDP	RFDI	RREM	RDK	REXP	RIMP
1988	9918.8	11.0	50.2	1821.3	466.1	1806.9
1989	11524.4	5.5	60.2	1932.0	585.9	2082.3
1990	14679.3	35.5	67.0	2778.0	899.8	2832.4
1991	9582.5	16.4	27.2	1748.5	878.6	2047.4
1992	10028.8	11.3	32.1	2180.0	1009.7	2292.7
1993	26569.6	26.0	29.7	5604.3	2568.8	6876.0
1994	26406.6	41.0	350.2	5827.7	2125.2	7672.2
1995	32751.7	51.1	350.0	7379.5	2617.0	9796.6
1996	30490.5	176.2	319.3	6390.7	2460.4	10157.9
1997	75211.3	171.3	1021.1	15183.5	6878.3	22250.5
1998	30538.9	51.6	582.2	5837.1	3185.4	7814.7
1999	50598.4	31.1	804.2	8702.5	6642.9	14467.3
2000	176607.6	1355.6	3919.0	30529.6	22261.6	46274.8
2001	170164.1	1255.2	5503.6	28900.4	17386.7	39773.7
2002	164077.0	320.3	13876.7	27204.3	16643.3	41450.7
2003	94166.5	594.6	9935.1	16196.5	9457.9	23908.2
2004	210504.3	48.6	22066.0	35078.6	20966.1	53383.2
2005	96188.8	498.4	13639.5	16911.8	8857.9	25555.9
2006	105482.2	52.5	15567.7	18956.5	8606.2	28216.5
2007	354633.9	127.8	60531.1	66087	25767.8	96494.3
2008	99825.5	184.7	19617.7	18686.9	6838.1	28732.2
2009	108434	259.3	19454.4	24080.9	5529.5	34032.0
2010	146984.3	692.2	27520.8	31476.3	6918.1	42599.6
2011	164230.5	987.6	35845.9	33526.9	7985.1	49641.7
2012	178488.7	956.0	41510.4	40312.6	8096.5	58604.2
2013	215735.2	355.0	54478.1	51334.4	10221.2	79374.0
2014	253589.3	521.5	73491.7	70931.0	10157	92224.3
2015	285210.5	749.5	84192.4	81935.4	8875.6	97923.9
2016	303919.7	1534.4	79040.9	95533.0	8301.0	112512.5
2017	845813.1	4864.4	209893.3	292205.6	22600	345861.1
2018	864698.3	3267.0	196301.3	291235.0	19777.5	354632.5
2019	684916.9	2838.2	187672.9	187650.9	17765.0	217600.0

Sources: Author's estimation results using Eviews-10, 2021

APPENDIX-II

Pairwise Granger Causality

Pairwise Granger Causality Tests
Date: 08/14/21 Time: 07:38
Sample: 1988 2019
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNRFDI does not Granger Cause LNRGDP	30	0.56191	0.5772
LNRGDP does not Granger Cause LNRFDI		4.98321	0.0151
LNRREM does not Granger Cause LNRGDP	30	0.61000	0.5512
LNRGDP does not Granger Cause LNRREM		0.98251	0.3884
LNRDK does not Granger Cause LNRGDP	30	0.92706	0.4089
LNRGDP does not Granger Cause LNRDK		1.07566	0.3563
LNREXP does not Granger Cause LNRGDP	30	0.22664	0.7988
LNRGDP does not Granger Cause LNREXP		0.04028	0.9606
LNRIMP does not Granger Cause LNRGDP	30	2.38977	0.1123
LNRGDP does not Granger Cause LNRIMP		2.54486	0.0986
LNRREM does not Granger Cause LNRFDI	30	2.70823	0.0862
LNRFDI does not Granger Cause LNRREM		0.80000	0.4605
LNRDK does not Granger Cause LNRFDI	30	5.79725	0.0085
LNRFDI does not Granger Cause LNRDK		0.10719	0.8988
LNREXP does not Granger Cause LNRFDI	30	2.42166	0.1093
LNRFDI does not Granger Cause LNREXP		0.64037	0.5355
LNRIMP does not Granger Cause LNRFDI	30	6.49314	0.0054
LNRFDI does not Granger Cause LNRIMP		0.17516	0.8403
LNRDK does not Granger Cause LNRREM	30	0.72143	0.4959
LNRREM does not Granger Cause LNRDK		0.44782	0.6440
LNREXP does not Granger Cause LNRREM	30	1.20182	0.3174
LNRREM does not Granger Cause LNREXP		0.23555	0.7919
LNRIMP does not Granger Cause LNRREM	30	1.66712	0.2091
LNRREM does not Granger Cause LNRIMP		0.53514	0.5921
LNREXP does not Granger Cause LNRDK	30	0.54964	0.5840
LNRDK does not Granger Cause LNREXP		0.10482	0.9009
LNRIMP does not Granger Cause LNRDK	30	0.25006	0.7807
LNRDK does not Granger Cause LNRIMP		0.24741	0.7827
LNRIMP does not Granger Cause LNREXP	30	0.08159	0.9219
LNREXP does not Granger Cause LNRIMP		1.07603	0.3562

Source: Author's estimation results using Eviews-10, 2021

APPENDIX-II(A)

Lag order selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNRGDP LNRFDI LNRDK LNRREM LNREXP LNRIMP
Exogenous variables: C
Date: 08/14/21 Time: 07:57
Sample: 1988 2019
Included observations: 30

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-66.31645	NA	5.00e-06	4.821097	5.101336	4.910748
1	49.83151	178.0935*	2.52e-08*	-0.522100*	1.439576*	0.105457*
2	81.87648	36.31764	4.49e-08	-0.258432	3.384681	0.907031

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Author's estimation results using Eviews-10, 2021

APPENDIX-II(B)

Unit Root Error Correction

Null Hypothesis: ECM has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.180942	0.0027
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECM)

Method: Least Squares
Date: 08/14/21 Time: 08:10
Sample (adjusted): 1989 2019
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.732004	0.175081	-4.180942	0.0002
C	-0.002631	0.011240	-0.234097	0.8166

R-squared	0.376079	Mean dependent var	-0.000895
Adjusted R-squared	0.354565	S.D. dependent var	0.077846
S.E. of regression	0.062540	Akaike info criterion	-2.643670
Sum squared resid	0.113427	Schwarz criterion	-2.551154
Log likelihood	42.97688	Hannan-Quinn criter.	-2.613512
F-statistic	17.48028	Durbin-Watson stat	1.994479
Prob(F-statistic)	0.000244		

Source: Author's estimation results using Eviews-10, 2021

APPENDIX-III

Measure of FDI Impact on GDP

Dependent Variable: LNRGDP
Method: Least Squares
Date: 08/14/21 Time: 13:23
Sample: 1988 2019
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.139534	0.347118	23.44893	0.0000
LNRFDI	0.622643	0.062313	9.992249	0.0000

R-squared	0.768955	Mean dependent var	11.42003
Adjusted R-squared	0.761254	S.D. dependent var	1.305067
S.E. of regression	0.637677	Akaike info criterion	1.998493
Sum squared resid	12.19898	Schwarz criterion	2.090102
Log likelihood	-29.97589	Hannan-Quinn criter.	2.028859
F-statistic	99.84504	Durbin-Watson stat	1.900448
Prob(F-statistic)	0.000000		

Source: Author's estimation results using Eviews-10, 2021

Appendix IV

Measure of RFDI and Other Variables

Dependent Variable: LNRGDP
Method: Least Squares
Date: 08/14/21 Time: 10:21
Sample: 1988 2019
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.643664	0.209545	12.61622	0.0000
LNRFDI	-0.001220	0.014966	-0.081521	0.9357
LNRREM	0.065469	0.015523	4.217490	0.0003
LNRDK	0.901215	0.139725	6.449915	0.0000
LNREXP	0.306780	0.039309	7.804409	0.0000
LNRIMP	-0.326278	0.167412	-1.948956	0.0622

R-squared	0.997478	Mean dependent var	11.42003
Adjusted R-squared	0.996993	S.D. dependent var	1.305067
S.E. of regression	0.071570	Akaike info criterion	-2.268912
Sum squared resid	0.133180	Schwarz criterion	-1.994086
Log likelihood	42.30259	Hannan-Quinn criter.	-2.177815
F-statistic	2056.339	Durbin-Watson stat	1.365240
Prob(F-statistic)	0.000000		

Source: Author's estimation results using Eviews-10, 2021