

IMPACT OF FDI ON GDP IN EAST AFRICA AND ETHIOPIA: PANEL AND TIME SERIES DATA ANALYSIS

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Abstract

Ethiopia is the second-highest population in Africa, with a 6.1 per cent increase, it also had the continent's strongest economic growth in 2020–21. The growth analysis indicates that Ethiopia experienced positive growth from 2002 to 2021, with annual growth of 16.7 per cent. Ethiopia is a major hub for China's Belt and Road Initiative, and FDI inflows surged there by 79 per cent to \$4.3 billion in 2021. This paper analyse, the casual relationship between Ethiopia's FDI and GDP during 2002-2021 using time series data and also finds casual relation between FDI and GDP in East Africa using panel data. From the Ethiopian point of view, the results of the co-integration test support the conclusion that there is no long-term link between FDI and GDP for the years 2002–2021. The causality test shows that neither FDI nor GDP is the Granger cause for GDP, proving that there is no direct Granger Causality relationship between FDI and GDP in Ethiopia. From the East Africa point of view, FDI into East Africa increased by 35 per cent to \$8.2 billion. The highest growth rate in East Africa was recorded in Rwanda, which was 24.6 per cent per annum. Although Madagascar and Malawi have statistically negligible positive growth, 12 out of the 14 countries have statistically significant positive growth overall. The Pedroni co-integration test suggests that there is a long-term relationship between the gross domestic product of East Africa and foreign direct investment. From the panel regression results, in the three computed regression models, probability values are less than 0.01, and observed FDI has positive coefficients. This suggests that the economies of East African countries benefit from foreign direct investment.

Key Words: East Africa, Ethiopia, FDI, GDP, Panel and Time Series Data Analysis, Growth Fixed Effect, Random Effect, Stationarity, Co-integration, Causality.

1. Introduction

Capitalization is crucial for economic growth. However, in the recent past, the term "economic development" was used synonymously with "economic growth," and it was defined as the process through which a country's real national income rises steadily over time. Given the significance of capital formation, foreign direct investment is one of the main avenues for an economy's capital formation. The best way to gain technical information is through FDI's historical roots because obtaining technical knowledge from abroad is expensive and frequently insufficient.

FDI increases employment opportunities as investors launch new companies abroad. Locals might make more money and have more purchasing power as a result, promoting wider economic growth in the targeted regions. The main advantage of foreign direct investment is the rise in the country's income. With more jobs and higher pay comes a rise in the national income, which promotes economic growth. For economic expansion, capitalization is essential. The process through which a nation's real national income increases continuously over time was defined as "economic development" in the recent past, which was used synonymously with "economic growth." The utilization of technology might attract foreign direct investment. The technology could be used to provide foreign direct investment. This is a subtly significant way that foreign direct investment contributes to economic development.

2. Literature review

Surya Kumar and Abdurhman Kedir Ali (2022), in this paper, examined the growth and causal relation between FDI and GDP in Africa during 1994-2020. Africa, FDI growth was registered at about 1.64 percent per annum. Johansen Co-integration test results reveal; FDI and GDP have long-run Co-integration in the entire African continent, Central and North Africa regions, remaining, there is no co-integration is accepted. The Granger causality test results indicate Africa and Southern Africa region, GDP is the FDI granger reason, and also FDI is the GDP granger reason, which indicates that there is a direct Granger causality relationship between total African continent FDI & GDP and also GDP & FDI. *Mohd and Muse (2021)* conducted a study in Ethiopia using the VAR model. According to their findings, foreign direct investment has a beneficial and considerable effect on economic growth both in the short and long run. *Nketiah-amponsah and Sarpong (2019)* examined the impact of infrastructure and foreign direct investment on economic growth in SSA. Their findings show that foreign direct investment has a favourable effect on economic growth when interacting with the host country's infrastructure. *Makiela and Ouattara (2018)* conducted a study based on a sample of developed and developing countries over the period 1970–2007. Their finding shows foreign direct investment has a positive contribution to the economic growth of the host countries. *Surya Kumar and Tesfye Fikadu (2017)*, the study reveals the growth rate of FDI in Africa and Ethiopia. The African FDI inflows growth registered 12.1 percent during 1994-2015, the growth rate of Ethiopia's FDI inflows has registered 14.9 percent per annum and is statistically significant at a 1 percent level. *Dechassa Obsi Gudeta et al (2017)*, this paper investigates the effect of export and import on the real economic growth of Ethiopia. Yearly data set on the variables are obtained for the period 1982 to 2015 from the national bank of the country. Johansen's cointegration test suggests that there is no long-run relationship between export and import with real GDP. The vector autoregressive analysis suggests that the lagged variables of both export and import have significant contributions in predicting the economic growth of the country. *Adams (2009)* in this paper he has examined the impact of foreign direct investment and domestic investment on economic growth in sub-Saharan African countries. He found that FDI and domestic investment correlated with economic growth, with FDI having a positive and significant effect. He found that FDI initially crowded out domestic investment; therefore, the magnitude of the current and lagged FDI coefficient suggested a net crowding-out effect. He argued the lack of positive impact of FDI might be due to the low level of

financial development in Sub-Sahara Africa. *Ayanwale, (2007)* in this paper found, FDI in Nigeria contributes positively to economic growth, although the overall effect of FDI on economic growth may not be significant. *Astatike & Assefa (2005)* he examining the determinants of FDI in Ethiopia, finding that the growth rate of real GDP, export orientation, and liberalization positively impact FDI.

From the literature, several studies have been done on the impact of FDI on GDP in different locations as well as different time periods conclusions reached, a clear indication that there is no clear conclusion on the effect of FDI on economic growth for East Africa and Ethiopian point of view so that more research needs to be done in this direction. Hence this study sought to study the effect of FDI on GDP in East Africa and particularly Ethiopia using data from 2002 to 2021.

3. Objective of this study

The present study mainly focused following objectives during 2002-2021.

1. To analyse the FDI Growth of East African countries.
2. To evaluate the impact of FDI on GDP using panel regression (Fixed and Random) models for East African countries.
3. To calculate Panel co-integration between FDI and GDP of East African countries.
4. Finally, to analyse the causal relationship between FDI on the GDP of Ethiopia.

4. Data and Methodology

The main source of the data is to collect from secondary data, such as UNCTAD. The study used composed panel data from 14 countries in East Africa from 2002 to 2021. All the data were obtained from the UNCTAD database. These 14 countries in East Africa are chosen based on data availability; the study didn't include countries that lacked complete data on the relevant variables. Thus, countries included in this study are Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Seychelles, Tanzania, Uganda, and Zimbabwe.

The study used GDP current prices in terms of USD dependent variable and Foreign direct investment inflows in terms of USD as an explanatory variable. This Paper first analysed growth rates of FDI for all 14 countries in East Africa during 2002-2021. Second, analyse the impact of FDI on the GDP of East African countries using Panel data regression (Fixed and Random Effect Model) analysis during 2002-2021. Finally, observed causal relationship between FDI and GDP using the panel Co-integration test for the East Africa region and the VAR model used for Ethiopia. While the analyse of objectives we are using SPSS and EViews software, for the visualization we are using the Tableau Desktop version.

5. RESULTS AND DISCUSSIONS

5.1 Global FDI Trends

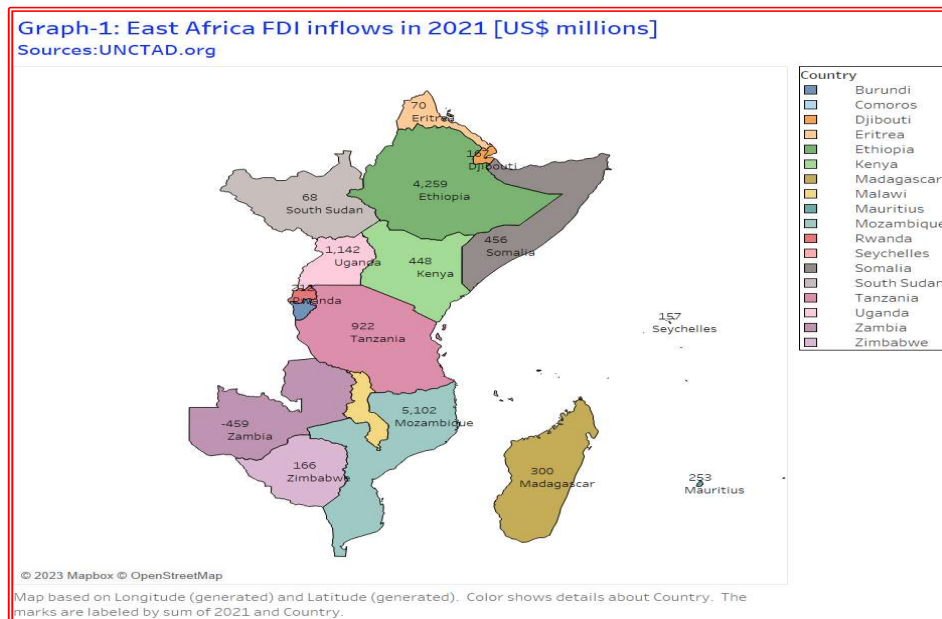
Global foreign direct investment inflows reached \$1.58 trillion in 2021, an increase of 64% from the level of less than \$1 trillion during the first year of the COVID-19 epidemic. Due to growing merger

and acquisition (M&A) markets, rapid expansion in international project finance, lenient financing conditions, and big infrastructure stimulus packages, FDI flows appeared to be gaining significant speed. However, in 2022, when the globe was still feeling the effects of the pandemic, the conflict in Ukraine broke out, drastically altering the global environment for international trade and cross-border investment. The war is having an impact well beyond its local area, resulting in a triple crisis of food, fuel, and money, with rising energy and basic commodity prices fuelling inflation and escalating debt spirals. In 2022, there may be strong downward pressure on global FDI due to investor uncertainty and risk aversion.

From \$39 billion in 2020 to \$83 billion in 2021, FDI inflows to the African continent achieved a record high, making up 5.2 percent of all FDI inflows from global. Following the decline in FDI that the covid19 pandemic caused in 2020, most economies had a modest increase. According to FDI by area, North Africa saw a 5 percent fall from \$10 billion in 2020 to \$9 billion in 2021. FDI inflow to West Africa grew by 48 percent to \$13.8 billion in 2021 from \$9 billion the year before.

East Africa FDI Trends

In this section discussed the East Africa FDI inflow structure and growth of 14 East Africa Countries during the period 2002-2021. FDI to East Africa grew by 35 percent to \$8.2 billion. Flows to Ethiopia reached \$4.3 billion, mainly due to a tripling of Chinese investment. FDI to the United Republic of Tanzania rose by 35 percent to \$922 million. In the year 2021, in East Africa, the highest FDI inflows were captured Mozambique accounting for 5102 US\$ million, followed by Ethiopia (4259 US\$ Million), Uganda (1142 US\$ Million), Tanzania (922 US\$ Million), Somalia (456 US\$ million). The below graph-1 presents detailed East Africa country-wise FDI inflows in the year 2021. For the below graphical representation, we are using Tableau software.



From table-1, Mozambique received 2418.46 US\$ million on average throughout the period of 2002 to 2021, followed by Ethiopia (1515.29 US\$ million), Kenya (1040 US\$ million), Tanzania (1039.30 US\$ million), and Uganda (768.91 US\$ million). The R² explained Rwanda had a high variation explanation rate of 72%, followed by Ethiopia (67%) and Mozambique (61%), as well as Uganda (60%) and Zimbabwe (59%). From the ACGR, the highest growth rate was registered at 24.6 percent per annum and statistically significant at a 1 percent level from Rwanda. Overall, out of 14 countries, 12 are registered positive growth and statistically significant, but Madagascar and Malawi, countries registered positive growth but statistically insignificant.

Table-1: Eastern Africa FDI inflows Growth during 2002-2021[US\$ Millions]							
<i>Eastern Africa</i>	<i>Average FDI inflows</i>	<i>STDEV</i>	<i>CV</i>	<i>R²-val</i>	<i>ACGR</i>	<i>t-val</i>	<i>p-val</i>
Comoros	5.49	5.38	98.02	0.264	9.7	2.539	0.021*
Djibouti	124.45	76.46	61.44	0.488	13.0	4.139	0.001**
Eritrea	45.86	25.39	55.37	0.362	9.9	3.199	0.005**
Ethiopia	1515.291	1493.85	98.59	0.672	16.7	6.074	0.000**
Kenya	1040.73	764.61	73.47	0.422	17.5	3.626	0.002**
Madagascar	498.01	366.85	73.66	0.149	5.8	1.774	0.093 ^{NS}
Malawi	160.34	224.14	139.79	0.120	5.8	1.570	0.134 ^{NS}
Mauritius	294.04	173.10	58.87	0.449	12.3	3.828	0.001**
Mozambique	2418.46	1986.23	82.13	0.614	17.3	5.349	0.000**
Rwanda	199.86	150.79	75.45	0.717	24.6	6.753	0.000**
Seychelles	153.71	60.53	39.38	0.277	4.7	2.628	0.017**
Tanzania	1039.30	520.86	50.12	0.262	5.0	2.531	0.021*
Uganda	768.91	325.95	42.39	0.598	7.4	5.173	0.000**
Zimbabwe	241.56	204.41	84.62	0.588	18.4	5.064	0.000**

Source: Authors calculations, ACGR: Annual Compound Growth Rate, STDEV: Standard Deviation, CV: Coefficient of Variation, **-Significant at 1 % Level, *- Significant at 5 % Level, NS-Not Significant.

The casual relationship between FDI and GDP in East Africa.

Panel Stationary Test

In order to analyze the present study, we employ the Johansen panel co-integration test for FDI and GDP. But before examining this test it is essential that the data are examined for panel stationary or non-stationary. For this purpose, we used the panel unit root test. The stationary test is very much helpful to avoid spurious and biased results, which may lead to false conclusions. To avoid this problem, the study conducted unit root tests for all the variables.

Table-2: Panel Unit Root Test	
Stationary Level	Tests

Variables			LLC	IPS	ADF	PP	Status
FDI	<i>At Level</i>	<i>Statistic value</i>	-1.8724	-1.4475	35.4628	40.8183	I(1)
		<i>P-value</i>	0.0306*	0.0739	0.1568	0.0558*	
	<i>At First difference</i>	<i>Statistic value</i>	-3.0510	-5.9363	88.5876	230.290	
		<i>P-value</i>	0.0011* *	0.0000* *	0.0000* *	0.0000**	
GDP	<i>At Level</i>	<i>Statistic value</i>	1.0625	3.6349	9.7795	12.3344	I(1)
		<i>P-value</i>	0.8560	0.9999	0.9994	0.9954	
	<i>At First difference</i>	<i>Statistic value</i>	-5.5178	-5.9583	87.2513	152.3180	
		<i>P-value</i>	0.0000* *	0.0000* *	0.0000**	0.0000* *	
<p><i>Note: ** and * indicates 1% and 5% significance level, NS indicates Not Significant. Source: Author's computation</i></p>							

Before the empirical estimation, it is essential to check whether the included variables are stationary or not. In this study, Levin, Lin, and Chu (LLC), Im, Pesaran, and Shin (IPS), Augmented-Dickey Fuller (ADF), and Phillip-Perron (PP) tests were hired. As in Table-2, the result of all LLC, IPS, ADF, and PP shows that is stationary at the first difference for FDI and GDP. Since all the two variables are stationary at I (1).

Pedroni Panel Co-integration Test

To determine if there is or is not a long-term relationship between the FDI and GDP of East Africa, the panel co-integration test is important. Under the null hypothesis of no co-integration, the Pedroni co-integration test was used in the study. According to Table-3, the majority of the results both within and between dimensions are significant at a 1% level, rejecting the null hypothesis. The Pedroni co-integration test demonstrates a long-term link between foreign direct investment and gross domestic product.

Table-3: Pedroni Co-integration results				
<i>Trend assumption: No deterministic trend, Null Hypothesis: No cointegration</i>				
<i>Tests</i>	<i>Within Dimensions</i>			
	<i>Statistic</i>	<i>Prob.</i>	<i>Weighted Statistic</i>	<i>Prob.</i>
Panel v-Statistic	4.008245	0.0000**	1.276959	0.1008 ^{NS}
Panel rho-Statistic	-2.22219	0.0131**	-2.97793	0.0015**

Panel PP-Statistic	-2.51636	0.0059**	-3.87632	0.0001**
Panel ADF-Statistic	-3.42126	0.0003**	-5.16133	0.0000**
Between dimensions				
<i>Tests</i>	<i>Statistic</i>	<i>Prob.</i>	--	--
Group rho-Statistic	-0.93399	0.1752 ^{NS}	--	--
Group PP-Statistic	-2.71694	0.0033**	--	--
Group ADF-Statistic	-4.3196	0.0000**	--	--
<i>The majority of Tests are Significant at a 1% level</i>				
<i>Note: ** and * indicates 1% and 5% significance level, NS indicates Not Significant, Source: Author's computation.</i>				

Panel regression analysis

This section reveals the panel regression results and interpretations. From the table-4 shows the results for the panel regression which examines the effect of FDI and economic growth for 14 East African countries. The R² for the OLS and Random effect regression models can explain 26.30% and 22.38% of the variation in GDP. The fixed effect model has registered the highest R² value, which means FDI explains a 72.25% variation in GDP during 2002-2021. In order to examine the impact of the FDI on the GDP we observed the estimated coefficients. As observed FDI has positive coefficients and probability values are less than 0.01 in the three estimated regression models. This indicates that foreign direct investment has a favorable effect on the economies of East African nations. The F-stat for all three estimates is significant because their p-values are less than 0.01, which suggests that there is a substantially linear and systematic link between GDP and FDI. From the Hausman test results we are accepting the random effect model that means from all three methods random effect model is appropriate.

Table-4: Panel Regression results			
Variable	Pooled OLS Estimates	Fixed Effect Model Estimates	Random Effect Model Estimates
Constant	9729.2810	11433.0100	11343.9000
t-stat	7.4440	12.4638	2.7191
p-value	0.0000**	0.0000**	0.0070**
FDI	11.3372	8.5331	8.6797
t-stat	9.9602	8.6927	8.9525
p-value	0.0000**	0.0000**	0.0000**
R²	0.2630	0.7225	0.2238
Adj R-squared	0.2604	0.7079	0.2210

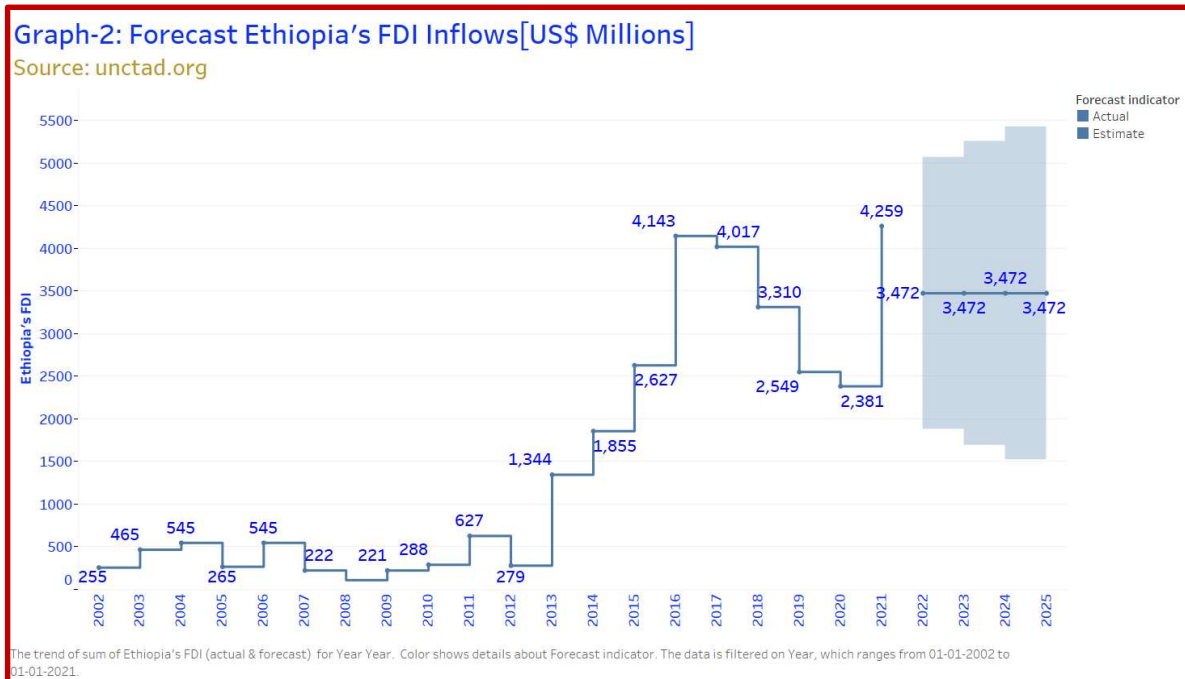
F-statistics	99.2053	49.2856	80.1740
p-value	0.0000**	0.0000**	0.0000**
Housman test	--	--	0.9101
p-value	--	--	0.3401 ^{NS}
Note: ** and * indicates 1% and 5% significance level, NS indicates Not Significant. Source: Author's computation			

5.2 Effect of FDI on Ethiopia's GDP

FDI Trends in Ethiopia

Ethiopia is the second-most populous nation in Africa after Nigeria, with an anticipated 117 million residents in 2021. With 6.1 percent growth in 2020-21, it also saw the strongest economic growth on the continent. Ethiopia, a central hub for China's Belt and Road Initiative, saw FDI flows rise by 79% to \$4.3 billion in 2021. Four out of five international project finance announcements in the country were in renewables.

The below graph-2 shows, Ethiopia's FDI trends, and forecast. From the growth analysis, Ethiopia registered positive growth accounting for 16.7 percent per annum, and was statistically significant during 2002-2021. As per observations, Ethiopia's FDI inflows received only 255 US\$ million in 2002, these inflows increased to 4143 US\$ million in 2016 and they declined to 2381 US\$ million in 2020, now present it was touched 4259 US\$ million in 2021.



Stationary Test

We are using time series data from 2002 to 2021 to assess the effects of FDI and GDP. For this, we use the Granger Causality Test and Johansen's Co-integration. However, it is crucial to determine if the data are stationary or non-stationary before analysing these two tests (testing the

time series properties of yearly data). We employed the Augmented Dickey-Fuller (ADF) test for this aim.

Variables	Test	At Level		At First difference	
		Intercept	Intercept &Trend	Intercept	Intercept &Trend
LnFDI I(I)	<i>ADF Statistic value</i>	-0.9550	-2.1119	-5.3334	-5.234
	<i>P-value</i>	0.7470	0.5072	0.0005**	0.0029**
LnGDP I(I)	<i>ADF Statistic value</i>	-2.8066	-0.2500	-3.2164	-4.7556
	<i>P-value</i>	0.0782	0.9849	0.0368*	0.0078**

*Note: ** and * indicates 1% and 5% significance level, NS indicates Not Significant, Source: Author's computation.*

The tests are predicated on the null hypothesis that the variables have a unit root. The stationary test is highly useful in avoiding biased and erroneous results that could result in incorrect inferences. The study ran unit root tests on all the variables to get around this issue. The tests were run on the LnFDI and LnGDP series. LnFDI and LnGDP are non-stationary at level, as seen in Table 5. However, the first difference rejects the null hypothesis of a unit root test at the proper level of significance. As a result, all of the variables we have chosen for this study obey the first order of integration I (1).

Johansen Co-integration Test

The Johansen approach is followed here to check for co-integration which is based on the Trace statistic and maximum Eigenvalue test statistic. The two tests were carried out for all two series.

Series: <i>LNFDI LNGDP</i>				
<i>Unrestricted Cointegration Rank Test (Trace)</i>				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.316339	9.180145	15.49471	0.3490
At most 1	0.121654	2.334874	3.841466	0.1265
The trace test indicates no cointegration at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
<i>Unrestricted Cointegration Rank Test (Maximum Eigenvalue)</i>				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**

None	0.316339	6.845271	14.26460	0.5076
At most 1	0.121654	2.334874	3.841466	0.1265
Max-eigenvalue test indicates no cointegration at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Johansen Cointegration test results are presented in Table-6. The empirical result confirms that the values of the trace tests and those of the Eigenvalue tests are statistically not significant ($p > 0.05$) and lesser than the critical values. This confirms that there is no co-integration is accepted by both the trace test and Maximum Eigenvalue test statistics. This indicates the absence of a long-run relationship between FDI and GDP during the period 2002-2021.

Lag selection criteria

After the stationarity test, Johansen cointegration is conducted due to the sensitivity for the number of optimal lags to include for the endogenous variables in the VAR model. To determine the optimal lags in the model is necessary to test before the cointegration test. Therefore, there are five lag length selection models: Akaike information criteria (AIC), Hanaan - Quinn Criterion (HQC), Likelihood ratio test statistics (LR), Schwarz Criterion (SC), and Final Prediction Error (FPE), which are presented in Table-7. From the calculation, all tests are recommended to lag one. The below table has selected the maximum lag to consider in the study’s VAR model and fixed lag one after performing the lag selection criterion.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-43.8693	NA	0.4286	4.8283	4.9278	4.8452
1	6.6549	85.0933*	0.0032*	-0.0689*	0.2293*	-0.0184*

* Indicates lag order selected by the criterion, Source: Authors calculation.

VAR Model results

The focus of this study was to assess the dependency of current values of economic variables: LnGDP, and LnFDI on their own past as well as on the past values of other variables. Based on the above results, the VAR model with the order of one was fitted and the results are presented in Table-8.

<i>Lags of variables</i>	<i>LnGDP</i>	<i>LnFDI</i>
<i>LnGDP (-1)</i>		
<i>Coefficient</i>	0.9313	0.4856
<i>SE</i>	0.0393	0.2569
<i>t-stat</i>	23.7042	1.8899
<i>p-val</i>	0.0000**	0.0679 ^{NS}

<i>LnFDI (-1)</i>		
<i>Coefficient</i>	0.0168	0.6157
<i>SE</i>	0.0280	0.1834
<i>t-stat</i>	0.5979	3.3572
<i>p-val</i>	0.5541 ^{NS}	0.0020**
<i>C</i>		
<i>Coefficient</i>	0.7342	-2.3372
<i>SE</i>	0.2954	1.9321
<i>t-stat</i>	2.4854	-1.2096
<i>p-val</i>	0.0184**	0.2353 ^{NS}
<i>R-squared</i>	0.9880	0.7769
<i>F-stat</i>	667.3157	27.8617
<i>p-val</i>	0.0000**	0.0000**
<i>** represents 1% level significance, NS- Not Significant</i>		
<i>Source: Author's calculation</i>		

From the results first, the current gross domestic product (LnGDP) is positively related to its own first lag (LnGDP (-1)) and statistically significant, to the first lag of foreign direct investment (LnFDI (-1)) is positively related but statistically insignificant. The second current foreign direct investment (LnFDI) is positively related to its own first lag (LnFDI (-1)) and statistically significant, to the first lag of gross domestic product (LnGDP (-1)) is positively related but statistically insignificant at 5% level.

VAR Granger Causality test

The direction of causality cannot be traced only through Cointegration tests; therefore, to test the existence of short-run causation among the variables, the Granger Causality test under the Vector Auto Regression model is applied. The Findings of the causality analysis are presented in Table-9. The relationship between Ethiopia's GDP and its FDI. At a 5% level of significance, LnFDI is not LnGDP's Granger reason, but LnGDP is Granger reason of LnFDI, which indicates that there exists no direct Granger Causality relationship between Ethiopian FDI and GDP, but there is a direct Granger Causality relationship between Ethiopia GDP and FDI.

Table-9: VAR Granger Causality test			
Dependent Variable: LnGDP			
<i>Excluded</i>	<i>Chi-sq</i>	<i>df</i>	<i>Prob</i>
LnFDI (LnFDI lag1 does not granger cause of LnGDP)	0.3575	1	0.5499
Dependent Variable: LnFDI			
<i>Excluded</i>	<i>Chi-sq</i>	<i>df</i>	<i>Prob</i>

LnGDP (LnGDP lag1 does not granger the cause of LnFDI)	3.59	1	0.05*
* Indicates 5% level significance, Source: Author calculation			

Diagnostic Checking

Once a VAR model has been estimated, it is essential to see whether the residuals obey the model’s assumptions. We should check for the absence of serial correlation and heteroscedasticity and see if the error process is normally distributed. Results indicate the non-rejection of the null hypothesis of no serial correlation in the case of the LM test, no heteroscedasticity and residuals are normal at a 5% level of significance. From the analysis, the results confirm that the residual terms are pure white noise, i.e., they are well behaved and the null hypothesis of no serial correlation, no heteroscedasticity, and residuals that are multivariate normal is not rejected. The diagnostic tests result revealed that the model is adequate and has the desired econometric properties, i.e., has the correct functional form, its residuals are serially uncorrelated and homoscedastic and multivariate normal.

6. Conclusion

East Africa’s FDI inflows grew by 35 percent to \$8.2 billion. Flows to Ethiopia reached \$4.3 billion. Rwanda had the greatest growth rate in East Africa, which was 24.6 percent annually and statistically significant at the 1% level. In all, 12 of the 14 countries have statistically significant growth, although Madagascar and Malawi have statistically insignificant growth. The result of all LLC, IPS, ADF, and PP shows that is a stationary at first difference between FDI and GDP. The Pedroni co-integration test demonstrates a long-term link between foreign direct investment and gross domestic product in East Africa. From the panel regression results, in the fixed effect model has registered the highest R² value, it means FDI explains 72.25 percent variation in GDP during 2002-2021. In order to examine the impact of the FDI on the GDP we observed the estimated coefficients. As observed FDI has positive coefficients and probability values are less than 0.01 in the three estimated regression models. This indicates that foreign direct investment has a favourable effect on the economies of East African nations.

Ethiopia has the second-highest population in Africa, with 117 million expected to live there in 2021. It also experienced the strongest economic growth on the continent in 2020–21, with a 6.1 percent increase. According to the growth analysis, Ethiopia saw growth from 2002 to 2021, with annual growth accounting to 16.7 percent. FDI inflows to Ethiopia, a key node of China's Belt and Road Initiative, increased by 79 percent to \$4.3 billion in 2021. In the nation, four of every five foreign project finance announcements used renewable energy. The unit root tests were run on the LnFDI and LnGDP series. As a result, all of the variables we have chosen for this study obey the first order of integration I (1). The co-integration test result confirms the absence of a long-run relationship between FDI and GDP for Ethiopia during 2002-2021. From the VAR Granger

Causality test, FDI is not GDP's Granger reason, but GDP is a Granger reason FDI, which indicates that there exists no direct Granger Causality relationship between Ethiopian FDI and GDP, but there is a direct Granger relationship between Ethiopia's GDP and FDI.

According to the results, Ethiopia should do more to draw in foreign direct investment. The nations can entice foreign direct investment through subsidies, infrastructural improvement, and a stable political climate. Foreign direct investment difficulties should be identified and reduced by the nation. They should also recognize and focus on the beneficial spillover routes. A positive and large impact of foreign direct investment on economic growth may be seen in Ethiopia.

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