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Exploring the Linkage and Impact of Foreign Direct Investment and Economic Growth in Ethiopia: (Evidence from ARDL model)

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Abstract

Many economists wonder why countries grow at different rates. Leaders and policymakers strongly believe that Foreign Direct Investment (FDI) is one of the tools for a nation's economic growth. However, existing studies have not reached a consensus on the impact of FDI on economic growth. This study aims to examine the long-term relationship and causality between FDI and economic growth, as well as analyze the short-term and long-term effects of FDI on economic growth from 1995 to 2015. The data sources for this study were the Ethiopian Investment Agency, the National Bank of Ethiopia, and the World Bank database. The researcher used Johannes, VEC, and ARDL modeling approaches to answer the research questions. According to the Johannes model, there is a long-term relationship between FDI and economic growth. The Vector Error Correction model shows that causality is unidirectional, from economic growth to FDI. The ARDL model indicates that in the long term, the impact of economic growth on FDI is not significant. However, the estimation results from the ARDL model reveal that in the short term, economic growth has a positive and statistically significant impact in attracting FDI to the country. Therefore, it is recommended that policymakers and decision-makers in Ethiopia devise mechanisms to sustain the positive impact of economic growth in terms of attracting FDI.

Keywords: Foreign Direct Investment, Economic Growth and ARDL model

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Introduction

Background

Many experts are interested in figuring out why countries grow at different rates. They have found various factors that might contribute to differences in economic development, such as differences in producing resources, the development of institutions, the effectiveness of legal systems, and how open a country is to international trade and cooperation. However, different experts have suggested different factors as the main reasons for the differences in global economic growth. Economic researchers study the reasons behind economic growth and its effects from both theoretical and practical perspectives. Some well-known researchers, like Solow, Swann, and Romer, have looked into the reasons for economic growth and what determines it from a theoretical point of view. On the other hand, scholars like Barro and Sala-I-Martin have conducted real-world studies to better understand the causes and effects of economic growth. Overall, there is a lack of enough real-world research on the reasons and determinants of economic growth, both in developed and developing countries. It is recommended to conduct more theoretical explanations and practical studies to gain a deeper understanding of the causes and effects of economic growth.

Scholars have not reached a consensus on the relationship between overseas investment and economic growth, as well as the impact it has. They have faced difficulties in accurately identifying the relationship and providing policy recommendations for decision-makers. Despite numerous studies conducted to understand the association between overseas investment and the growth rate of per capita GDP, researchers have not come to a unanimous agreement on its impact. For example, in a paper by Adam and Tweneboah in 2009, they examined the effect of Foreign Direct Investment (FDI) and stock market development on the growth rate of per capita GDP. They concluded that there is a positive and statistically significant effect of overseas investment and stock market development on the growth rate of per capita GDP. Similarly, Mello, in 1999, analyzed the effect of overseas investment on the growth rate of per capita GDP using a fixed effect model. He also found a positive and statistically significant effect of overseas investment on GDP per capita growth rate. In summary, while there

have been studies exploring the relationship between overseas investment and economic growth, there is no consensus among researchers regarding its impact. Different studies have yielded varying conclusions, making it challenging to provide definitive policy recommendations.

In their study, Ericson and Irandoust (2001) identified that the causality runs from overseas investment to GDP per capita growth rate. Blomstrom (1992) examined the causality between overseas investment and per capita GDP growth rate and concluded that in developing countries, there is no causality between overseas investment and per capita GDP growth rate, while in advanced countries, there is a positive and significant relationship between overseas investment and per capita GDP growth rate. Carkovic and Levine (2002) and Umeora (2013) studied the causality between foreign direct investment and economic growth and found no significant relationship between overseas investment and economic growth.

Albert Hirschman (1958) analyzed the impact of foreign direct investment on economic growth and found that the impact varies across different sectors. In one of his studies, Kahramanoglu (2009) analyzed the causality between overseas investment and economic growth by dividing the study period into two: 1970-2002 and 2002-2008. Balasubra manyam, Salisu, and Sapsford (1996) analyzed the role of overseas investment on economic growth and found that for countries that follow export promotion strategies, the impact is positive, whereas for countries that follow import substitution strategies, the impact is negative.

Zhang (2001), in his paper, analyzed the causality between foreign direct investment and economic growth for 11 Asian countries. He found that the causality runs from foreign direct investment to economic growth for Hong Kong, Indonesia, Singapore, Taiwan, and Mexico. Mottaleb (2007) analyzed the factors that matter for foreign direct investment in developing countries and concluded by identifying key factors that attract foreign direct investment, as well as proving that foreign direct investment has a positive and statistically significant impact on economic growth. Agawal (2000), in his study titled "Impact of foreign direct investment in South Asia Countries," examined its impact across different countries using time series and cross-sectional panel data for five South Asian countries, including India, Pakistan, Bangladesh, Sri Lanka, and Nepal. In his study, he found a positive and significant impact of foreign direct investment on the economic growth of these countries.

In a paper published in 1999, Bosworth and Collins examined how investments made by other countries affect the economic growth of emerging and advanced nations. They discovered that overseas investment has a positive and significant impact on the growth of a country's GDP per person. In a separate study conducted in 2000, Xu focused on foreign direct investment from the United States into 40 developing countries. His findings aligned with those of other scholars, concluding that overseas investment has a positive effect on economic development, but Xu emphasized the importance of having a skilled workforce. However, in a study conducted by Hanson in 2001, he argued against the positive impact of overseas investment on GDP per person growth rate. Similarly, Gorg and Greenwood's analysis in 2002 revealed a negative effect of foreign direct investment on GDP per person growth rate. Therefore, this study aims to answer the following research questions:

1. Does Ethiopia have a long-term relationship between Foreign Direct Investment and the growth rate of GDP per person?
2. What is the long-term cause-and-effect relationship between Foreign Direct Investment and the growth rate of GDP per person in Ethiopia?
3. What are the immediate and long-term effects of Foreign Direct Investment on the growth rate of GDP per person in Ethiopia?

Empirical Review

Methods and Methodology
The study conducted in Ethiopia utilized secondary data collected from the Ethiopian Investment Agency, the National Bank of Ethiopia, and the World Bank database. The study period spanned from 1995 to 2015.

Equation for unit root tests

$\Delta Y_t = B_1 + \Delta Y_{t-1} + a_i + e_t$ **(Intercept only)** ---------- (1)
$\Delta Y_t - B_1 + B_{2t} + \Delta Y_{t-1} + a_i + e_t$ **(Trend and Intercept) -2)**
$\Delta Y_t = \Delta Y_{t-1} + a_i + e_t$ **(No trend and no intercepts) ------ (**Null Hypothesis Ho = Variable is not stationary or got unit root and Alternative Hypothesis H1 = stationary

Co integration Tests

After we verify that our data are stationary either at level or at first difference, the next step is running Johansen co integration model to check existence of the long run association. Thus, the Johansen model is expressed by the following equation:

$$z_t = \alpha + \beta_1 z_{t-1} + \beta_2 z_{t-2} + ---\beta_n z_{t-k} + \epsilon \text{ ----------4}$$

This expression can be written:

$$\Delta z_t = \alpha + \beta_1 z_{t-k} + \sum_{i=1}^{k-1} \beta_{i_2} \Delta z_{t-i} + \text{ ----------5}$$

Here, π and θ are n-by-n matrices of unknown parameters and Σ is the white noise term. In their paper, Johansen and Juselius (1990) introduced two testing approaches to determine the presence of long-run co-integration among variables. The first test is called the Maximum Eigen Value test, and the second is the Trace test. The null hypothesis in both tests assumes that there is no association or co-integration among the variables.

Vector Error Correction Model

Once we have established the presence of a long-run association, the next step is to determine the direction of causality between the two variables using an error correction model. The error correction model relevant to this scenario is:

$$(GDP)_t = B_{1t} + \sum B_{11,j} \Delta GDP_{(t-j)} + \sum B_{12,j} \Delta FDI_{(t-1)} + \delta_1 EC_{(t-1)} + \varepsilon_{(t)}$$
$$(FDI)_t - B_{2t} + \sum B_{21,j} \Delta (FDI)_{t-j} + \sum B_{12,j} \Delta (GDP)_{(t-1)} + \delta_2 EC_{t-1} + \varepsilon_{2t} \text{----------6}$$

To analyze the impact of overseas investment on economic growth

To examine the impact of overseas investment on economic growth, researcher used Autoregressive Distributed Lag (ARDL) modeling approach.

$(FDI)_t$= F (GDPR, inf, ODA, Goveff, stability) $_t$

GDPR= GDP per capita growth rate, FDI= annual inflow of Overseas investment inf= annual inflation growth rate, ODA= official Development Assistance, Goveff= Government effectiveness and stability= stability of political environment. By recalling the basic form of an ARDL regression model:

$$(FDI)_t = \beta_0 + \beta_1(FDI)_{t-1} + ...+ \beta_k(FDI)_{t-p} + \gamma_0(GDPR)_t + \gamma_1(GDP)_{t-1} + ... + \gamma_i(FDI)_{t-i} + \mu_0(inf.)_t + \mu_1(inf.)_{t-1} + ……+ \mu_i(inf.)_{t-i} + V_t \text{ ----------7}$$

μ, γ, δ, β = Coefficients to be estimated and V_t = Error term assumed to be white noise. There are several reasons for the use of ARDL model for bound test. Researcher prefer ARDL model because of small sample size, it is not necessary to conduct unit root test and we can use ARDL model in mixed stationary data structure (I (0,) I (1)). But in case of I (2), ARDL technique crashes and it yields spurious results.

Based on the equation mentioned above, we assume that there is a connection between overseas investment and the rate at which the GDP grows over a long period of time. Since we don't know the exact direction of this relationship, we can use a prior method to determine the long-term connection by using an unrestricted error correction model (UECM) regression.

$$\Delta(FDI)_t = \alpha + \sum^{N}_{i=1}\beta\Delta(FDI)_{t-i} + \sum^{N}_{i=0}\gamma_i\Delta(GDP)_{t-i} + \sum^{N}_{i=0}\mu\Delta(Inf.)_{t-i} + \psi_1(FDI)_{t-1} + \psi_2(GDP)_{t-1} + \psi_4(inf.)_{t-1} + v_t \text{ ----------8}$$

Where 'Δ' is first difference operator, ψi = Coefficients to be estimated and v_t = Error term assumed to be white noise, 'i' is the number of lags, 'n' is the optimal lags length. The F-test is used for validating of long-run relationship. The null hypothesis for no long-run relationship amongst the variables in the above equation is (H0: ψ1 = ψ2 = ψ3 = ψ4 =0) Against the alternative hypothesis (H1: ψ1 ≠ ψ2 ≠ ψ3 ≠ ψ4≠ 0). Two critical values [I (0) and I (1)] were taken from the Pesaran (2001) table. The decision for rejection or acceptance of null hypothesis depending whether, the calculated F value is greater than Pesaran critical value or not. If it is greater than the

upper critical value, the null hypothesis would be rejected. On the other hand, it would be accepted if it is less than the lower critical value. We can make decision if it is between the lower and upper value (Younguck and Muhammed, 2012). To find the maximum number of lags for all variables, $(m+1)^p$ number of regressions was estimated. In the study 'm' represent for the maximum number of lag and 'p' represents the number of independent variable in the model. For annual data it is common that the maximum number of lag is 2. In the study researcher will select the optimal lag using Akaike Information Criteria (AIC). The common ARDL model is represented below:

$$(FDI)_t = \Omega_0 + \Omega_1(GDP)_t + \Omega_3(Inf.)_t + V_t \quad \text{----------10}$$

The error correction of co integration representation of the series can be specified as follow:

$$\Delta(FDI)_t = \rho 0 + \sum^{N}_{i=1}\Delta\Pi(FDI)_{t-i} + \sum^{N}_{i=0}\Delta\Theta(GDP)_{t-i} + \sum^{N}_{i=0}\Delta\Psi(inf.)_{t-i} + \lambda ECT_{t-1} + V_t \quad \text{----------11}$$

Where Π_i, Θ_i, Ψ_i, and Φ_i, are coefficients of short-run dynamic parameters and λ captures the speed of adjustment and tells us how much of the adjustment to equilibrium takes place each period.

Result and Discussion

Unit root tests

In the Autoregressive Distributive Lag (ARDL) model, it's not necessary to check if the data is stationary. However, researchers often run a test called Augmented Dickey Fuller (ADF) to improve the quality of their research. This test helps determine if the data is stationary. If there are some data points that are not stationary after taking the first difference, our ARDL model may give inaccurate results. So, it's advisable to conduct a unit root test and make sure that our data is stationary, at least after taking the first difference. The results of the Augmented Dickey-Fuller (ADF) test can be found in Table 1.

Table 1: Unit root test

No	Variables	ADF t-statistics		Criteria	Conclusion
		Level	First difference		
1	FDI	2.74	5.19***	Intercept	I(1)
2	GDPG	2.87	4.11***	Intercept	I(1)
3	Inf	1.24	6.50***	Intercept	I(1)
4	ODA	1.51	2.75*	Intercept	I(1)
5	Gov.eff	2.00	5.59***	Intercept	I(1)

Source: Author estimation
NOTE *, ** and * represent one, five and ten present significance level respectively.**

The table above indicates that all the variables become stationary after taking the first difference. This means that we can use approaches like Johannes, Vector Error Correction, or Autoregressive Distributive Lag for co-integration testing. These techniques allow us to analyze the long-term association, as well as the short-term and long-term impact, between Foreign Direct Investment and economic growth.

Long run co integration -Johannes approach

The researchers conducted their analysis by using Equation 6 and annual data from 1995 to 2015. They employed co-integration based on bound testing approaches (2001) as well as Johansen's multivariate co-integration approaches. The primary requirement to examine the causality between overseas investment and economic growth is to ensure the presence of long-term co-integration. Long-term co-integration can have either a positive or negative relationship. To run the Vector Error Correction Model, it is necessary to confirm the co-integration among the identified variables. For this purpose, the researchers employed Johansen's long-run co-integration testing methods. Johansen's method provides two test statistics, namely the trace and max Eigen tests, to determine the significance level of the model. The results of this model can be found in the table below.

Table 2: Johannes Long run co integration

Test	Null hypothesis	Variables	Trace value	Trace statistics	5% critical value
Trace	H_0=0	FDI	0.749	40.012	29.797***
		GDPg			
Max Eigen test	H_0=0	FDI	0.749	24.914	21.131***
		GDPg			
Source: Author estimation **NOTE ***, ** and * represent one, five and ten present significance level respectively.**					

According to the table above, both Foreign Direct Investment and economic growth exhibit long-term co-integration. In the Johansen model, both the trace statistics and max Eigen test affirm the presence of a long-term relationship between overseas investment and economic growth. This finding adds support to previous studies conducted by Kreishan and Sami (2012), Sothan (2017), and Lean and Wah (authors' names missing).

Long run causality

The Johansen co-integration test does not provide information about the direction of causality. Therefore, the researcher applied the Granger causality test based on the Vector Error Correction Model (VEC). To determine the direction of causality between overseas investment and economic growth, the researcher used a restricted VEC model.

The first requirement to use the VEC model is that all variables in the model must have long-term co-integration with each other. Since it has already been confirmed that there is long-term co-integration among the variables in the model, it is possible to employ the VEC model in the study.

Table 3 below presents the results from the Vector Error Correction Model regarding the existence of long-term causality between overseas investment and economic growth. In the first case, the researcher considered overseas investment as the dependent variable and the Real GDP growth rate as the independent variable. In the second column, the per capita GDP growth rate is the dependent variable, while overseas investment is the independent variable.

Table 3: Long run causality

Indicators	Dependent variable	
	Model One D(FDI.g)	Model two D(PGDP.g)
	C(S.E)	C(S.E)
Constant	0.175 (0.369)	0.148 (0.121)
ECT(-1)	-0.550** (0.243)	-0.092 (0.053)
R-square	31.3	21.22
Adjusted R-square	17.53	5.42
Log Likelihood	-33.54	-56.10
Source: Author estimation **NOTE ***, ** and * represent one, five and ten present significance level respectively.**		

In model one, as shown in the table above, overseas investment is the dependent variable. The error correction term (ECT) in this model has a negative value and is statistically significant. This indicates that the model is stable and converges towards long-term equilibrium. Moreover, the statistical significance of the error correction term suggests that economic growth in Ethiopia facilitates and attracts foreign direct investment. In model two, per capita GDP growth rate is the dependent variable, while overseas investment is the independent variable. The results from the Vector Error Correction (VEC) model indicate that in the long run, the error correction term is negative but statistically insignificant. Based on this, the researcher concludes that in Ethiopia, there is a

unidirectional causality between overseas investment and per capita GDP growth rate, meaning that the realization of economic development attracts overseas investors to invest in Ethiopia.

Impact analysis result from ARDL model

Long run association

In the Vector Error Correction Model, it was observed that the direction of causality runs from economic growth towards foreign direct investment. Therefore, using the Autoregressive Distributive Lag (ARDL) approach, researchers examine the impact of per capita GDP growth rate on overseas investment in both the short run and the long run.

The procedure begins by checking the existence of long-term co-integration through Equation 8 and testing the joint significance of the long-run coefficient in the model. To do this, the calculated "F" statistics are compared with the Pesaran F statistics. If the calculated F statistics is greater than the upper boundary of the Pesaran F statistics, we reject the null hypothesis.

Table 4: the long run association

Model	Specification	Computed F-statistics	Level of significance	Lower critical value	Upper critical value
GDP Growth rate (2 0 0 0)	Intercept	4.96**	10%	2.45	3.52
			5%	2.86	4.01
			1%	3.74	5.06
FDI (1 2 2 2 2)	Intercept	3.133*	10%	2.2	3.09
			5%	2.56	3.49
			1%	3.29	4.37
Source: Author estimation **NOTE ***, ** and * represent one, five and ten present significance level respectively.**					

Based on the table above, the computed F-statistics is higher than the critical value obtained from Pesaran et.al (2000) at a significance level of five percent. This means that we do not have evidence to support the absence of long-term co-integration. On the contrary, the model confirms the presence of a long-term relationship between overseas investment and economic growth.

Short run and Long run estimate

The researcher employed the Autoregressive Distributive Lag (ARDL) approach to analyze the long-term impact of economic growth on attracting overseas investment in Ethiopia. The results of the short-run and long-run ARDL models are presented in the table below.

Table 5: Short run and long run impact

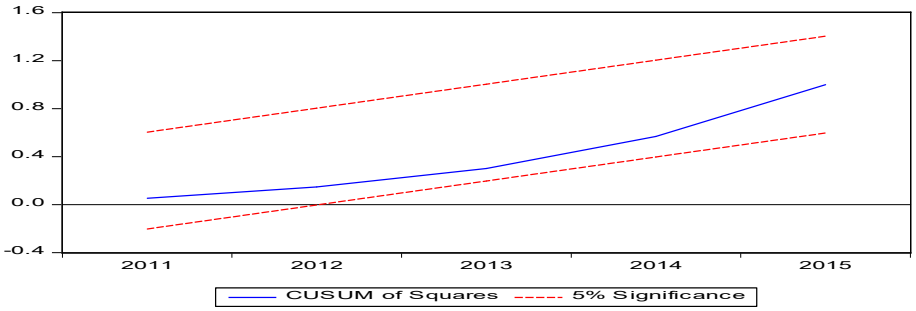
Shor run impact		
Dependent variable	**Variable**	**Coefficient (SE)**
D(FDI) **(1 2 2 2 2)**	D(GDPG)	0.274**
	D(GDP(-1))	-0.194*
	D(INF)	0.117*
	D(INF(-1))	0.452*
	D(ODA(-1))	-9.598*
	D(GOVEFF)	-10.44***
	D(GOVEFF(-1))	-0.241**
	ECT(-1)	-0.973***
Long Run Impact		
Foreign Direct Investment **(1 2 2 2 2)**	GDPG	1.361
	INF	0.392
	ODA	0.091
	GOVEFF	-34.303
	C	-30.484
	'R' square	
	Adjusted 'R' square	
Source: Author estimation **NOTE ***, ** and * represent one, five and ten present significance level respectively.**		

The findings of the study suggest that in the short run, economic growth in Ethiopia has a positive impact on attracting foreign investors to the country. The model used in the study is stable and converges towards the long-run equilibrium, as indicated by the coefficient of the error correction term being negative, less than one in absolute value, and statistically significant. However, in the long run, the study does not find any significant impact of economic growth on overseas investment. This finding is unique compared to the findings of previous studies conducted by Khaliq and Noy (2007), Rahman (2014), Hiavacek and Bal-Domanska (2016), and Moudatsoo (2003), which reported different results. It's important to note that without access to the actual study and its methodology, it is challenging to provide a comprehensive analysis or assess the validity of the findings. Additionally, as an AI language model, my responses are based on general knowledge up until September 2021, and I don't have access to specific studies or data published after that date.

Based on the information provided, it appears that the study found a long-run association between overseas investment and economic growth in Ethiopia. The study suggests that the fast economic growth of Ethiopia is the cause for an increase in the annual net inflow of foreign direct investment (FDI) in the country. Furthermore, the study employed an Autoregressive Distributed Lag (ARDL) model and found that in the short run, the economic growth rate has a positive and statistically significant impact on overseas investment in Ethiopia. These findings suggest that when Ethiopia experiences higher economic growth in the short run, it attracts more foreign direct investment. This positive relationship between economic growth and overseas investment implies that economic expansion plays a crucial role in encouraging foreign investors to invest in Ethiopia.

Model Specification test Cusum Square test

According to the table, the green line is positioned between the two red lines. This means that the model is moving towards a balanced state in the long term. As a result, we can say that our model is stable and steadily moving towards this balanced state.



Conclusion and Policy Recommendation

Conclusion

All the variables in the study were found to be stationary when analyzed at their first difference. The Johannes model also confirms the presence of a long-term relationship between overseas investment and economic growth. The findings from the vector error correction model indicate that, in the long run, there is a one-way causal relationship between overseas investment and economic growth. Specifically, good economic performance attracts overseas investors to invest in Ethiopia. However, in the long term, the impact of economic growth on overseas investment is not significant. This is primarily due to the low proportion of foreign direct investment to GDP in Ethiopia. According to a World Bank report covering the period from 1992 to 2015, the average value of foreign direct investment as a percentage of GDP for Ethiopia was 2.04%, with a minimum of 0% in 1992 and a maximum of 5.39% in 2003. These statistics highlight the fact that the contribution of foreign direct investment to Ethiopia's economic growth is not significant, which aligns with the findings of this study. However, in the short term, foreign direct investment has a positive and statistically significant impact on economic growth.

Policy recommendation

Since the causal relationship between economic growth and overseas investment indicates that economic growth influences foreign direct investment, it is advisable for the government to formulate policies that support and attract foreign investors by maintaining a robust economic growth rate. It is recommended that policymakers and leaders in Ethiopia design policies that promote the transfer of technology and knowledge from foreign firms, as this can stimulate economic growth and attract overseas investment, ensuring sustainable economic development.

Considering that the link between overseas investment and economic growth is influenced by socio-economic and sector-specific conditions, it is highly recommended to conduct further research at the sector level to examine the specific linkages and impacts of overseas investment on economic growth.

The results obtained from the ARDL model indicate that in the short term, economic growth has a positive and statistically significant impact on attracting overseas investment to the country. Therefore, policymakers and decision-makers should implement measures to sustain the positive impact of economic growth in attracting overseas investment. Overall, it is crucial for Ethiopia's policymakers and decision-makers to focus on designing effective mechanisms that can support and enhance the positive relationship between economic growth and overseas investment in the country.

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