

The Impact of public, private and foreign Investments on Economic Growth: Evidence from North African countries

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1- Abstract:

Numerous authors worldwide have examined the relationship between investment and economic growth using various timeframes and research approaches. Consequently, there exist contradictory viewpoints on this matter. This study aims to contribute empirical evidence by evaluating the effects of different investment sources, namely public, private, and foreign direct investment, on short- and long-term economic growth. The study utilizes panel data from North African countries between 1990 and 2022, using the fixed effects model (FEM). The Kao test was employed during the mentioned period to conduct joint cointegration tests on the variables. The long-term relationship was estimated using the fully modified least squares (FMOLS) method. This estimation revealed that public and private investments positively influence economic growth in North African countries. However, it was observed that foreign direct

investment has a detrimental effect on long-term economic growth in these countries.

Key Words: Pubic investment, private investment, Foreign investment, North African countries, economic growth, fixed effects model (FEM), Kao Test, and fully Modified Least Squares (FMOLS) Method.

2- Introduction:

In the last few decades, economists are trying to understand the global and country-specific factors contributing to economic growth. The variations in market fluctuations, financial crises, economic turmoil, and recessions made it hard to predict economic uncertainty. Both developed and developing countries face changes in macroeconomic dynamics and have identified a complex relationship between public, private, and foreign investment with economic growth. Public and private investments play a substantial role in production functions by providing the required capital for development.

The investment multiplier model, initially introduced by Keynes in his book "General Theory of Employment, Interest, and Money" in 1936, proposes that increasing investments is essential for raising national income or output. Keynes also stated that investment should be viewed in terms of total supply, meaning that changes in production would lead to changes in investment. The investment multiplier demonstrates the relationship between an initial increase

in investment and the subsequent increase in national income. It measures the extent to which a change in investment affects national income. Thus, it explains how an increase in investment results in a corresponding rise in revenue.

In the 1940s, two economists, Harrod in England and Domar in the United States, developed the Harrod-Domar growth model based on Keynesian principles. This model elucidated the connection between economic growth and unemployment in developed nations (Harrod, 1939; Domar, 1946). The analysis of the relationship between economic growth and the demand for investment capital has also been widely applied in developing countries.

However, Solow introduced a new growth model in 1956 known as the Solow economic growth model due to the limitations of the Harrod-Domar model, which was based on neoclassical theory. This model incorporated labor, technology, and the role of technical progress as crucial factors in economic growth, both in the short and long term. It demonstrated how population, technological advancements, and savings influenced production levels and an economy's long-term growth.

Public investment has often been considered a crucial factor contributing to economic growth. On the one hand, it can stimulate private investment by providing socioeconomic infrastructure support, increasing capital productivity and overall resource availability, and boosting output. On the other hand, public investment may crowd out

private investment. That occurs when raising additional public investment necessitates future tax increases, higher domestic interest rates, or when the public sector competes directly with the private sector in producing investment goods. Furthermore, allocating additional physical and financial resources to the public sector may dampen private investment (Blejer and Khan 1984, Aschauer 1989). Consequently, economic growth slows down due to a decline in private investment, known as the crowding-out effect of the public on private investments. The crowding-out effect can also arise from excessive distortions in the public sector.

According to the IS-LM theory, the impact of public investment on private investment is evident. An increase in government expenditures, taxes, and domestic interest rates can cause a simultaneous shift in the IS curve, thus adversely affecting private investment (Buiter, 1977; Ram, 1986). Hence, achieving economic growth hinges on capital accumulation, rendering the primary objective of policymakers in all countries, especially Less Developed Countries (LDCs), to be the augmentation of investment. Nevertheless, the inadequacy of domestic savings and the ineffectiveness of financial intermediaries underscore the necessity for external finance, making Foreign Direct Investment (FDI) the optimal alternative as a primary source for financing development and a focal point of policy attention (Amighini et al., 2017).

Besides, many factors affect investment; for example, a study by Che and Nor (2021) highlighted the importance of

human capital and innovation capacity as determinants of economic growth. They identified skilled human resources as significant contributors to a country's economic growth and development.

3- Literature Review:

Over the years, economists around the globe have actively engaged in discussions about the impact of investment on economic growth. However, only in the late 1980s did a significant number of empirical studies systematically investigate the relationship between investment and the emergence of economic development. That coincided with a period of increased economic activity and the availability of comprehensive data on economic, political, and social indicators for different countries and regions. However, the findings of these studies have varied depending on the specific sample and methodology employed.

Several studies were applied in developed countries, among those;

Hung et al. (2020) examined the relationship between fiscal decentralization, corruption, and income inequality in Vietnamese provinces. Their study utilized panel data from 63 provinces/cities in Vietnam between 2011 and 2018. The empirical evidence showed a simultaneous relationship, indicating that increased corruption led to higher regional income disparities, income inequality, and increased fiscal decentralization. The results also suggested that higher per-capita income reduced corruption levels or provided better control over corruption in each province. The study highlighted the

importance of improving corruption control and local governance effectiveness in a country's fiscal decentralization strategy to address income inequality between regions.

Nguyen and Trinh (2018) examined public investment's short-term and long-term influences on private investment and economic growth in Vietnam. They used an autoregressive distributed lag model with macro data from 1990 to 2016. The results indicated that public investment positively affected short-term growth but constrained long-term growth. Private investment and FDI, on the other hand, had positive effects on short-term economic growth. State-owned capital stock positively impacted economic growth in the short and long run.

Zou (2006) investigated the interaction between public and private investment and economic growth in the USA and Japan. The study suggested that public and private investment significantly contributed to Japanese economic growth. However, in the USA, private investment appeared to play a more significant role than public investment.

Pereira (2001) conducted an empirical investigation of the effects of public investment on private investment in the United States. The study utilized time series data from 1956 to 1997 and employed impulse response analysis and vector autoregressive (VAR) estimates. The results showed that public investment had

a crowding-in effect on private investment at the aggregate level, particularly for industrial and transportation equipment.

Wei (2008) conducted a study on the correlation between foreign direct investment (FDI) and regional economic growth in China during the period from 1979 to 2003. The research employed regression analysis and concluded that FDI consistently had a positive influence on economic growth.

Seitz (1994) investigated the impact of the public capital provision on the demand for private capital and labor in the West German manufacturing industry. The study used a cost function approach and panel data from 31 two-digit industries. The findings indicated that public capital had a supplementary impact on private investments.

Hsieh and Lai (1994) analyzed the relationship between the per capita GDP growth rate, private investment to GDP ratio, and government expenditure in G-7 countries. Their study found that government spending significantly impacted the per capita GDP growth rate in Canada, the U.K., and Japan but had an insignificant impact in France, Germany, Italy, and the USA. The United States, Japan, Canada, Germany, and the United Kingdom were significantly impacted by the ratio of private investment to GDP.

Another study by Barro (1991) assessed the effectiveness of investment and public expenditure on economic growth rates in 98 countries from 1960 to 1985. The research model included

control variables. The results suggested no evidence indicating that public investment significantly influenced economic growth. Concurrently, the findings revealed that government spending detrimentally affected economic growth.

Aschauer (1989a) conducted a study examining the effects of investment on economic growth in seven countries belonging to the Group of Seven (advanced economic countries) from 1967 to 1985. The study utilized time series data and considered both public and private investment variables; the survey findings indicated that public investment played a crucial role in positively influencing labor productivity and that private investment also had a favorable impact on growth. Conversely, the study revealed that public spending hurt economic growth. The research also demonstrated that public investment stimulated economic growth by enhancing infrastructure, facilitating better economic activity within the private investment sector.

Aschauer (1989b) conducted a study investigating the relationship between government spending variables and aggregate productivity. The findings of the study revealed several important points. Firstly, nonmilitary public capital stock was found to have a significantly more significant impact on productivity than nonmilitary and military spending flows. Secondly, there was little correlation between military capital and productivity. Thirdly, the presence of "core" infrastructure such as streets, highways, airports, mass transit, sewers, and water systems had the most explanatory power for

an and James (2014) analyzed the macroeconomic determinants of economic growth in Iraq from 1970 to 2010, based on the neoclassical growth model of Solow (1956). The study examined the impact of public and private investment on economic growth. It applied cointegration and error correction models to the time series data and conducted a Johansen cointegration test. The findings unveiled a long-term equilibrium connection between the explanatory variables and economic development. Specifically, it found that private investment, public investment, labor force growth, and growth in oil revenues positively and significantly influenced real GDP. Conversely, volatility in prices and exchange rates negatively affected real GDP. Based on these findings, the study made policy recommendations for policymakers.

Phetsavong and Ichihashi (2012) investigated the impact of foreign direct investment (FDI), public investment, and private domestic investment on economic growth in 15 Asian developing countries from 1984 to 2009. They employed panel regression analysis and found that private domestic investment and FDI were the two most crucial factors contributing to economic growth. Conversely, public consumption was inversely related to economic growth. The study also revealed that public investment reduced the positive impact of private domestic investment and FDI on economic growth.

Kandenge (2010) examined the impact of public and private investment on economic growth in Namibia from 1970 to 2005, using

an endogenous growth model framework. The study employed cointegration and error correction modeling techniques. The results indicated that in addition to public and private investment, factors such as exports, imports, economic freedom, labor, and human capital significantly and positively influenced short- and long-term economic growth; however, terms of trade and the real exchange rate hurt economic growth.

Syed et al. (2007) explored the interactions among macroeconomic variables and their impact on economic growth using panel data from Korea, Singapore, and Taiwan from 1971 to 2000. The study found that public and private investment and public consumption had long-term dynamic effects on economic growth in the sample countries. They observed bidirectional causality between public investment and economic development, and the homogeneous non-causality hypothesis suggests that non-causality results were consistent across the small sample of countries analyzed.

The simultaneous impact of both public expenditures and foreign direct investment (FDI) on economic growth was examined by Le and Suruga (2005b). Their study considered 105 developing and developed countries from 1970 to 2001. The findings indicated that FDI, public capital, and private investment were influential in promoting economic growth. However, public non-capital expenditure hurts growth, and excessive spending on public capital could hinder the beneficial effects of FDI.

Ramirez and Nazmi (2003) conducted an empirical study on nine Latin American countries from 1983 to 1993. They utilized panel regression analysis and examined the relationship between government consumption expenditures, private investment, and economic growth. The study revealed a negative effect of government consumption expenditures on private investment and growth. In contrast, the study showed that public spending on education and healthcare had a favourable and statistically significant impact on forming private capital and long-term economic growth.

Everhart and Sumlinski (2001) studied the relationship between public and private investment in 63 developing countries from 1970 to 2000. They utilized a data panel and employed the pooled ordinary least squares method and random-effect model. It lagged private investment on GDP, the interaction between public investment and corruption, and the effect of the broad money supply on economic growth. The findings indicated a negative correlation between public and private investment. However, the correlation was positive in countries with a more robust institutional framework.

Ghali (1998) conducted a study in Tunisia that examined the impact of an IMF debt stabilization program on economic growth. Ghali developed a vector error-correction model using multivariate cointegration techniques to investigate the long-term effects of public investment on private capital formation and economic growth. The findings indicated that public investment had an inverse long-run impact on economic growth.

The contribution of public and private investment to per capita GDP growth in developing countries was also analyzed by Khan and Kumar (1997). Their study used cross-sectional and panel data from 95 developing countries from 1970-1990. The results indicated that public and private investment had different effects on growth, influenced by factors such as human capital formation, population growth, and technical progress. The effects varied across regions and over time.

Devarajan et al. (1996) examined the relation between public expenditure and growth. Their study analyzed data from 43 developing countries over 20 years. The results indicated that increased the share of current spending had a positive and statistically significant effect on growth. In contrast, the capital component of public expenditure showed a negative relationship with per-capita growth, suggesting that excessive use of seemingly productive expenditures could become unproductive. These findings indicated a misallocation of public spending in developing countries, favouring capital expenditures at the expense of current expenditures. Ghosh and Gregoriou (2007) reached similar conclusions regarding developing countries' optimal fiscal policy framework.

Hadjimichael and Ghura (1995) studied the impact of public policy, private investment, and savings on economic growth in sub-Saharan African countries. The research focused on a sample of 41 countries from 1981 to 1992. The findings revealed that policies promoting low inflation rates, reduced macroeconomic uncertainty,

financial deepening, and lower external debt burdens effectively stimulated private savings and investment. Additionally, the study found that structural reforms and reduced budget deficits (without reducing government investment) enhanced private investment; however, increases in private savings only partially offset the declines in government savings.

Blejer and Khan (1984) conducted a statistical analysis of 24 developing countries from 1971 to 1979 to investigate the impact of public investment on private investment, exploring both the crowding-out and crowding-in effects. They discovered that public investment in infrastructure positively influenced private investment, while other types of public investment depleted the funds available for private investment.

In light of this, the current study investigates the impact of investment on economic growth in North African countries (Egypt, Sudan, Libya, Tunisia, Algeria, and Morocco) during the period (1990 to 2022).

4- Methodology, Data Sources, and Variables Definitions:

Panel data models is utilized to examine the relationship, specifically the static panel model, which combines cross-section and time series data. The sample size of our analysis will consist of 198 observations over a defined period (T). To estimate the long-term relationship between investment and economic growth in North African countries, we will employ the modified least squares

(FMOLS) method. The data for our analysis was sourced from the World Bank website.

Based on economic theory and previous experimental studies, the real GDP per capita will be the dependent variable. At the same time, foreign direct investment, public investment, private investment, recurring expenditures, Labor and trade openness (exports and imports) will be the dependent variables. The following mathematical formula explains this relationship:

$$IRGDP = f(lFDI, lPUIN, lPRIN, lREX, lLAB, lOPEN)_{t=1990-2022}$$

..... (01)

Table (1) Calculation and Expectation Symbols of Variables in the Model

Variable	Description	Calculation	Expectation
IRGDP	Economic growth	Log\GDP per capita (constant 2015 US\$)	Dependent variable
lFDI	Foreign Direct Investment	Log\ Foreign direct investment	+
lPUIN	Public investment	Log\Public investment/current GDP	+
lPRIN	Private Investment	Log\Private Investment/current GDP	+
lREX	Recurrent Expenses	Log\Recurrent Expenses/current GDP	+
lLab	Labor	Log\Numbers of labor/ Population	+
lExp & lIMP	Trade openness	Log\Import & Export	+

Hence, the following multiple regression equation is used:

$$IRGDP_{it} = B_0 + B_1 lFDI_{it} + B_2 lPUIN_{it} + B_3 lPRIN_{it} + B_4 lREX_{it} + B_5 lLAB_{it} + B_6 lEXP_{it} + B_7 lIMP_{it} + e_{it}.....(02)$$

i represents the number of countries, t is the time period, and E_{it} is the random error term.

1- Estimating and comparing static panel data models

The main goal of this research segment is to estimate three fundamental models using the available sample data. In the subsequent phase, suitable tests will be used to compare these models and identify the most appropriate one for studying the influence of investment on economic growth in the chosen region and time period.

The outcomes of estimating the analyzed model will be presented in the subsequent Table, employing three-panel data models: the Pooled Regression Model (PRM), the Fixed Effects Model (FEM), and the Random Effects Model (REM). This presentation aims to determine the most suitable model for the study.

Table (2) Result of three static panel models

Dependant variable: IRGDP						
Variables	PRM		FEM		REM	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
IFDI	0.0005	0.052	-0.009	0.003	0.003	0.852
IEXP	0.078	0.001	0.058	0.015	0.302	0.000
IIMP	0.130	0.033	0.086	0.005	0.069	0.231
ILAB	0.193	0.010	0.556	0.000	-0.433	0.000
IREX	-0.248	0.008	0.284	0.000	-0.164	0.006
IPUIN	-0.026	0.000	0.041	0.000	0.124	0.000

IPRIN	-0.025	0.000	0.037	0.001	-0.114	0.000
Constant	0.410	0.000	1.317	0.001	2.991	0.000
R-squared	0.80	-----	0.819	-----	0.81	-----
F-test	108.753		111.911		761.269	
Prob > F	0.000		0.000		0.000	

Source: From Stata V14 Output

The Fisher "F" test statistic demonstrates statistical significance for all three models utilized and the majority of the independent variables incorporated within the model. Following the estimation of the three models for the analyzed model, appropriate selection methods will be employed to determine the most suitable model among them.

2- Comparison between models

To make model comparisons, we will employ the Lagrange Multiplier test to assess the aggregate model against the fixed effects model. Furthermore, the Hausman test will be utilized to compare the fixed effects model against the random effects model.

Table (3) result of the Lagrange Multiplier and Hausman test

Test	chi2	Prob>chi2
Lagrangian multiplier test	13.67	0.00
Hausman test	184.38	0.00

Source: From Stata V14 Output

Upon examining Table (3), it is evident that the Lagrangian multiplier test statistic has a value of 13.67,

accompanied by a probability value of 0.0000. Since this probability value is below the 5% threshold, we can reject the null hypothesis that countries exhibit homogeneity and instead accept the alternative hypothesis that countries do not demonstrate homogeneity. Consequently, the Fixed Effects Model (FEM) is deemed as the appropriate model.

Furthermore, according to the findings in Table (3), the results of the Hausman test support rejecting the null hypothesis in favor against the alternative hypothesis. This indicates that the fixed effects model (FEM) is preferred and confirms its suitability for the study.

3- Analysis of the results of estimating the Fixed Effects Model.

The examination of the results from estimating the Fixed Effects Model reveals that, after conducting comparative assessments among the three fundamental panel data models, the fixed effects approach was identified as the appropriate choice for analyzing the impact of investment on the economic growth of North African countries from 1990 to 2022. The STATA 16 software was employed to estimate the model parameters.

Table (4) Results of estimating the fixed effects model

IRGDP	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
IFDI	-0.009	0.007	-3.31	0.003	-0.023	0.005	*
IEXP	0.058	0.024	2.45	0.015	0.011	0.106	**
IIMP	0.086	0.03	2.87	0.005	0.027	0.145	**

LLAB	0.556	0.08	6.99	0.000	0.399	0.713	**
IREX	0.284	0.028	10.14	0.000	0.339	-0.229	**
IPUIN	0.041	0.011	3.8	0.000	0.563	-0.02	**
LPRIN	0.037	0.011	3.39	0.001	0.458	-0.015	**
Constant	1.317	0.392	3.36	0.001	2.091	-0.544	**
Mean dependent var			3.514	SD dependent var		0.226	
R-squared			0.819	Number of obs		186	
F-test			111.911	Prob > F		0.00	
Akaike crit. (AIC)			-668.356	Bayesian crit. (BIC)		-642.55	

*** $p < .01$, ** $p < .05$, * $p < .1$

Source: From Stata V14 Output

The estimation results indicate that all of the independent variables incorporated in the model exhibit statistical significance. Moreover, the probability value (prob F = 0.0000) is below 0.05, signifying that the overall estimated model holds statistical significance.

Also, the determination coefficient R² value is 0.81, meaning that 81% of the changes in the dependent variable (LRGDP) are due to changes in the independent variables. Likewise, from the previous results, the regression equation can be concluded as follows:

$$\text{LRGDP} = 1.317 + 0.009 \cdot \text{LFDI} + 0.556 \cdot \text{LLAB} + 0.058 \cdot \text{LEXP} + 0.086 \cdot \text{LIMP} + 0.037 \cdot \text{LPRIN} + 0.041 \cdot \text{LPUIN} + 0.248 \cdot \text{LREX}$$

The above estimation results also show the following:

- The influence of labor (LAB) on economic growth exhibited a positive and statistically significant effect at the 5% significance level. More specifically, a 1% increase in the

overall workforce corresponds to a 0.556% upward adjustment in the average Real GDP per capita. It is worth highlighting that the coefficient estimate for this variable surpasses the magnitudes of other estimators incorporated in the model. This finding suggests that employment can be considered a substantial determinant of economic growth in these nations, affirming the proposition put forth by economic theory.

- The effect of foreign direct investment (IFDI) on economic growth demonstrated a statistically significant and negative association at the 1% significance level. More precisely, a 1% decrease in aggregate foreign direct investment would lead to a 0.009% decline in the average real GDP per capita.
- Exports (IEXP) and imports (IIMP) make a positive contribution to economic growth. The coefficient for exports is estimated to be 0.086, while for imports, it is 0.059. This observation is noteworthy as it indicates that net exports exhibit a robust performance.
- The estimation results indicate that both public and private investment have a positive and statistically significant impact on economic growth at the 5% significance level. More specifically, a 1% increase in public investment (IPUIN) corresponds to a 0.041% increase in the average per capita share of real domestic product. Similarly, a 1% increase in private investment (IPRIN) leads to a 0.036% increase in the average per capita share of real domestic product. Therefore, it

can be concluded that both public and private investment play crucial roles as determinants of economic growth in North African countries.

4- The impact of investment on economic growth in the long run.

4.1 Stability study of the study variables:

The stability of the series is assessed using widely employed stability tests, namely the Levin, Lin, and Chu (LLC) test (2002), the Fisher-ADF test, and the Fisher-PP test. The null hypothesis for each of these tests posits the presence of a unit root in the series, indicating instability.

Table (5) Stability tests for the study variables

Variable	Level			1stDifference		
	PP	ADF	LLC TEST	PP	ADF	LLC TEST
IRGDP	3.874	5.673	-0.547	21.473	11.930	-7.420
	0.45	0.09	0.68	0.00	0.00	0.00
IFDI	5.6261	7.0499	-1.3088	55.9663	59.2341	-6.5446
	.40	0.53	0.90	0.00	0.00	0.00
IEXP	9.3971	10.5104	-0.0373	59.8886	46.6236	-6.4544
	0.31	0.23	0.49	0.00	0.00	0.00
IIMP	1.9691	2.4675	-1.3820	32.9387	25.6430	-3.5499
	0.36	0.27	0.57	0.00	0.00	0.00
ILAB	8.9272	9.9849	-7.5670	---	---	---
	0.00	0.00	0.00	---	---	---
IREX	0.6892	0.8636	-1.5520	31.2918	24.3608	-3.3724

	0.48	0.36	0.75	0.00	0.00	0.00
IPUIN	9.1245	14.4947	-3.8985	---	---	---
	0.00	0.00	0.00	---	---	---
IPRIN	0.6547	0.8204	-1.4744	9.4658	7.3692	-1.0202
	0.63	0.47	0.99	0.00	0.00	0.00

Source: From Stata V14 Output

Based on the outcomes presented in Table (5), it is evident that all the employed tests indicate the presence of instability, as indicated by significance values exceeding 5%. However, subsequent analysis involving the first differencing of the unstable variables and reapplication of the aforementioned tests reveals that all variables achieve stability at a 5% significance level.

Consequently, we conclude that the variables (IRGDP - LFDI - LEXP - LIMP - LLAB - LREX - LPUIN - LPRIN) are integrated at the first degree (1)I. Thus, the application of Panel Cointegration methodology appropriately captures the relationship between these integrated variables to the same degree.

4.2 Cointegration between the study variables.

The Kao Residual Cointegration test is employed to assess the degree of long-term integration between economic growth and the independent variables. This test utilizes the developed Dickey-Fuller (ADF) test and evaluates the null hypothesis that no cointegration exists among the variables. The outcomes of this test are presented as follows:

Table (6) Results of the (Kao) cointegration test

Kao ResidualCointegration test		
NullHypothesis: No Cointegration		
Test	Statistical	p-value
ADF-statistical	-2.606	0.004

Source: From Stata V14 Output

The results presented in Table (6) offer supportive evidence for the existence of a cointegration relationship among all variables analyzed in the study. As a result, the null hypothesis is rejected, and the alternative hypothesis is accepted at a significance level of 5%. This signifies the presence of a long-term integration relationship among the variables studied, which remain consistently stable.

4.3 Estimating the long-term relationship using the fully corrected least squares (FMOLS) method:

A non-parametric estimation method known as the Fully Modified Ordinary Least Square Estimator (FMOLS) method, which is efficient in estimation and its ability to address the problem of self-correlation and parameter bias, in addition to addressing the issue of internally determined variables (endogeneity). The general

formula for estimating FMOLS) will be used as follows:

$$\omega_{GFM} = N^{-1} \sum_{i=1}^N \left[\sum_{t=1}^T (X_{it} - X_i^*)^2 \right]^{-1} \left[\sum_{t=1}^T (X_{it} - X_i^*) Y_{it}^* - T r_i^* \right]$$

Where,

$$\omega_{GFM} = N^{-1} \sum_{i=1}^N \omega_{FMI} \cdot \omega_{FMI}$$

: Represents the FMOLS estimator for the individual variable, i: represents the segments

N

: Total number of observations

T

: Represents the time

X_{it}

: Represents the external variable

X_i^*

: Represents the average of the external variable

Y_{it}^*

: Represents the difference between the internal variable Y_{it} and its average Y_i^* ,

TR_i^*

: Represents the autocorrelation effect, corrector.

In the presence of a typical integration relationship between variables, the long-term relationship will be estimated using the (FMOLS) method. The estimation results are shown in Table (7), where the model parameters were estimated using E-views 9.

Table (7) Results of estimating FMOLS method

Dependent Variable: LRGDP
 Method: Panel Fully Modified Least Squares (FMOLS)
 Date: 02/26/24 Time: 18:42
 Sample (adjusted): 1991 2022
 Periods included: 32
 Cross-sections included: 6
 Total panel (unbalanced) observations: 175
 Panel method: Weighted estimation
 Cointegrating equation deterministics: C
 Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI	-0.060854	0.073027	-4.568415	0.0014
LLAB	0.502079	0.013938	36.02345	0.0000
LEXP	0.086342	0.034310	2.516501	0.0128
LIMP	0.096137	0.036018	2.669095	0.0084
LPRIN	0.028141	0.044812	6.279541	0.0171
LPUIN	0.008578	0.026164	3.214551	0.0169
LREX	0.215543	0.019295	11.170985	0.0000
R-squared	0.926911	Mean dependent var	3.513161	
Adjusted R-squared	0.921497	S.D. dependent var	0.219333	
S.E. of regression	0.061454	Sum squared resid	0.611802	
Long-run variance	0.000849			

Source: From E-views 9 Output

The results from Table 7 reveal that various variables, such as LLAB, LEXP, LIMP, LPRIN, LPUIN, and LREX, demonstrate positive and statistically significant influences on long-term economic growth. Conversely, foreign direct investment (LFDI) shows a negative and statistically significant effect on economic growth. With a coefficient of determination of 92%, they indicate a robust relationship between the independent and dependent variables.

In particular, the logarithm of the number of workers (LLAB) demonstrates a positive and statistically significant influence on

economic growth. A 1% increase in the total number of workers corresponds to a 0.50% increase in real GDP per capita. That underscores the significance of employment as a determinant of long-term economic growth in North African countries.

In contrast to many previous studies, foreign direct investment (LFDI) exhibits a negative and statistically significant effect on long-term economic growth. Specifically, a 1% rise in foreign direct investment leads to a 0.06% decrease in the average per capita share of real domestic product. This adverse effect may be attributed to factors such as the instability of inbound foreign direct investment flows within these nations.

Furthermore, both the logarithm of public investment (LPUIN) and private investment (LPRIN) have positive impacts on economic growth, with a 1% increase in LPUIN and LPRIN leading to a 0.008% and 0.02% increase in real GDP per capita, respectively. Similarly, the logarithm of exports and imports (trade opening) positively influences economic growth, with a 1% increase in exports and imports resulting in a 0.08% and 0.09% increase in real GDP per capita. Additionally, the logarithm of recurrent expenses (LREX) positively impacts economic growth, with a 1% increase in LREX leading to a 0.21% increase in real GDP per capita.

To sum up, findings from both static panel data estimation and the fully adjusted least squares (FMOLS) approach reveal a detrimental effect of foreign direct investment on the economic

growth of North African nations between 1990 and 2022. Conversely, public and private investments exhibit positive impacts on economic growth.

5- Final Conclusion:

This research study aimed to examine the impact of public, private, and foreign investments on the economic growth of North African countries. The findings yielded valuable empirical evidence and shed light on the intricate relationship between different sources of investment and economic development. The results indicated that both public and private investments have a positive effect on economic growth in both the short and long term. This underscores the significance of investments from both the government and the private sector in stimulating production and providing the necessary capital for development.

growth in these countries. This suggests that the impact of FDI on economic growth is not straightforward and requires careful consideration. Policymakers should evaluate the potential benefits and drawbacks of foreign investments, ensuring that they align with the country's long-term development goals.

By offering specific insights into North African countries, this research study makes a valuable contribution to the existing literature, enhancing our comprehension of the connection between investment and economic growth. It emphasizes the significance of adopting a well-rounded investment approach that promotes both public and

private investments, while also effectively addressing and mitigating any potential adverse impacts of foreign direct investment (FDI).

Overall, this study emphasizes the crucial role of investment as a driver of economic growth in North African countries. Policymakers should concentrate on formulating policies that create a conducive environment for investments, both domestic and foreign, and ensure the effective utilization of investment resources to foster sustainable and inclusive economic development in the region.

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