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# Analysis of the Impact of FDI on GDP in Algeria, Morocco, Tunisia, and Libya: An Econometric Study for the Period 1970-2023

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## Abstract:

This study examines the impact of Foreign Direct Investment (FDI) on economic growth in Algeria, Morocco, Tunisia, and Libya using panel models, including Pedroni's panel cointegration approach, the Johansen Fisher Panel Cointegration test, and the Granger Causality Test, over the period from 1970 to 2023. The results show a long-term relationship between FDI and GDP, without clear causality, indicating an indirect influence. Algeria shows a weaker effect due to its heavy reliance on hydrocarbons, while Morocco benefits more from FDI due to its relatively diversified economy. Libya also experiences weaker impacts due to political instability, and similarly, Tunisia is affected by economic instability. Furthermore, weak business environments and a lack of reforms limit these countries' ability to fully benefit from FDI. The study recommends improving investment conditions, promoting economic diversification, and strengthening political and economic stability. It ultimately concludes that FDI can support growth, but its impact depends on the policies and institutional framework of each country.

**Keywords:** Foreign Direct Investment (FDI); Economic Growth; Cointegration; Panel data analysis; Economic stability

**Jel Classification Codes :** F21, F43, O11, O57, C33.

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## **1. Introduction:**

Foreign direct investment (FDI) is one of the key factors influencing economic growth, as it can stimulate productivity, facilitate technology transfer, and enhance human capital in host countries. In the context of the Maghreb countries (Algeria, Morocco, Tunisia, and Libya), FDI inflows have shown significant variations over the past decades, raising questions about their impact on economic growth rates in these nations.

This study relies on panel data analysis, which enables the examination of the relationship between FDI and GDP across multiple countries over an extended period. This approach helps overcome some of the limitations faced by single-country studies. To achieve this, panel cointegration tests such as Pedroni and Johansen Fisher were employed, in addition to the Granger causality test to determine the direction of the relationship between the two variables.

Given the importance of FDI in driving economic growth, it is crucial to investigate the relationship between these two variables in Algeria, Morocco, Tunisia, and Libya using panel data analysis. This raises the following research question: To what extent does foreign direct investment affect economic growth rates in Algeria, Morocco, Tunisia, and Libya?

To address this issue, the study tests several hypotheses. First, there is a cointegration relationship between FDI and GDP in Algeria, Morocco, Tunisia, and Libya, indicating a long-term connection between them. Second, FDI has a positive impact on economic growth rates in these countries, although the degree of influence may vary from one country to another. Third, there is a causal relationship between FDI and GDP, which may be unidirectional or bidirectional. Fourth, using panel data analysis provides more accurate results compared to traditional studies based on individual time series data for each country.

The significance of this study lies in its application of dynamic panel data analysis, which allows for a more precise understanding of the relationship between FDI and economic growth while accounting for differences among the countries in the sample. The findings of this study can contribute to shaping economic policies that better attract foreign direct investment and maximize its positive impact on economic growth.

## **2. FDI and GROWTH littérature:**

(Balasubramanyam, Salisu, & Sapsford, 1996), explore the role of foreign direct investment (FDI) in economic growth within the framework of new growth theory, focusing on developing countries with varying trade policy regimes. Using cross-sectional data from 46 developing countries, they test J. Bhagwati's hypothesis, which suggests that FDI has a greater positive impact on economic growth in countries with outward-oriented trade policies compared to those with inward-oriented policies.

Building on this perspective, (Borensztein, De Gregorio, & Lee, 1998) analyze the impact of FDI on economic growth using cross-country regression data on FDI flows from industrial nations to 69 developing

countries over two decades. Their findings indicate that FDI enhances growth by facilitating technology transfer and outperforms domestic investment. However, its higher productivity effect is evident only when the host country possesses a minimum threshold of human capital, ensuring sufficient absorptive capacity for advanced technologies.

Further examining the causal dynamics, (De Mello, 1997) investigates the relationship between FDI and economic growth across 32 countries, including 17 non-OECD nations. Initially, he explores the time-series dynamics of FDI and growth, revealing that the long-term impact of FDI on growth varies across countries. Complementing his time-series analysis, he presents evidence from panel data estimations, where fixed effects regressions with country-specific intercepts indicate no causal link from FDI to growth in non-OECD countries, while the mean group estimator suggests a negative short-term effect of FDI on GDP.

(Choe, 2003), extends this line of research by applying the traditional panel data causality testing method developed by Holtz-Eakin, Newy, and Rosen (1988) in an analysis of 80 countries. His findings indicate a bi-directional causal relationship between FDI and economic growth, though the impact of FDI on growth appears to be weak. Similarly, (Basu, Chakraborty, & Reagle, 2003) examine the two-way relationship between FDI and growth by accounting for country-specific cointegrating vectors and incorporating individual country and time fixed effects. Their study highlights trade openness as a key factor influencing the impact of FDI on growth. They find evidence of bi-directional causality in open economies in both the short and long run, whereas in relatively closed economies, long-run causality runs only from growth to FDI.

As research on the FDI-growth relationship evolved, (Mahembe & Odhiambo, 2014) reviewed the theoretical literature, emphasizing FDI's role as a key driver of economic growth. They identify two main mechanisms through which FDI contributes to economic growth: technology spillovers that enhance production processes and knowledge transfers that improve labor skills, management practices, and innovation. Expanding the empirical scope, (Encinas-Ferrer & Villegas-Zermeño, 2015) extend the analysis of the FDI-growth relationship to China, Brazil, South Korea, and Peru, confirming previous findings from Argentina and Mexico that suggest GDP growth attracts FDI rather than the reverse. Using Granger causality tests adjusted by Toda and Yamamoto's method in E-Views, they find that FDI, as a small fraction of total gross fixed capital formation (GFCF), has only a marginal impact on economic growth.

(Baiaishvili & Gattini, 2020), introduce a nuanced perspective by investigating the role of income levels and institutional quality in shaping the impact of FDI on growth across 111 countries from 1980 onward. Using robust panel GMM techniques, they identify an inverted U-shaped relationship, where FDI's impact increases from low- to middle-income countries but declines in high-income nations.

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Moreover, institutional quality plays a crucial role, as countries with stronger institutions relative to their income group benefit more from FDI-driven growth. (Wang, Xu, Qin, & Skare, 2021) further contribute to the field by conducting a bibliometric analysis of 1,075 documents on the FDI-economic growth relationship using Bibliometrix software. Their study identifies key researchers, conceptual structures, and thematic trends in the field, highlighting C. Chen, the Journal of International Economics, and the USA as the most influential researcher, journal, and country, respectively. Research on FDI and economic growth primarily focuses on technology, firm performance, modeling, and theoretical inquiry, offering insights into its evolution, current trends, and future research directions.

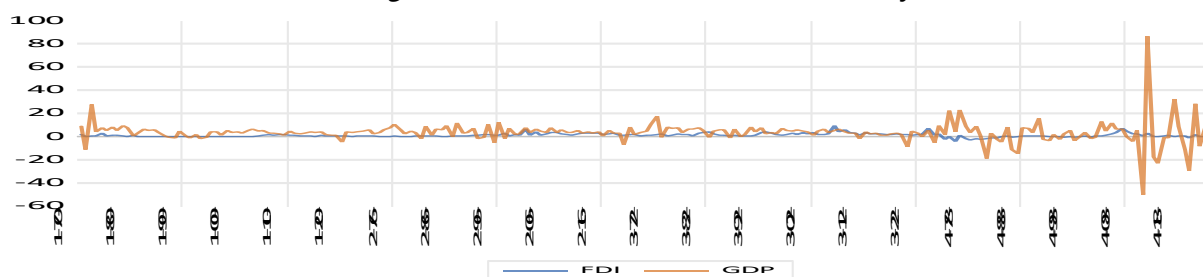
More recently, (Minh & Trinh, 2023) examine the relationship between FDI inflows, trade openness, and economic growth in 60 developing countries from 1995 to 2019 using the threshold methodology and GMM estimation. Their findings indicate that while FDI positively impacts growth, its effect diminishes beyond a certain threshold relative to GDP, highlighting the host country's absorptive capacity. The study recommends aligning trade liberalization policies with FDI attraction strategies to maximize the benefits of foreign investment. Extending the analysis further, ( Le, Do , & Duong, 2024) explore the impact of FDI and total factor productivity (TFP) on economic growth in 90 middle-income countries, which often face challenges in achieving sustainable development. Using dynamic system GMM on 2,714 annual observations (1990–2020), they find that a 1% increase in FDI boosts economic growth by 9.3%, while TFP also positively influences growth through improved labor quality and innovation. Moreover, TFP strengthens the FDI-growth relationship, and the results remain robust across alternative growth measures. The study offers policy insights to promote sustainable development in middle-income countries.

Through this chronological progression of research, it becomes evident that while FDI plays a crucial role in economic growth.

### 3. The empirical part of the study:

We will use a data series for foreign direct investment (FDI) inflows to the four countries—Algeria, Morocco, Tunisia, and Libya—as well as a data series for gross domestic product (GDP) for the period from 1970 to 2023 (see Figure N° 1).

Figure N°1: FDI Influx and GDP for Algeria (1), Morocco (2), Tunisia (3), and Libya (4) from 1970 to 2023.



Source: Output from the EViews 13 program using data from the WDI.

**3.1. Stationarity Test of series:**

**3.1.1. Stationarity Test of FDI series:**

The unit root test aims to determine whether the Foreign Direct Investment (FDI) series is stationary or contains a unit root, meaning it is non-stationary and requires transformation, such as first differencing, to become stable. The analysis covers the period from 1970 to 2023, using a panel dataset with four cross-sections and approximately 208 to 212 observations. The estimation accounts for individual effects and applies the Newey-West method for automatic bandwidth selection along with the Bartlett kernel for noise filtering.

**Table N°1: Stationarity Test of FDI series**

Method	Statistic	Prob.**	Cross-sections	Obs
<b>Null: Unit root (assumes common unit root process)</b>				
Levin, Lin & Chu t*	-1.52533	0.0636	4	208
<b>Null: Unit root (assumes individual unit root process)</b>				
Im, Pesaran and Shin W-stat	-2.19179	0.0142	4	208
ADF - Fisher Chi-square	17.4043	0.0262	4	208
PP - Fisher Chi-square	63.4731	0.0000	4	212

\*\* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

The test follows two main hypotheses: the null hypothesis, which assumes the presence of a unit root (indicating non-stationarity), and the alternative hypothesis, which suggests that the series is stationary. When considering tests that assume a common unit root process across cross-sections, the Levin, Lin & Chu test yields a t-statistic of -1.52533 with a p-value of 0.0636. This result is not statistically significant at the 5% level but is close to significance at the 10% level, suggesting some evidence of stationarity, though not conclusive.

On the other hand, tests that allow for individual unit root processes across cross-sections provide stronger evidence of stationarity. The Im, Pesaran, and Shin test reports a W-stat of -2.19179 with a p-value of 0.0142, the ADF-Fisher test gives a Chi-square statistic of 17.4043 with a p-value of 0.0262, and the PP-Fisher test produces a highly significant Chi-square statistic of 63.4731 with a p-value of 0.0000. Since all these tests yield p-values below 0.05, they strongly reject the null hypothesis, confirming that the FDI series is stationary.

The results of the Levin, Lin & Chu t\* test are inconclusive but suggest a tendency to reject the unit root hypothesis at the 10% significance level. Meanwhile, the Im, Pesaran, and Shin test, along with the ADF Fisher and PP Fisher tests, indicate stationarity at the 5% level or lower. Considering these results collectively, we can reject the unit root hypothesis and conclude that the series is stationary. (See Table N°1)

**3.1.2. Stationarity Test of GDP series:**

This analysis aims to determine whether GDP is stationary or contains a unit root, meaning it is non-stationary and requires transformation to be suitable for statistical models. The study examines GDP over the

period from 1970 to 2023 with four cross-sections and approximately 208 to 212 observations Individual effects are included as external variables The estimation method uses Newey-West automatic bandwidth selection and Bartlett Kernel for noise filtering

**Table N°2: Stationarity Test of GDP series**

Method	Statistic	Prob.**	Cross-sections	Obs
<b>Null: Unit root (assumes common unit root process)</b>				
Levin, Lin & Chu t*	-8.41181	0.0000	4	208
<b>Null: Unit root (assumes individual unit root process)</b>				
Im, Pesaran and Shin W-stat	-8.32558	0.0000	4	208
ADF - Fisher Chi-square	77.3602	0.0000	4	208
PP - Fisher Chi-square	169.537	0.0000	4	212

\*\* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

**Source:** Output from the EViews 13 program

There are two null hypotheses, the first states that a unit root exists, indicating that the series is non-stationary, the alternative hypothesis suggests that no unit root is present, meaning the series is stationary

Tests assuming a common unit root across cross-sections include the Levin Lin and Chu t\* test, which reports a statistic of -8.41181 with a p-value of 0.0000 This result is highly significant at the 1% level, leading to the rejection of the null hypothesis and indicating that the series is stationary Since the p-value is far below 0.05, the unit root hypothesis is strongly rejected

Tests allowing for individual unit roots in each cross-section include the Im Pesaran and Shin W-stat test, which reports a statistic of -8.32558 with a p-value of 0.0000 The ADF Fisher Chi-square test yields a statistic of 77.3602 with a p-value of 0.0000 The PP Fisher Chi-square test results in a statistic of 169.537 with a p-value of 0.0000 In all cases, the p-value is below 0.05, confirming that the series is stationary and that the null hypothesis of a unit root is rejected

Overall, all tests confirm that GDP is stationary, as the unit root hypothesis is decisively rejected There is no need to take first differences since the series is already stable. (See Table N°2)

### 3.2. Covariance Analysis:

The table N° 3 presents the covariance analysis between Foreign Direct Investment (FDI) and Gross Domestic Product (GDP) using annual data from 1970 to 2023, with a total of 216 observations.

**Table N°3: Covariance Analysis**

	FDI	GDP	
Covariance	2.541372		<b>FDI</b>
Correlation	1.000000		
SSCP	548.9364		
t-Statistic	-----		
Probability	-----		
Cases	216		
Observations	216		
Covariance	2.430686	90.50292	<b>GDP</b>
Correlation	0.160274	1.000000	
SSCP	525.0282	19548.63	
t-Statistic	2.375315	-----	
Probability	0.0184	-----	
Cases	216	216	
Observations	216	216	

Source: Output from the EViews 13 program

The covariance values provide insights into the relationship between foreign direct investment (FDI) and gross domestic product (GDP). The covariance between FDI and itself is 2.541372, representing the variance of FDI, while the covariance between GDP and itself is 90.50292, reflecting the variance of GDP. The covariance between FDI and GDP is 2.430686, indicating the extent to which changes in FDI are associated with changes in GDP.

The correlation coefficient between FDI and GDP is 0.160274, suggesting a weak positive correlation between the two variables. This implies that as foreign direct investment increases, GDP also tends to increase, although the relationship is not particularly strong.

The sums of squares and cross products (SSCP) values represent the sum of squares and deviations of the original data used in the covariance calculations. These values help in understanding the dispersion and interdependence of the variables.

The t-statistic value is 2.375315, which measures the significance of the relationship between FDI and GDP. The corresponding p-value is 0.0184, which is below the 0.05 threshold, indicating that the relationship between the two variables is statistically significant at a 95% confidence level. While the correlation remains weak, the positive relationship suggests that an increase in foreign direct investment may contribute to GDP growth, albeit not in a strong manner.

### 3.3. Pedroni's cointegration test:

#### 3.3.1. Pedroni's cointegration approach:

Pedroni (1999, 2004) proposed seven test statistics to examine the null hypothesis of no cointegration in nonstationary panel data. These statistics account for heterogeneity within the panel, allowing variations in both short-run dynamics and long-run slope and intercept coefficients. Unlike traditional time-series analysis, these tests do not require normalization or the precise determination of the number of cointegrating relationships. Instead, they assess the strength of evidence for or against the presence of cointegration among two or more variables in the panel. (Pedroni, 1999)

The seven test statistics are classified into two categories: group-mean statistics, which average the results of individual country test statistics, and panel statistics, which pool the statistics along the within-dimension. Both categories include nonparametric tests ( $\rho$  and  $t$ ) as well as parametric tests (augmented Dickey–Fuller [ADF] and  $v$ ). (Baltagi, 2013)

To account for simple cross-sectional dependency, the test can incorporate common time dummies. This is achieved by time-demeaning the data for each individual and variable, as shown below:

$$\bar{y}_t = \frac{1}{N} \sum_{i=1}^N y_{it}$$

All the test statistics are residual-based tests, with residuals collected from the following regressions:

$$\begin{aligned} \beta_{1i} x_{1i,t} &= \alpha_i + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \dots + \beta_{Mi} x_{Mi,t} + e_{i,t} \\ \Delta y_{i,t} &= \sum_{m=1}^M \beta_{mi} \Delta x_{mi,t} + \eta_{i,t} \\ \hat{e}_{i,t} &= \hat{\gamma}_i \hat{e}_{i,t-1} + \hat{\mu}_{i,t} \\ \hat{e}_{i,t} &= \hat{\gamma}_i \hat{e}_{i,t-1} + \sum_{k=1}^K \hat{\gamma}_{ik} \Delta \hat{e}_{i,t-k} + \hat{\mu}_{i,t}^* \end{aligned}$$

where  $i = 1, 2, \dots, N$  is the number of individuals in the panel,  $t = 1, 2, \dots, T$  is the number of time periods,  $m = 1, 2, \dots, M$  is the number of regressors, and  $k = 1, 2, \dots, K$  is the number of lags in the ADF regression (selected automatically by `xtpedroni` with several available options). A linear time trend  $\delta_{it}$  can be inserted into the regression at the user's discretion. (Pedroni, 2004)

#### 3.3.2. Analysis of the impact of Foreign Direct Investment (FDI) on economic growth in Algeria, Morocco, Tunisia, and Libya using the Pedroni test:

The Pedroni cointegration test was applied to examine the long-term relationship between FDI and GDP in four countries. The null hypothesis states that no cointegration exists, meaning there is no stable long-term equilibrium between the two variables. Conversely, the alternative hypothesis suggests that changes in FDI influence economic growth in the long run.

**Table N°4: Pedroni Cointegration Test (Long run relationship)**

Alternative hypothesis: common AR coefs. (within-dimension)				
Statistic	Prob.	Weighted Statistic	Prob.	
2.974540	0.0015	0.371915	0.3550	Panel v-Statistic
-11.38815	0.0000	-11.49035	0.0000	Panel rho-Statistic
-5.999677	0.0000	-5.866394	0.0000	Panel PP-Statistic
-2.530128	0.0057	-2.730133	0.0032	Panel ADF-Statistic
Alternative hypothesis: individual AR coefs. (between-dimension)				
		Statistic	Prob.	
		-9.164641	0.0000	Group rho-Statistic
		-7.283866	0.0000	Group PP-Statistic
		-2.874527	0.0020	Group ADF-Statistic

Source: Output from the EViews 13 program

**Table N°5: Cross section specific results**

Phillips-Peron results (non-parametric)					
Obs	Bandwidth	HAC	Variance	AR(1)	Cross ID
53	4.00	0.337497	0.309718	0.533	Algeria
53	3.00	2.381704	2.070628	0.421	Morocco
53	3.00	3.634859	3.535872	0.434	Tunisia
53	4.00	2.697732	1.822548	0.568	Lybia
Augmented Dickey-Fuller results (parametric)					
Obs	Max lag	Lag	Variance	AR(1)	Cross ID
52	--	1	0.314968	0.531	Algeria
52	--	1	1.002909	0.844	Morocco
52	--	1	3.305781	0.582	Tunisia
52	--	1	1.576744	0.732	Lybia

Source: Output from the EViews 13 program

These results aim to analyze the relationship between Foreign Direct Investment (FDI) and Gross Domestic Product (GDP) in four countries: Algeria, Morocco, Tunisia, and Libya.

The within-dimension statistics provide mixed evidence. While the Panel v-Statistic indicates weak cointegration, the Panel rho-Statistic shows a strong relationship between FDI and GDP. The Panel PP-Statistic strongly supports cointegration, and the Panel ADF-Statistic also confirms a long-term relationship, though with slightly less strength than the PP-Statistic. Similarly, the between-dimension statistics reinforce these findings, with the Group rho-Statistic, Group PP-Statistic, and Group ADF-Statistic all indicating a stable link between FDI and GDP. Given that all key statistics have p-values below 0.05, the null hypothesis is rejected, confirming the presence of long-term cointegration between FDI and GDP in these countries.

Individual country analysis using the Phillips-Perron (PP) test reveals variations in the strength of the FDI-GDP relationship. Algeria has a moderate temporal correlation, while Libya exhibits the highest AR(1) coefficient,

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indicating a more stable relationship. Tunisia shows significant fluctuations, likely due to economic or political instability, as reflected in its high variance. The Augmented Dickey-Fuller (ADF) test further supports these findings, with Morocco displaying the strongest dependence on past FDI values.

Overall, the results confirm a stable FDI-GDP relationship, though its strength varies across countries. Algeria's relationship is stable but less influential, while Morocco exhibits the strongest temporal correlation. Tunisia's high fluctuations suggest the need for policies that enhance economic stability. Libya, despite a relatively strong relationship, would benefit from greater political and economic stability to maximize FDI's positive effects. Policy recommendations include improving the investment climate, reducing economic volatility, and fostering long-term infrastructure development to enhance FDI's contribution to sustainable growth. (See Table N°4 and N°5)

The Johansen Fisher Panel Cointegration test is used to determine whether there is a cointegration relationship between Foreign Direct Investment (FDI) and Gross Domestic Product (GDP) across multiple countries using panel data. The test is conducted using both the Trace and Maximum Eigenvalue tests, where the null hypothesis states that there is no cointegration between FDI and GDP, while the alternative hypothesis suggests the existence of a cointegration relationship.

**Table N°6: Johansen Fisher Panel Cointegration Test (Long run relationship)**

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	79.57	0.0000	67.63	0.0000
At most 1	32.07	0.0001	32.07	0.0001

\* Probabilities are computed using asymptotic Chi-square distribution.

Source: Output from the EViews 13 program

**Table N°7: Individual cross section results**

Cross Section	Trace Test Statistics	Prob.**	Max-Eign Test Statistics	Prob.**
<b>Hypothesis of no cointegration</b>				
Algeria	32.7079	0.0001	29.5511	0.0001
Morocco	29.0495	0.0003	25.7919	0.0005
Tunisia	29.2623	0.0002	19.2015	0.0076
Lybia	42.7838	0.0000	36.6668	0.0000
<b>Hypothesis of at most 1 cointegration relationship</b>				
Algeria	3.1568	0.0756	3.1568	0.0756
Morocco	3.2575	0.0711	3.2575	0.0711
Tunisia	10.0608	0.0015	10.0608	0.0015
Lybia	6.1169	0.0134	6.1169	0.0134

\*\*MacKinnon-Haug-Michelis (1999) p-values

Source: Output from the EViews 13 program

The overall panel cointegration test results indicate that the p-values for both the "None" and "At most 1" hypotheses are below 0.05, leading to the rejection of the null hypothesis. This confirms the presence of at least one cointegration relationship between FDI and GDP across the studied countries. These findings suggest that FDI and GDP are linked in the long run, even if there is no direct short-term causality, as previously shown by Granger causality tests.

When analyzing each country separately, the results of the Trace and Max-Eigen tests reveal that all the studied countries—Algeria, Morocco, Tunisia, and Libya—exhibit a cointegration relationship between FDI and GDP, as all p-values are below 0.05. This indicates a long-term association between these two variables in each of these nations.

Regarding the second cointegration relationship, the test results show that in Algeria and Morocco, the p-values exceed 0.05, suggesting no strong evidence of a second cointegration relationship. However, in Tunisia and Libya, the p-values are below 0.05, indicating the potential presence of at least two cointegration relationships. (See Table N°6 and N°7)

In conclusion, there is a cointegration relationship between Foreign Direct Investment and Gross Domestic Product in all four countries, meaning that FDI and GDP move together in the long run, even if short-term effects are not direct, as demonstrated by the Granger tests. This relationship appears to be stronger in Libya and Tunisia compared to Algeria and Morocco, as the former countries show evidence of more than one possible cointegration relationship.

### 3.4. The Granger Causality Test:

Theoretically, demonstrating the causal relationships between economic variables helps explain economic phenomena in a clear and effective manner, thereby aiding the implementation of economic policies. Moreover, the direction of the causal relationship between economic variables provides a better understanding of the economic phenomenon under study. Granger introduced concepts of causality and exogeneity, explaining them as follows: a variable causes a change in another variable if the predictability of the latter's evolution improves when information or data from the former is included in the analysis.

The composition of the variables  $y_{2t-1}, y_{2t-2}, \dots$  is considered external to the composition of the  $y_{2t-p}, \dots$  variables  $y_{1t-1}, \dots, y_{1t-2}, y_{1t-p}$  if the increase in the combination does not significantly improve the identification of the variables. This requires a test of constraint parameter variables to be VAR (to become RVAR: Restricted VAR). Determination of delay or delay periods p is based on the AIC and SC criteria where if:

$y_{2t}$  It does not cause if the next nihilistic hypothesis is acceptable  $H_0 : b_1^1 = b_2^1 = \dots = b_p^1 = 0$

$y_{1t}$  It does not cause if the next nihilistic hypothesis is acceptable  $H_0 : a_1^2 = a_2^2 = \dots = a_p^2 = 0$

If we come to accept the two nihilistic assumptions together, that is, cause and cause, in the case of what is known as the effect feedback loop. The Granger Causality Test is used to confirm the extent to which there is a feedback or reciprocal relationship between two variables. (Granger, 1969)

**Table N°8: Granger Causality Test (Short run relationship)**

Null Hypothesis	Obs	F-Statistic	Prob.
GDP does not Granger Cause FDI	208	1.00683	0.3672
FDI does not Granger Cause GDP	208	0.46810	0.6269

Source: Output from the EViews 13 program

The Granger causality test examines the directional relationship between FDI and GDP. Two hypotheses are tested: first, whether GDP influences FDI, and second, whether FDI influences GDP. If the null hypothesis is rejected, it implies a predictive relationship between the variables.

However, since all probability values exceed 0.05, the null hypothesis is not rejected in either direction. This indicates that there is no short-term causal link between FDI and GDP. Instead, their relationship may be characterized by long-term cointegration rather than direct short-term causality.

These findings have important implications. The results suggest that FDI does not immediately drive economic growth, nor does GDP necessarily attract more foreign investment in the short run. Instead, intermediary factors such as the business environment, political stability, and macroeconomic policies may play a crucial role in shaping the long-term relationship between FDI and GDP. Therefore, policymakers should focus on creating favorable conditions for investment and economic development rather than expecting an automatic causal effect between the two variables. (See Table N°8)

#### **4. The economic interpretation of the empirical results:**

##### **4.1 Analysis of Empirical Results by Country:**

##### **4.1.1 Algeria: Limited Impact of Foreign Investment Due to Business Environment and Economic Regulations:**

The Pedroni and Johansen Fisher cointegration tests confirmed a long-term relationship between Foreign Direct Investment (FDI) and economic growth. However, Granger causality tests did not show a direct impact of FDI on growth, suggesting the presence of intermediary factors influencing this relationship. Algeria's economy relies heavily on hydrocarbons (oil and gas) as the primary source of revenue, making it vulnerable to fluctuations in oil prices. Despite government efforts to attract foreign investment, regulatory restrictions such as the 51/49 rule—requiring foreign investors to hold less than 49% of capital—have limited effective FDI inflows. Weak economic diversification has resulted in limited benefits for non-oil sectors from foreign investment, thereby reducing its apparent impact on economic growth. The weak relationship between FDI and

growth in Algeria can be explained by the fact that most foreign investments are concentrated in the energy sector, which is capital-intensive but does not create sufficient job opportunities to stimulate overall economic growth. Additionally, an unfavorable business environment, bureaucracy, and legislative instability have deterred investors from engaging in non-oil sectors.

#### **4.1.2 Morocco: Relative Benefits from Foreign Investment in Productive Sectors:**

Cointegration tests confirmed a long-term relationship between FDI and economic growth, though Granger causality tests did not establish a clear causal link, implying a possible indirect impact of FDI on growth. Morocco has a relatively diverse economy, with strong sectors such as tourism, agriculture, and manufacturing. The country has attracted significant foreign investments in the automotive and renewable energy industries, including solar and wind energy projects. Government policies, such as free industrial zones (e.g., in Tangier), have helped attract high-value-added foreign investments. Although FDI has contributed to economic growth by creating jobs and facilitating technology transfer, its impact remains conditional on other factors, such as domestic consumption, infrastructure, and trade policies. The absence of a strong causal relationship may be due to the fact that foreign investments in Morocco are primarily focused on export-oriented sectors, making their impact on local economic growth less direct.

#### **4.1.3 Tunisia: Missed Opportunities Due to Political Instability and Economic Uncertainty:**

Cointegration tests confirmed a long-term relationship between FDI and GDP, but Granger causality tests did not establish FDI as a direct driver of economic growth. Tunisia has experienced political and economic instability since 2011, affecting its attractiveness to foreign investors. Despite having a relatively strong industrial sector compared to neighboring countries—such as electronics, automotive components, and textiles—the country's unstable political environment and bureaucratic inefficiencies have slowed foreign investment inflows. A significant portion of foreign investments in Tunisia is directed toward export-oriented sectors, such as electronics, which reduces their direct impact on domestic economic growth. Although Tunisia has the potential to benefit significantly from FDI, political instability and inconsistent economic policies have weakened the effectiveness of foreign investments in supporting long-term economic growth.

#### **4.1.4 Libya: Weak Impact Due to Political and Security Instability:**

Despite the confirmation of a long-term relationship between FDI and economic growth, causality tests did not indicate a direct effect between the two variables. Libya's economy is almost entirely dependent on the oil sector, making it undiversified and highly vulnerable to global market fluctuations. Since 2011, the country has faced persistent political and security instability, leading to a sharp decline in FDI inflows. Most foreign investments in Libya have been concentrated in the oil and gas sector, which does not generate broad economic effects compared to industries like manufacturing or services. Due to the unstable situation, Libya has been

unable to leverage FDI as a stimulus for economic growth. Even during periods of investment inflows, the impact remained limited due to the lack of clear economic policies for diversification.

#### **4.2 Aggregate Analysis: Why Does the Impact of Foreign Direct Investment Differ Between Countries?**

The business environment and economic policies play a crucial role in determining the impact of Foreign Direct Investment (FDI). Morocco and Tunisia have relatively better business environments compared to Algeria and Libya, making them more capable of benefiting from foreign investment inflows. Economic diversification also influences the extent to which countries can leverage FDI. More diversified economies, such as Morocco and Tunisia, have greater opportunities to channel foreign investment into productive sectors, enhancing its impact on economic growth.

Political stability is another key factor. The instability in Libya and Tunisia, particularly after 2011, has negatively affected their attractiveness to foreign investors. Countries that experience frequent political and economic disruptions tend to struggle in maintaining steady FDI inflows, which in turn weakens the investment's contribution to long-term growth. Additionally, dependence on natural resources significantly shapes the nature of foreign investments. Algeria and Libya, which rely heavily on the oil and gas sector, often attract investments limited to these industries, resulting in a narrow economic impact rather than a broader contribution to overall development.

In conclusion, FDI is not an independent driver of economic growth; its impact depends on economic policies, political stability, and structural conditions within each country. The effect of foreign investment on growth is more pronounced in countries with diversified economies, such as Morocco, compared to oil-dependent nations like Algeria and Libya. The absence of a strong causal relationship between FDI and growth suggests that intermediary factors, such as education levels, infrastructure quality, and domestic investment, must be taken into account. To maximize the benefits of FDI, countries should focus on improving their investment climate through more open policies, encouraging investments in productive sectors, diversifying their economies to reduce dependence on natural resources, and strengthening political and institutional stability to attract sustained foreign investments and achieve long-term economic growth.

#### **4.3 Comparison of Algeria, Morocco, Tunisia, and Libya in Terms of the Impact of Foreign Direct Investment on Economic Growth:**

To assess the impact of Foreign Direct Investment (FDI) on economic growth (GDP) in the four studied countries, several key indicators were considered. These include the strength of the relationship between FDI and GDP (based on cointegration and Granger causality tests), economic diversification (the extent to which different sectors benefit from FDI), the stability of the business environment and government policies (ease of

foreign investment entry), political and security stability (a crucial factor for attracting investment), and the extent to which FDI contributes to job creation and technology transfer.

Among the four countries, Morocco stands out as the most favorable environment for FDI. Its diversified economy—spanning industries such as manufacturing, tourism, agriculture, and renewable energy—has enabled it to maximize the benefits of foreign investments. The country's investment-friendly policies, industrial zones, and stable business environment have further enhanced its attractiveness. As a result, FDI has significantly contributed to Morocco's economic growth through job creation and infrastructure development.

Tunisia ranks second, offering notable potential for FDI benefits. However, political instability and bureaucratic inefficiencies have hindered the full realization of these opportunities. While Tunisia has a relatively diversified economy with strong industrial and service sectors, its investment climate remains uncertain, affecting the overall impact of FDI on economic growth. Although foreign investments do contribute to certain sectors, their effect is less pronounced compared to Morocco.

Algeria, in third place, faces significant challenges in leveraging FDI for broad economic development. Its investment landscape is heavily dominated by the oil and gas sector, limiting the spillover effects of foreign investments into other industries. Strict regulatory policies, such as the 51/49 rule restricting foreign ownership, further deter investors. Consequently, FDI has not played a significant role in fostering job creation or technological advancements outside the energy sector, which constrains its impact on long-term economic growth.

Libya ranks last due to its ongoing political and economic instability, which has severely limited its ability to attract and benefit from FDI. Most foreign investments in Libya have historically been concentrated in the oil sector, with minimal contributions to broader economic development. The absence of clear economic policies, coupled with persistent security concerns, has prevented Libya from capitalizing on foreign investments as a driver of growth.

In conclusion, Morocco emerges as the country best positioned to leverage FDI, thanks to its diversified economy and relatively stable business environment. Tunisia has strong potential but remains hampered by political uncertainty. Algeria's reliance on hydrocarbons restricts the broader benefits of FDI, while Libya's instability makes it the least capable of utilizing foreign investments to stimulate growth. This comparison underscores the critical role of economic diversification, policy reforms, and political stability in maximizing the positive impact of FDI on long-term economic development.

## 5. SWOT Analysis of the Study Results:

SWOT analysis is a strategic framework was developed by the American management scholar William A. Smith in the 1970s, but the concept became more widely known thanks to Kenneth Andrews from Harvard

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University, who contributed to its promotion and use in strategic contexts. The core idea of this analysis, which focuses on identifying strengths, weaknesses, opportunities, and threats in a strategic context, was further developed by a group of researchers in the field of strategic management, including Henry Mintzberg, Alan Depreux, and others. (Humphrey, 2005)

The SWOT analysis can be applied to the study results on the impact of Foreign Direct Investment (FDI) on economic growth in Algeria, Morocco, Tunisia, and Libya. The findings highlight several strengths, including the presence of a long-term relationship between FDI and economic growth in some countries and Morocco's success in attracting foreign investments in manufacturing industries. Additionally, Algeria and Libya possess abundant natural resources, particularly oil and gas, which can attract investments in the energy sector. Furthermore, Tunisia and Morocco enjoy relative political stability compared to Libya, providing a more favorable investment environment.

Despite these strengths, several weaknesses limit the effectiveness of FDI in driving economic growth. The causality tests, such as Granger's, indicate that in some cases, FDI does not have a strong direct impact on growth. Moreover, Algeria and Libya suffer from an unstable business environment due to restrictive regulations and political uncertainties. Additionally, the weak integration of Maghreb markets reduces the regional impact of FDI, preventing these economies from fully leveraging foreign investments for broader economic development.

There are, however, significant opportunities to enhance the role of FDI in economic growth. Strengthening economic integration among Maghreb countries could increase the collective benefits of foreign investments. Improving infrastructure and regulatory frameworks can further attract international investors. Moreover, the growing global interest in renewable energy presents an opportunity for North African countries to diversify their FDI inflows and reduce dependence on traditional industries.

Nevertheless, several threats could undermine these opportunities. Libya's political instability remains a major obstacle to securing long-term investments. Additionally, North African countries face strong competition from emerging economies in Africa and Asia, which are also striving to attract foreign capital. Furthermore, fluctuations in energy prices could impact oil and gas investments in Algeria and Libya, making their economies more vulnerable to external shocks.

Based on this SWOT analysis, several recommendations can be made. First, Algeria and Libya need to improve their investment climate by reforming regulations and enhancing political stability to encourage sustainable economic growth. Second, deepening regional cooperation among Maghreb countries could boost intra-regional investment flows, fostering a more integrated and competitive economic bloc. Third, diversifying FDI sources and focusing on emerging sectors such as technology and renewable energy would reduce dependence on traditional industries and enhance long-term economic resilience. Lastly, implementing

economic policies that strengthen the link between FDI and growth is essential to ensure that foreign investments contribute effectively to GDP expansion and overall economic development.

## 6. Conclusion:

This study, which relied on panel data analysis to examine the relationship between Foreign Direct Investment (FDI) and economic growth in the Maghreb countries (Algeria, Morocco, Tunisia, and Libya), has yielded important findings that contribute to a better understanding of this relationship and its impact on economic development in the region.

The results varied across the four countries. In Algeria, Pedroni and Johansen Fisher cointegration tests indicated a long-term relationship between FDI and GDP. However, Granger causality tests did not confirm that FDI directly drives economic growth, suggesting that its impact may be limited or dependent on intermediary factors such as the quality of economic policies and political stability. Morocco showed more positive results, with cointegration tests confirming a long-term relationship between FDI and growth. While causality tests were not conclusive, they suggested that FDI may act as a driver of economic growth in certain periods. The variation in impact could reflect Morocco's success in attracting high-value-added investments in sectors such as manufacturing and services.

In Tunisia, cointegration tests also confirmed a long-term relationship between FDI and GDP. However, Granger causality tests did not establish a direct causal link, implying that FDI's effectiveness may depend on factors such as infrastructure and political stability. Although Tunisia has the potential to leverage foreign investments, further economic reforms are necessary to enhance their positive impact on growth. In Libya, despite the existence of a long-term relationship between FDI and economic growth according to cointegration tests, the impact of FDI remained weak due to persistent political and economic instability. The causality tests did not indicate a strong link, highlighting the extent to which instability has limited Libya's ability to benefit from foreign investments.

The general conclusions drawn from the study reveal that while a long-term relationship between FDI and economic growth exists in the Maghreb countries, the degree of impact varies significantly among them. The absence of a direct causal link in all cases suggests that FDI's influence on growth may be indirect or contingent on the quality of economic policies. The differences in FDI's impact across countries reflect disparities in business environments, infrastructure, and political stability. Additionally, the use of panel data analysis has provided more precise insights compared to studies that analyze each country separately.

Based on these findings, several recommendations can be made. Improving the business environment by fostering political and economic stability is essential for attracting and maximizing the benefits of FDI. Policymakers should encourage productive foreign investments rather than short-term or non-productive

investments. Economic policies must be developed to ensure that local economies effectively benefit from FDI inflows. Strengthening partnerships between the public and private sectors is also crucial for facilitating technology transfer and building local capacities.

In conclusion, this study confirms that while FDI can contribute to economic growth in the Maghreb countries, its effectiveness depends on institutional, economic, and political factors unique to each country. Further research is recommended to explore additional intermediary factors, such as financial stability and industrial development, to gain a deeper understanding of the relationship between FDI and economic growth in the region

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