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FDI and domestic Investment in North Africa: a correlation between substitution and stimulation

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Abstract:
The objective of this article is to empirically study the relationship between foreign direct investment (FDI) and domestic investment in a sample of six North African countries. The study draws on the theoretical frameworks proposed by Agosin and Mayer (2001) and explores two main hypotheses: (1) multinational companies create a crowding-out effect on local firms, and (2) FDI stimulates national investments. The empirical approach is based on the methodology of Arellano and Bond (1991), applied to panel data covering the period from 1995 to 2023. The results show that FDI leads to a phenomenon of creative destruction, with a short- and long-term crowding-out effect on domestic investment. For the sectoral relationship, we find that FDI may transfer investments from the agricultural sector to the manufacturing sector.
Keywords: FDI, growth, inequality, poverty, investment climate and simultaneous equations.

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1. INTRODUCTION

This document examines the contribution of foreign direct investment (FDI) to capital accumulation in host countries, focusing on its interaction with domestic investment. The response of local investors to the entry of foreign firms is of major interest to policymakers. The interactions between Multinational Firms (MNF) and Local Firms (LF) have been addressed through two main hypotheses. The first shows that MNFs develop spillover effects and external productivity effects. This hypothesis suggests that FDI stimulates local investment. In contrast, the second hypothesis shows that the competition exerted by MNFs is likely to crowd out local investment.

If it turns out that FDI significantly crowds out domestic investments, the benefits of FDI for developing countries could be seriously questioned, and policies designed to attract FDI could be reconsidered. While crowding-out is generally considered beneficial, as it promotes investment and overall economic growth, the implications of crowding-out remain ambiguous. If crowding-out drives less efficient domestic firms out of the market, implying a short-term negative effect on investment, it can also increase average productivity levels. This issue seems even more important in Central and Eastern European countries (CEEC), given the obsolescence of the capital stock inherited from the socialist era and the industrial transformation that accompanied the transition period. In fact, as the initial distance from the global technological frontier was significant, some have argued that FDI's contribution to capital accumulation in CEECs was more favorable to growth than the technology transfer associated with FDI (Hunya, 2000; Eichengreen, 2004).

According to the neoclassical growth theory, economic growth is mainly driven by capital accumulation, up to the optimal level of capital per worker (Solow, 1956), although convergence may take a long time. From the perspective of investment as a key determinant of economic growth, international capital flows, primarily FDI, are expected to complement national capital supply, thus facilitating the financing of local investment projects. Moreover, FDI serves as a vehicle for technology transfer, contributing to overall technical progress and productivity spillovers in host countries de Mello, 1997; Carkovic and Levine, 2005; Liu, 2008; Jude, 2016). While FDI can

directly increase the existing capital stock, it can also influence the structure of the capital stock itself. In general, local investors may react to the arrival of FDI, leading to a substitution or complementarity relationship (Agosin and Machado, 2005). Foreign investors may crowd out local investors due to increased competition, thus discouraging previously planned investment projects (Markusen and Venables, 1999).

Our results indicate that FDI has a two-level impact on domestic investment, tending towards a phenomenon of creative destruction. In the short term, FDI crowds out domestic investments, while in the long term, it tends to attract them, explained by the integration of foreign subsidiaries into the local market and the emergence of trade links.

To what extent do foreign direct investments influence domestic investment in North Africa: do they act as a substitutive factor that hinders local investment, or rather as a lever for stimulation and complementarity?

This work differs from other studies in two aspects: (i) the focus on North Africa, and (ii) the study of the role of FDI in changing the sectoral distribution of domestic value added. To address this dual issue, the work is structured into three sections. The first section provides a literature review. The second section presents the status of FDI and domestic investments in the studied region. It is followed by the construction of the theoretical model and hypotheses in the third section. This section builds an econometric model within the framework of a dynamic panel. The purpose of this model is to estimate the effects of FDI on domestic investments in North Africa, differentiating between country time horizons and sectoral distribution of investments.

An econometric model to study the relationship between FDI and domestic investment can rely on a dynamic specification to capture short- and long-term interactions, as well as potential crowding-out or stimulating effects. A commonly used methodology is the dynamic instrumental variable models, such as the Arellano and Bond (1991) GMM system.

2. LITERATURE REVIEW

From the perspective of FDI as a capital flow, its effects on the host country's economy are primarily reflected in capital accumulation. The literature identifies two main channels of interaction between FDI and domestic

investment: the first occurring in the real market and the second in the financial market (UNCTAD, 1999; Agosin and Machado, 2005).

The mechanism of interaction in the real market is based on the idea that FDI inflows influence demand addressed to local companies. Foreign subsidiaries, often benefiting from lower marginal costs due to their specific advantages (Aitken and Harrison, 1999), capture part of the domestic demand, forcing local firms to reduce their production and increase their average costs. Increased competition may ultimately lead them to abandon investment projects or even reduce existing production capacities. However, sufficiently competitive local firms can respond to FDI inflows by increasing and modernizing their capital stock (De Mello, 1999). To the extent that FDI uses local inputs, it can also stimulate investment by domestic suppliers in upstream sectors (Cardoso and Dornbusch, 1989). Finally, funds temporarily freed by the cancellation of previous investment projects could be reallocated to other activities where local firms hold a comparative advantage.

A second mechanism of interaction occurs in the financial market, where FDI can improve access to financing for local companies. As an international capital flow, FDI increases local liquidity, fosters currency appreciation, and leads to a reduction in interest rates (Harrison et al., 2004). Although this effect appears more pronounced in developing countries (Harrison et al., 2004), its magnitude depends on the degree of development of financial markets (Razin et al., 1999).

Although the literature on FDI is extensive, the interaction between FDI and domestic investment has received relatively little attention to date. Theoretical studies are scarce, and empirical research has several limitations while arriving at divergent conclusions. The theoretical model of Markusen and Venables (1999) presents a two-sector economy where multinational enterprises (MNES) enter the final goods sector. This entry leads to the displacement of local firms in this sector, while firms in the intermediate goods sector benefit from upstream externalities. Barrios et al. (2005) show that this short-term displacement in downstream sectors can be offset in the long term by increased demand for upstream sectors.

From a different perspective, de Backer and Sleuwaege (2003) model the behavior of local entrepreneurs following the entry of MNES. They argue that a significant portion of potential entrepreneurs chooses to become employees of foreign subsidiaries rather than create their own businesses, resulting in a crowding-out effect on the labor market.

Agosin and Machado (2005) argue that foreign subsidiaries in developing countries introduce new products to both domestic and external markets, positively impacting capital formation through upstream and downstream spillovers, as noted by Romer (1993). However, positive integration (crowding in) is only expected if foreign investors target underdeveloped or emerging local industries, with limited risk of displacing existing producers. Similarly, Amighini et al. (2017) suggest that FDI contributes to increasing total investment only if MNES engage in productive activities rather than those related to trade. A key limitation lies in the difficulty of empirically distinguishing foreign investment from domestic investment. Since national accounting statistics do not differentiate between foreign and domestic firms, analyses can only be conducted based on estimates of what constitutes investment by foreign firms and domestic investment. Contrary to popular belief, FDI flows do not measure foreign firms' investment expenditures but represent a financial flow from the balance of payments. Consequently, deriving domestic investment by subtracting FDI flows from gross fixed capital formation, as done in some existing studies (Adams, 2009; Wang, 2010; Morrissey and Udomkerdmongkol, 2012; Chen et al., 2017), is inaccurate, as these two concepts are not directly comparable.

The empirical question of FDI's effect on domestic investment has only been marginally addressed until recently in studies examining FDI's effects on growth (Borensztein et al., 1998; Blonigen and Wang, 2004), as the main advantage of FDI is generally considered to lie in technology transfer. A limited number of empirical studies specifically address the role of FDI in domestic capital formation. Most of them have several methodological limitations, which may explain their divergent results, as detailed below.

Focusing on Central and Eastern European countries (CEE), the results remain mixed. Mišun and Tomšík (2002) found evidence of a positive crowding-in effect of FDI on domestic investment in the 1990s in the Czech

Republic and Hungary but a negative crowding-out effect in Poland. Titarenko (2006), examining FDI's effect on domestic investment in Lithuania during 1995–2004, concluded a negative crowding-out effect. The negative crowding-out effect appears to be primarily a short-term phenomenon following foreign investors' entry, as confirmed by Kosová (2010) for the Czech Republic during 1994–2001 and Zajc Kejžar (2016) for Slovenia. However, the subsequent growth of local sales by foreign firms does not seem to cause a significant crowding-out effect for firms in CEE countries.

Overall, there is no clear consensus in the literature regarding FDI's effect on domestic investment. Moreover, distinguishing between different types of FDI seems crucial when studying potential complementarities between domestic and foreign investments. Finally, none of the existing studies precisely examines the mechanisms of interaction between FDI and domestic investment, whether through the real economy or the financial spectrum. The aim of our study is therefore to address these questions through an improved and detailed empirical analysis focusing on North African countries.

3. METHODOLOGY

3.1. Presentation of the theoretical model

The economic literature examines the relationship between foreign investment and domestic investment as a key factor in understanding the interactions between these two types of flows. This relationship serves as a crucial foundation for constructing empirical models. In this context, the works of Agosin and Mayer (2000), as well as those of Noomen Lahimer (2009), provide a relevant framework for analyzing this dynamic. These authors have developed a theoretical model based on the idea that domestic investment results from an adjustment process between:

- The desired capital stock (the optimal level of capital to meet economic needs).
- The existing capital stock (the already accumulated capital).

This model highlights that foreign investment flows directly influence the ability of local economies to adjust their capital stock, either by stimulating domestic investment (crowding-in effect) or reducing it (crowding-out effect).

To explain the relationship between foreign investment, domestic investment, and their impact on economic growth, Agosin and Mayer (2000) proposed a model widely used in economic literature. This model is based on the idea that foreign investments (FDI) directly influence the adjustment of an economy's capital stock in interaction with domestic investments. The general equation of the model can be formulated as follows:

$$DI_{i,t} = \alpha_i + \beta_1 FDI_{i,t} + \beta_2 FDI_{i,t-1} + \beta_3 FDI_{i,t-2} + \beta_4 DI_{i,t-1} + \beta_5 DI_{i,t-2} + \beta_6 G_{i,t-1} + \beta_7 G_{i,t-2} + \varepsilon_{i,t} \quad (1)$$

This model is considered a theoretical foundation in our econometric studies. We then limit the number of lags applied to both variables (FDI and domestic investment) over a specific period. Once again, to adapt the model to the North African region, we construct a matrix for the instrumental variables, which are regarded as instruments for the relationship between the two variables. The model we use takes the following form:

$$DI_{i,t} = \alpha_i + \beta_1 DI_{i,t-1} + \beta_2 FDI_{i,t} + \beta_3 FDI_{i,t-1} + \alpha_\kappa \chi_{i,j,k} + \gamma_\kappa Y_{i,j,k} + \varepsilon_{i,t} \quad (2)$$

According to model (2), the explanatory variables for domestic investments can be classified into three groups:

The first group contains lagged domestic investments $(DI_{(t-1)})$, current FDI $(FDI_{(i,t)})$, and lagged FDI $(FDI_{(t-1)})$. The role of the estimated coefficients of these variables is to control the nature of the effect of foreign investment on domestic investments under the various hypotheses proposed in table (1).

The second group of variables $(X'_{i,j,k})$ includes the explanatory variables that are directly linked to domestic investment. In this context, we estimate the impact of the following factors on domestic investment:

- ✓ **Education**: As a key factor in human development, education can influence productivity and the ability to attract investments.
- ✓ **Economic Growth**: GDP growth is often an indicator of a country's economic health and can stimulate domestic investment by increasing demand and profitability.

- ✓ **Trade Openness**: Trade openness, measured by exports and imports, plays an important role in facilitating foreign investments and stimulating domestic investment through competition and access to markets.
- ✓ **Real Effective Exchange Rate**: A competitive exchange rate can impact domestic investment by influencing export costs and the returns on foreign investments.

The last group of explanatory variables $(Y'_{i,j,k})$ consists of strictly exogenous variables, meaning variables that are not influenced by the model's error process. This group primarily includes institutional variables, which play a crucial role in a country's economic environment. These variables are:

Institutional Variables: They are typically well correlated with other explanatory variables (such as economic growth, trade openness, etc.) and directly influence domestic investment by affecting market conditions, legal security, and political stability.

3.2 . Research hypotheses on the effect of FDI on Domestic Investment

We use equation (2) to distinguish between the short-term and long-term effects of foreign investment on domestic investment over different time horizons. The sign of the foreign investment coefficient provides the interpretation and nature of the short-term effects. On the other hand, we use equation (3) to show the long-term effects. This formula is as follows:

$$\frac{\beta_2 + \beta_3}{1 - \beta_{Inv(t-1)}} \qquad (3)$$

With:

β_{LT} Represents the long-term coefficient;

β_2 Represents the estimator of the consequence of foreign investment at time « t »;

β_3 Represents the estimator of the effect of lagged foreign investment at time « $t-1$»

$\beta_{Inv(t-1)}$ Represents the estimated coefficient of lagged domestic investments at time.

To show the nature of the effects (crowding-out or crowding-in) of foreign investment on domestic investment, we will use the coefficient of (β) whether in the short-term or long-term. We distinguish three different cases for the value of (β):

- If the coefficient (β) > 1 and significant, there is a stimulating effect. Domestic investment increases more proportionally than the increase in foreign investment;
- If the coefficient (β) = 1 and significant, both types of investment increase in the same proportion;
- If the coefficient (β) < 1 and significant, there is a crowding-out effect. Domestic investment increases less proportionally than the increase in foreign investment.

The nature of the effect of foreign investment on domestic investment across the time horizon is distinguished by four hypotheses, which are summarized in the following table:

Table 1: Research hypotheses on FDI and Domestic Investment

	Short-term Effect (βCT)	**Long-term Effect (βLT)**	**Overall Impact**
H1	βCT < 1	βLT > 1	**Creative Destruction**
H2	βCT < 1	βLT < 1	**Eviction**
H3	βCT > 1	βLT > 1	**Stimulation**
H4	βCT > 1	βLT < 1	**Temporary Congestion**

In (H1), the impact of foreign direct investment on domestic investment in the short term is less than (1), resulting in a crowding-out effect. This effect can be explained by the competition exerted by multinational corporations on domestic companies. However, the long-term effects in the first case are greater than (1), leading to a stimulating effect, illustrating the reverse of the crowding-out effect. In other words, multinational companies support domestic companies, leading to an increase in domestic investment greater than the

increase in FDI. In this hypothesis, both the short-term and long-term effects are referred to by Schumpeter as "creative destruction."

In the case of (H2), the effect of foreign investment on domestic investment, both in the short and long term, is less than (1). This means that FDI does not significantly stimulate sustainable domestic investments. This phenomenon is partly explained by the marginalization of local businesses and, on the other hand, by the unfavorable competition mechanisms and institutional weaknesses.

In the case of (H3), the effect of foreign investment on domestic investment, both in the short and long term, is greater than (1). This impact manifests through two types of effects: a direct effect and an indirect effect. The direct effect mainly comes from increased demand, while the indirect effect results in technological spillovers and training-related externalities. These dynamics foster long-term productivity growth, thus contributing to sustainable economic growth.

In the case of (H4), the effect of foreign investment on domestic investment in the short term is greater than (1). This means that the creation of multinational companies initially fosters the development of significant activities that stimulate the growth of local businesses. However, in the long term, the effect becomes less than (1), leading to the closure of some local businesses. Indeed, as multinational companies advance in their production cycle, they reach the maturity stage. At this stage, the increased competition they exert on domestic companies results in a crowding-out effect. This phenomenon is referred to as a "temporary congestion effect" in the context of (H4).

In this empirical study, we rely on the work of Agosin and Mayer (2000) and the different hypotheses derived from it. To analyze the data, we use the appropriate econometric method: the Generalized Method of Moments (GMM) developed by Arellano and Bond (1991). This method is applied to data from North African countries covering the period from 1995 to 2013. This approach accounts for the dynamic and structural specificities of the data while correcting for potential biases related to the endogeneity of explanatory variables.

The empirical analysis of the effect of FDI on poverty is structured around two main parts. First, we examine the determinants of domestic investment in the North African regions. This step helps identify the key factors influencing local investment while evaluating the interaction between FDI and national economic dynamics. The goal is to understand the extent to which FDI directly or indirectly affects domestic investment and its role in regional economic development.

Second, we analyze the effect of FDI on the main economic sectors, namely agriculture, manufacturing industries, and services. To assess this effect, we adopt the Generalized Method of Moments (GMM) method by Arellano and Bond, which is particularly suited for handling dynamic panel data while accounting for potential endogeneity issues of explanatory variables.

In the first part, we detail the econometric estimation method, integrating the time dynamics to capture the adjustments and delayed impacts of FDI on different economic sectors. Next, we present the main results obtained from the estimated models, along with in-depth interpretations. This analysis aims to empirically verify the validity of the four hypotheses defined in the theoretical part of the study, highlighting the sectoral and temporal specifics of the FDI impact.

4. RESULTS AND DISCUSSION

In this section, we examine the relationship between FDI and domestic investment. To do this, we use several econometric methods to test this relationship between different variables, ensuring that the results are consistent and reflect economic reality. Among these methods, we employ the Ordinary Least Squares (OLS) method, which serves as a starting point for preliminary analysis.

However, to overcome the limitations of OLS, particularly in the presence of endogeneity problems or delayed explanatory variables, we use the Generalized Method of Moments (GMM). This approach allows for a better capture of the dynamics of the relationship between FDI and domestic investment through two types of estimators: the first-difference estimator and the system estimator. These two tools are essential for obtaining robust and reliable results while accounting for the dynamic characteristics of panel data.

Table 2: Definition of Variables and Data Sources

Acronym	Description	Sources
AGR	Agricultural value added (% of GDP)	WDI*
Arable land	Arable land / total land area	WDI
Credit	Domestic credit extended by the banking sector (% of GDP)	WDI
Growth (GDP/Capita)	Annual growth rate of GDP per capita	WDI
EDUC (EDUS/EDUP)	Secondary education enrollment ratio / Primary education ratio	Author from WDI
Savings	Domestic savings (% of GDP)	WDI
ECM	Fuel, metals, and minerals exports / total exports	WDI
EM	Manufacturing exports / total exports	WDI
FDI	Foreign direct investment (% of GDP)	WDI
Rule of Law	Rule of Law	WGI*
Control of Corruption	Control of corruption	WGI
REER	Real effective exchange rate	Author from WDI
MAN	Manufacturing value added (% of GDP)	WDI
Domestic Investment	Gross Fixed Capital Formation	WDI
OPEN	Trade openness ratio [(Exports + Imports) / GDP]	WDI
Services	Services value added (% of GDP)	WDI

Note: WDI World Development Indicators and WGI: World Governance Indicators*

The estimations of the impact of FDI on domestic investment cover the period from 1995 to 2021 and rely on panel data from six North African countries. Before proceeding with econometric analysis, it is essential to check the stationarity of the variables used in the model. To this end, we apply unit root and cointegration tests on the main variables: economic growth, FDI, and domestic investment. Unit root tests, such as those by Levin, Lin, and Chu

(LLC) or Im, Pesaran, and Shin (IPS), help determine whether the time series are stationary or require transformation (e.g., differencing) to become stationary. Additionally, cointegration tests, such as those by Pedroni or Kao, are used to assess the existence of long-term relationships between the studied variables. These checks ensure the validity of the econometric models and the reliability of the results obtained in the study.

The combined use of these two categories of unit root tests, those based on the homogeneity hypothesis (Levin, Lin, Chu, and Breitung) and those based on the heterogeneity hypothesis (Im, Pesaran, and Shin, ADF-Fisher), allows for a comprehensive analysis of the stationarity of the variables in the panel data. By combining these methods, we can test whether the time series for the different entities in the panel follow a common stationary process or if they exhibit dynamics specific to each country. This also helps verify the robustness of the econometric results because if the variables are stationary according to these tests, the econometric models used in the study will be more reliable, and the conclusions drawn from the analysis will be stronger. In case of non-stationarity, appropriate transformations (such as differencing the series) will be applied to ensure the validity of the models.

After performing the unit root tests for the variables: FDI, domestic investment, and GDP, we proceed with the use of the correlation matrix to minimize the risk of endogeneity in the explanatory variables. This step is crucial to ensure that the relationships between the variables are not biased by unobserved correlations or dependencies between them.

The correlation matrix helps verify the absence of multicollinearity among the explanatory variables, which could affect the estimation of coefficients in econometric models. By identifying high correlations between certain variables, we can adjust the model accordingly, for example, by removing redundant variables or using techniques such as principal component regression to reduce dimensionality.

4.1. The effects of foreign investment on domestic investment in a total panel

- ✓ The results presented in Table (3) give an econometric description of the determinants of domestic investment in North Africa. This table is broken down into seven columns: domestic investment, FDI, control of

corruption, real effective exchange rate, per capita income growth, education and rule of law. We can distinguish three groups of explanatory variables for domestic investment:

- ✓ The first group contains variables as in the theoretical model of Agosin and Mayer (2000), one-period lagged domestic investment $(DIi_{(t-1)})$, current foreign investment $(FDI_{(i,t)})$, and one-period lagged foreign investment $(FDI_{(t-1)})$, and the coefficients of foreign investment give the nature of the effects on domestic investment across different time horizons.
- ✓ $(X_{i,j,k})$ represents the second group of explanatory variables directly linked to domestic investment and likely to be endogenous. Within this framework, we estimate the effects of growth, real effective exchange rate and education.
- ✓ Finally, for the last group of explanatory variables $(Y_{i,j,k})$, which represent strictly exogenous variables. These variables are independent of the model error process correlated with the other explanatory variables. Thus, the credit, landlocked and institutional variables (rule of law and control of corruption).

The statistical robustness of the model's results relies on the validity of the specification tests, which guarantee that the instruments used and the model's underlying assumptions are appropriate. In this context, several tests have been carried out to verify the validity of the econometric model. The Sargan test is used to check the validity of the instruments in a GMM model. According to the results presented in Table (3), this test does not reject the null hypothesis of model over-identification, which means that the instruments used are valid and not correlated with the model error. This reinforces the reliability of the estimates obtained.

The second-order autocorrelation test is used to verify the absence of autocorrelation in dynamic model errors. The results show that the tests do not reject the null hypothesis of second-order non-correlation, meaning that there is no residual second-order autocorrelation in the model errors, thus guaranteeing the validity of the results.

The Kao and Pedroni cointegration tests are used to determine whether the variables under study share a long-term relationship. The results show that both tests found a cointegrating relationship between FDI, growth and domestic investment. Indeed, the probability associated with the T-Statistic is 0.0259 for the Kao test and 0.063 for the Pedroni test. These results allow us to reject the null hypothesis of no cointegration, indicating that there is a stable, long-term relationship between FDI, economic growth and domestic investment.

Table 3: Results of the effects of foreign investment on domestic investment (GMM system)

$ID_{i,t}$	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**
$ID_{i,t-1}$	0,829*** (0,101)	0,811*** (0,107)	0,838*** (0,117)	0,808*** (0,107)	0,658*** (0,122)	0,661*** (0,118)	0,642*** (0,120)
$FDI_{i,t}$	0,089** (0,043)	0,085* (0,049)	0,094* (0,049)	0,112** (0,049)	0,136*** (0,046)	0,146*** (0,047)	0,137*** (0,047)
$FDI_{i,t-1}$	-0,002** (0,009)	-0,006*** (0,0001)	-0,002** (0,0008)	-0,025** (0,011)	-0,033** (0,016)	-0,040*** (0,010)	-0,028** (0,011)
Growth (GDP/H)	0,006 (0,017)	0,007 (0,017)	0,007 (0,016)	0,018 (0,016)	0,015 (0,015)	0,018 (0,015)	0,019 (0,015)
EM		0,004*** (0,015)	0,0005*** (0,0001)	0,007** (0,003)	0,015*** (0,004)	0,019** (0,009)	0,017*** (0,006)
ECM			-0,003 (0,015)	-0,010 (0,014)	0,022* (0,012)	0,023* (0,012)	0,019** (0,008)
TCER				2,016** (0,811)	2,962*** (0,747)	2,615** (0,819)	2,140** (0,827)
Education					0,055** (0,024)	0,049** (0,021)	0,064** (0,026)
Rule of Law						0,007 (0,008)	0,007 (0,009)
Corruption control							0,013 (0,010)
Constant	2,222 (1,778)	2,614 (1,855)	2,031 (1,774)	6,844 (4,329)	8,626 (3,797)	7,467 (4,118)	5,210 (4,283)
Observations	108	108	108	108	108	108	108
Sergan test	13,35 (0,009)	15,46 (0,004)	21,99 (0,001)	41,05 (0,006)	15,6 (0,048)	21,55 (0,010)	19,58 (0,034)

Order autocorrelation (1)	-3,26 (0,001)	-3,36 (0,001)	-4,14 (0,000)	-3,77 (0,000)	-3,29 (0,000)	-4,34 (0,001)	-3,86 (0,000)
Order autocorrelation (2)	0.97 (0,332)	0.96 (0,335)	1.06 (0,289)	1.01 (0,311)	0.64 (0,520)	0.48 (0,631)	0.62 (0,532)

Note: Estimates are made using GMM Arellano Bond (1991). Standard errors are indicated in brackets. *, ** and * refer to significance levels of 10%, 5% and 1%. The null hypothesis of the Arrelano Bond AR (2) test is no second-order autocorrelation in the residuals. The Sargen test for instrument validity has as its null hypothesis the exogeneity of the instrument set.**

Using equation (2), we interpret the dynamic effects of domestic investment in North Africa. Then, using the time horizon equation, we interpret the effects of FDI on domestic investment. Finally, we analyze the robustness of these results through the control variables.

In the seven regressions (Table 3), domestic investment is a cumulative dynamic process through the positive and significant coefficients of one-period lagged investment [Inv (-1)]. A one-point increase in the lagged variable increases domestic investment in year (t) by an average of 0.750 points.

As regards the effect of FDI on domestic investment, the results in all the regressions in table (3) show that FDI is positive and significant. A one-point increase in FDI implies an increase in domestic investment of between 0.085 and 0.146 points. But the FDI coefficients are less than 1, which means that FDI has a short-term crowding-out effect on domestic investment. This confirms that the results show that the effects of lagged FDI are negative and significant in all seven regressions.

Empirical results have shown that FDI crowds out domestic investment in North Africa. On the other hand, the nature of the long-term effects should be verified on the basis of the hypotheses formulated earlier. So we use equation (3) to show these effects. We find that the long-term coefficients (β_{LT}) are positive in all columns.

Table 4: Long-term effects of FDI on domestic investment

	M1	M2	M3	M4	M5	M6	M7
$DI_{(-1)}$ $\beta_{tinv_{(t-1)}}$	0,829***	0,811***	0,838***	0,808***	0,658***	0,661***	0,642***
$FDI_{(\beta 2)}$	0,089**	0,085*	0,094*	0,112**	0,136***	0,146***	0,137***
$FDI_{(-1)}$ $_{(\beta 3)}$	-0,002**	-0,006***	-0,002**	-0,025**	-0,033**	-0,040***	-0,028**
$FDI_{(BLT)} = \frac{\beta 2 + \beta 3}{1 - \beta Inv(t-1)}$	**0,50**	**0,42**	**0,56**	**0,45**	**0,30**	**0,31**	**0,30**

Note: Estimates are made using GMM Arellano Bond. Standard errors are indicated in brackets. *, ** and * refer to significance levels of 10%, 5% and 1%.**

In the previous simultaneous effect of FDI on domestic investment, the results in Table (4) show that FDI has a short-term effect. However, the nature of the long-term effects must be verified. After calculating the long-term effect based on the time horizon equation (3), Table (4) shows that these long-term coefficients are positive in all seven columns. In these columns, an increase in FDI by one point leads to an increase in long-term domestic investment between 0.56 and 0.30 points. However, these coefficients are less than 1, which indicates the presence of a long-term crowding-out effect following the short-term crowding-out effect. This suggests that multinational companies in North African regions exert a crowding-out effect on local firms both in the short and long terms, according to hypothesis (H2). For the other hypotheses—creative destruction (H1), stimulation (H3), and transient stimulation effect (H4)—they are invalidated in the case of North African countries in favor of a lasting crowding-out effect exerted by foreign firms on local firms (H2). This result aligns with the empirical study by Noomen Lahimer (2009) on sub-Saharan Africa, and contrasts with the findings of Agosin, M. and Mayer, R. (2000), who found that the long-term effect of FDI on domestic investment in sub-Saharan Africa was 1.3 points.

Furthermore, the determinants of domestic investment need to be verified in accordance with the different hypotheses of the other explanatory variables in Table (4). These hypotheses concern control variables, which have been

categorized into three groups. The first group has already been studied. The remaining variables are divided between the second and third groups, which allow for controlling the robustness of the effects of FDI on domestic investment. According to Table (3), the results show that the coefficient of growth is positive but insignificant in all regressions, indicating a non-deterministic relationship between growth and domestic investment. This can be explained by the low visibility of investors regarding the evolution of economic conditions and the absence of adaptive anticipation behavior. Therefore, the behavior of African investors is short-term, and their decisions are constrained by subsistence limitations. Thus, the lack of long-term visibility among investors in these countries justifies the non-determinism of growth as an indicator of anticipation mechanisms.

For the remaining variables, which have been classified into two groups, the first group has already been studied. These variables help control the robustness of the effects of FDI on domestic investment. According to Table (3), the growth coefficient is positive but not statistically significant in all seven regressions, indicating a non-deterministic relationship between growth and domestic investment. Indeed, the insignificance between the two variables can be explained by several reasons, such as the limited visibility of investors regarding the evolution of economic conditions and the absence of adaptive anticipation behavior. Regarding the characteristics of African investors, their decisions are constrained by subsistence limitations in the short term. Thus, the lack of long-term visibility for investors in these countries justifies the non-determinism of growth as an indicator of anticipation mechanisms.

As for the effects of the real effective exchange rate on domestic investment, the results show that this variable has a statistically significant and positive coefficient in all four columns. This is expressed by the increase in the exchange rate resulting from the growth in exports. The effect of education on domestic investment seems to be sensitive to the choice of indicator. The results show that a 1-point increase in the education percentage raises domestic investment between 0.055 and 0.064 points. Finally, in columns (6) and (7), we test the effects of institutional variables. These institutional variables—rule of law and corruption control—are statistically positive but not significant. These

results align with the work of Egger and Winner (2006), who found that the attractiveness of FDI in developing countries is not affected by the level of corruption. They also showed that FDI has crowding-out effects on domestic investment in both the short and long terms.

4.2. The estimation of the effects of foreign investments on sectoral distribution.

Domestic investment is distributed across three sectors: agriculture, manufacturing, and services. Each of these sectors has specific characteristics that distinguish it from the others, based on its role in overall production as well as labor mobility between them. The impact of FDI on each sector will help analyze whether it contributes to economic performance and poverty reduction. Table (5) presents various estimates of the effects of FDI on the sectoral distribution of domestic investment in North African regions.

In each sector, we analyze the effects of lagged FDI, current FDI, and lagged domestic investment. Next, we examine the impact of other key sector-specific variables, such as education, trade openness, real effective exchange rate, and savings. Finally, to verify the robustness of the results, we test the effect of additional variables specific to each sector: "arable land" for the agricultural sector, "bank loans" for the manufacturing sector, and "corruption control" for the services sector. In the following, based on Table (6), we begin by interpreting all the effects (both short-term and long-term) of FDI on each sector.

Table 5: The Effects of FDI on the Three Sectors Studied in North Africa

INV	**Total panel**		
	ARG	**MAN**	***SCE***
$DI_{(i,t-1)}$	0,709*** (0,134)	0,712*** (0,111)	0,704*** (0,098)
FDI	0,513* (0,297)	0,628*** (0,129)	0,169 (0,331)
$FDI_{(i,t-1)}$	-0,381*** (0,295)	-0,40** (0,270)	0,217 (0,231)
Savings	0,094 (0,064)	0,027** (0,012)	0,032** (0,074)

OUV	0,008** (0,004)	0,019** (0,012)	0.069** (0.027)
RER	-0,057 (0,057)	0,029 (0,069)	0,074 (0,053)
Education	0,225 (0,150)	0,066*** (0,019)	0,174** (0,079)
ED	0,051*** (0,018)	0,183* (0,100)	0,071*** (0,025)
LTA	0,402 (1,161)	-	-
Credit	-	-0,024 (0,035)	-
Corruption	-	-	0,039*** (0,015)
Constant	21,611** (10,85)	17,62 (15,22)	14,61 (10,39)
Observations	108		
Sargan test	19,20 (0,024)	19,23 (0,023)	19,53 (0,021)
Autocorrelation of order 1	-8,94 (0,000)	-4,94 (0,001)	-4,21 (0,000)
Autocorrelatio 2nd-order	2,06 (0,039)	1,10 (0,272)	0,32 (0,746)

Note: **The estimations are made using the GMM Arellano-Bond method. Standard errors are provided in parentheses. *, **, and *** refer to significance levels of 10%, 5%, and 1%, respectively. The null hypothesis of the Arellano-Bond AR(2) test is that there is no second-order autocorrelation in the residuals. The Sargan test for the validity of instruments has the null hypothesis that the set of instruments is exogenous.**

Table 6: The effects of Foreign Investment on Sectoral Distribution by Time Horizon

				Short-term effects	Long-term effect
	Sector	$DI(-1)_{\beta tin(t-1)}$	$FDI_{(B2)}$	$IFDI(-1)_{(B3)}$	$FDI_{(BLT)}$
Total Panel	**Agr**	0,709***	0,513*	-0,381***	0,450
	Man	0,712***	0,628***	-0,390**	0,82
	Sce	0,704***	0,169	0,217	------

Note: The abbreviations AGR, MAN, SCE and ns: represent the sum of the value added (%) of the agricultural sector/GDP, the sum of the value added (%) of the manufacturing sector/GDP, the sum of the value added (%) of the service sector/GDP and finally (---) and not significant. Standard errors are indicated in brackets. *, ** and * refer to significance levels of 10%, 5% and 1%.**

The majority of economic theories indicate that the industrial sector is characterized by a high intensity of capital and technology, in contrast to the agricultural sector, which is more characterized by low levels of skilled labor intensity (Elbadawi, (1999); Wood and Berge (1997). The low level of investment in agriculture leads to a redistribution of resources towards the manufacturing sector, resulting in a reduction of unskilled labor in agriculture. This dynamic is closely linked to the process of globalization, which refers to the recent impact of innovations in production and transportation systems on international trade and the growing interdependence of countries. In response to this trend, countries must reduce trade barriers within their economic blocs and adopt liberalization policies to stimulate the volume of trade, including agricultural products.

The effects of FDI on sectoral distribution, both in the short and long term, can create income inequality in a local economy by altering the structure of labor demand. This can lead to an increase in income inequality, particularly between urban and rural areas. This phenomenon was observed, for example, in oil-producing countries in the 1970s and 1980, where it triggered waves of

deindustrialization. These effects can generate inequality both directly and indirectly.

Direct effects manifest through higher wages offered by multinational companies compared to the wages in the local sector. On the other hand, indirect effects concern the promotion of skilled labor at the expense of unskilled labor, leading to an increase in inequality, both in the short term (through wage disparities) and in the long term (through inequality of access to education and training).

Finally, regarding institutional variables in the total panel, the results show that a 1-point increase in corruption control leads to a 0.039 increase in value-added services. Although there is broad consensus on the negative effects of corruption on growth and economic development, some researchers continue to argue that corruption could, in certain cases, be justified. According to this thesis, corruption allows bypassing ineffective regulations and institutions, enabling the private sector to compensate for failures and mistakes of public authorities. In this sense, it could potentially offer useful insights into the contradictory aspects of this phenomenon [Méon and Sekkat (2005)].

Despite the well-documented negative effects of corruption on economic growth and sustainable development, some economists, such as Méon and Sekkat (2005), defend the idea that corruption could be used as a tool to bypass inefficient decisions and institutions. From this perspective, corruption could foster economic growth by reducing administrative barriers to business entry and lowering transaction costs associated with excessive regulations.

5. RESEARCH LIMITATIONS AND PERSPECTIVES

Despite the interest in analyzing the relationship between foreign direct investment (FDI) and domestic investment in North Africa, several limitations should be highlighted, which also open avenues for future research:

First, the analysis is primarily based on correlation relationships between FDI and domestic investment. This approach does not allow for a clear identification of causality. It therefore remains difficult to determine whether FDI stimulates domestic investment or, conversely, whether a high level of local investment attracts more FDI.

Second, the study adopts an aggregated approach for all North African countries, which may obscure significant disparities between countries in terms of economic structures, institutional frameworks, and investment policies. This heterogeneity limits the generalizability of the results.

Third, the research does not sufficiently distinguish between different forms of FDI by sector. Yet, FDI directed towards extractive sectors may generate substitution effects, whereas FDI aimed at manufacturing or technological sectors is more likely to stimulate domestic investment.

Fourth, certain institutional and structural variables, such as governance quality, the rule of law, or the business climate, are not fully integrated into the analysis. These factors, however, play a decisive role in the relationship between FDI and domestic investment.

Finally, constraints related to the availability and quality of statistical data for North African countries may affect the robustness of the estimates and the reliability of the empirical results.

Future research could, first, use more advanced econometric methods, including causality tests and dynamic models, to better identify the interactions between FDI and domestic investment in the short and long term.

Second, it would be relevant to expand the analysis by incorporating additional variables, such as public investment, financial sector development, institutional quality, and industrial policies, to better understand the mechanisms of substitution or complementarity.

Third, comparative studies between North African countries, or between this region and other areas such as the MENA region or Sub-Saharan Africa, would help assess the regional specificity of the results.

Finally, adopting qualitative approaches or sectoral case studies could provide a better understanding of the channels through which FDI influences domestic investment, particularly in terms of technology transfer, spillover effects, and the creation of local productive capacities.

6. CONCLUSION

When examining the relationship between FDI and domestic investment, theoretical studies suggest that FDI can crowd out domestic investment in both the short and long term. To test this hypothesis, we extend the empirical framework of Agosin and Machado (2005) by including additional determinants of investment. Next, we analyze the individual effects of FDI on sectoral distribution. Finally, we provide insights into the nature of the interaction between foreign and local investors, with different implications for local investment dynamics and potential divergent implications for public policies.

However, as local firms gradually adapt and foreign subsidiaries develop business links with these local firms, the effect on domestic investment eventually becomes beneficial and tends toward a stimulating effect. The mode of entry of foreign investors seems to play a crucial role in the impact of FDI on domestic investment.

Finally, the model allowed for the analysis of FDI effects on the three main economic sectors: agriculture, manufacturing, and services. The results show that FDI facilitates the transfer of value-added from the agricultural sector to manufacturing only in countries with few natural resources. This confirms the idea that the isolation of MNCS (Multinational Corporations) specializing in extractive industries limits any form of interaction with local firms. In contrast, MNCS operating in the manufacturing sector contribute more to encouraging dualistic development.

The results obtained in this study generate a certain pessimism regarding the beneficial effects of FDI on the development of sub-Saharan African countries. The predominance of FDI in extractive industries, as well as the quality of institutions in host countries, could explain these conclusions. From this perspective, analyzing the interactions between FDI and local institutions appears as a priority research avenue for future studies.

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