

Institutional Interaction and FDI Dynamics in the Growth of MENA Economies: Application to Dynamic Panel Data

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Abstract. This study analyzes the interaction between institutional quality and FDI dynamics in driving economic growth across 16 MENA countries over the period 2011–2024. Using the Generalized Method of Moments (GMM) developed by Arellano and Bond (1991), it addresses the endogeneity between growth, FDI, and institutional factors. The results suggest that FDI positively contributes to growth, but its impact largely depends on the quality of institutions. Countries with strong governance and sound regulatory frameworks benefit more from technology transfer and productivity spillovers generated by FDI. The study therefore highlights that institutional improvement is a key lever for maximizing the benefits of foreign investment and fostering sustainable growth in the MENA region.

1. INTRODUCTION

For more than three decades, foreign direct investment (FDI) has been a key factor in the financing and growth of emerging economies. In the MENA (Middle East and North Africa) region, this role is all the more crucial as these economies strive to diversify their production structures and reduce their dependence on natural resources. However, despite a significant increase in FDI flows in several MENA countries, their impact on economic growth remains uneven and often below expectations. According to Mtiraoui (2018, 2021), this disparity in the impact of FDI on growth can be explained by the quality of institutions, which determines the ability of countries to effectively absorb the positive effects of FDI flows.

In economies with strong, transparent, and predictable institutions, FDI contributes to structural transformation through technology diffusion, human capital development, and integration into global value chains. However, in unstable institutional contexts marked by corruption, political instability, bureaucratic inefficiency, or weak legal frameworks, these potential effects are significantly limited. Foreign investors favor a stable institutional environment where property rights are guaranteed and the rules of the economic game are predictable. When institutions are weak, the business climate becomes uncertain, increasing transaction costs and the political risks associated with investment projects. Under such conditions, FDI is often concentrated in extractive or low value-added sectors, generating little impact on economic growth and employment (Mtiraoui, 2021).

This finding is consistent with recent research by Alfaro and Chauvin (2022), which shows that FDI-induced productivity growth is significantly higher in countries with good economic governance and sustainable macroeconomic stability. Similarly, Kherfi (2023) points out that institutional weaknesses in several countries in the MENA region limit the ability of FDI to promote production diversification due to rigid regulations and a lack of fiscal transparency. In the same vein, Farah and Rahman (2023) emphasize that institutional reforms, including the modernization of public administration, the fight against corruption, and the consolidation of the rule of law, are essential prerequisites for transforming FDI flows into a real driver of inclusive and sustainable growth.

Furthermore, theoretical analyses are consistent with the endogenous growth model, according to which FDI promotes growth through technology transfer, human capital

development, and the diffusion of innovation (Romer, 1990; Borensztein, De Gregorio, and Lee, 1998). However, the effectiveness of this mechanism depends on the institutional framework, which determines the quality of the business environment (North, 1990).

Furthermore, recent empirical studies confirm this interaction. Azman-Saini et al. (2010) showed that the impact of FDI on growth is only significant when institutions reach a sufficient quality threshold. More recently, Anyanwu and Okoye (2020) and Mtiraoui (2021) demonstrated, based on a sample of countries in Africa, the Middle East, and North Africa, that the impact of foreign direct investment (FDI) on economic growth is amplified in contexts where good governance and corruption are controlled. Furthermore, Farah and Rahman (2023) emphasize the importance of institutional reforms in strengthening economic resilience to external shocks and attracting sustainable investment.

With this in mind, this study aims to analyze the interaction between institutional quality and foreign direct investment (FDI) dynamics on economic growth in Middle Eastern and North African countries from 2011 to 2024. To this end, the generalized moments method (GMM) developed by Arellano and Bond (1991) is used, adapted to dynamic panels, which allows for the correction of endogeneity biases and the capture of cumulative growth effects.

- Empirically updates the work of Mtiraoui (2018, 2021) by incorporating the most recent data (up to 2024) and taking into account the common dynamics between FDI, institutions, and economic growth.
- Analytically, it highlights the moderating role of institutions in the transmission of FDI effects, emphasizing that countries in the MENA region with more effective governance and greater political stability derive greater economic benefits from FDI.

Overall, this study aims to shed new light on the relationship between FDI, institutions, and growth, showing that institutional consolidation remains a prerequisite for the success of strategies to attract and optimize FDI flows in the MENA region. To this end, we have divided this work into four sections: the first is the introduction, the second highlights the literature review. The third

section will be devoted to the methodology of this work and finally the conclusion.

2. LITERATURE REVIEW

The relationship between foreign direct investment (FDI), institutional quality, and economic growth is a central field of study in contemporary economic literature, both theoretically and empirically. Since the pioneering work of Romer (1990) and Borensztein, De Gregorio, and Lee (1998), FDI has been seen as an essential vehicle for technology transfer, innovation diffusion, and productivity growth. Through their ability to introduce new technologies, strengthen human capital, and stimulate competition, FDI can contribute significantly to improving the competitiveness and productive capacity of host economies.

These components help to create a climate of confidence and predictability that is conducive to investment and innovation. Conversely, fragile or inefficient institutions generate high transaction costs, discourage foreign investors, and limit the diffusion of technological spillovers into the local productive fabric.

The work of Kaufmann, Kraay, and Mastruzzi (2010) empirically confirms this relationship: countries characterized by strong governance and effective institutions not only attract larger volumes of FDI, but also manage to derive more positive externalities from it, particularly in terms of skilled employment, competitiveness, and knowledge transfer.

For their part, Acemoglu, Johnson, and Robinson (2005) emphasize those inclusive institutions, i.e., those that guarantee the protection of property rights, promote competition, and ensure equitable access to economic opportunities, are an essential foundation for sustainable development. They enable efficient resource allocation, stimulate productivity, and strengthen economic resilience.

In contrast, extractive institutions, based on predation, corruption, or favoritism, tend to divert resources and neutralize the beneficial effects of foreign capital flows. In short, the literature converges on the idea that the impact of FDI on growth is neither automatic nor uniform. It depends heavily on the institutional context in which it occurs.

Institutions do not merely attract investment: they also determine its effectiveness and sustainability. This is why improving governance, consolidating the rule of law, and promoting a transparent and predictable business environment are essential conditions for transforming FDI into a real driver of sustainable economic development.

2.1. Theoretical Framework

The relationship between foreign direct investment (FDI), institutional quality, and economic growth is a key area of analysis in contemporary economic research. It has been the subject of a particularly abundant theoretical and empirical literature, both because of its importance for developing economies and because of the diversity of results observed depending on institutional contexts. Since the seminal work of Romer (1990) and Borensztein, De Gregorio, and Lee (1998), FDI has been seen as an essential channel for technology transfer, innovation, and productivity diffusion. By introducing new technologies, promoting human capital formation, and stimulating local competition, FDI helps to strengthen the competitiveness and productive capacity of host economies.

However, these benefits are only fully realized when the host country has a stable, transparent, and incentive-based institutional and macroeconomic environment. With this in mind, North (1990) defines institutions as the "rules of the game" that govern economic, political, and social interactions. They structure the behavior of agents, reduce uncertainty, and promote trust, all of which are essential elements in investment decisions. Thus, institutional quality—which encompasses political stability, the rule of law, regulatory transparency, public accountability, and control of corruption, is a key variable in determining the impact of FDI on economic growth. The work of Kaufmann, Kraay, and Mastruzzi (2010) shows that countries with strong and credible institutions not only attract more FDI, but also manage to derive more sustainable benefits from it, particularly through the creation of skilled jobs, improved productivity, and diversification of the productive fabric.

Conversely, in countries with weak institutions, foreign investment flows tend to concentrate in low value-added or immediate-return sectors, thus limiting their impact on long-term growth. Similarly, Acemoglu, Johnson, and Robinson (2005) highlight that high-quality institutions, known as "*inclusive*" institutions, promote efficient resource allocation, encourage innovation, and support productivity, while "*extractive*" institutions, characterized by corruption, state capture, or lack of transparency, hinder economic development and limit the positive impact of FDI. Thus, the effectiveness of FDI as an engine of growth depends heavily on the institutional framework in which it operates. This framework not only attracts investment flows, but also determines their scope and sustainability by guiding the way in which local economies integrate and leverage foreign investment.

2.2. Empirical Research

The work of Mtiraoui (2018, 2021) confirms that in the MENA region, the relationship between FDI and growth is closely linked to institutional quality.

According to this author, structural weaknesses, corruption, political instability, and low government efficiency significantly reduce the absorption capacity of economies and prevent

FDI from stimulating sustainable growth. These conclusions are consistent with those of Li and Liu (2005) and Alfaro and Chauvin (2022), who demonstrate that governance and macroeconomic stability determine the effectiveness of FDI in developing countries.

Other studies, notably those by Azman-Saini, Baharumshah, and Law (2010), highlight the role of economic freedom and financial development as catalysts for the effect of FDI. They show that the benefits of foreign capital depend not only on the institutional framework, but also on the degree of trade openness and financial integration. Similarly, Hermes and Lensink (2003) emphasize that the interaction between FDI and the financial system determines a country's ability to transform investment flows into effective growth.

In the specific context of MENA countries, several recent studies, notably Mtiraoui (2021)¹, Kherfi (2023), and Farah and Rahman (2023), confirm the existence of a positive but conditional relationship between FDI and growth. These authors show that countries that have improved their governance and the transparency of their economic policies (such as Morocco, Jordan,

¹ Mtiraoui, A., (2021). The Attractiveness of FDI on Economic Growth between Institutional Quality and Pandemic in the Arab World and the Sub-Saharan Africa Countries. *International Journal of Empirical Finance and Management Sciences* 3 (03), 21-32

and the United Arab Emirates) have seen a more pronounced impact of FDI on GDP.

2.3. Graphical Illustrations

2.3.1. Real GDP Growth in MENA Countries

Figure 1 above illustrates the evolution of real GDP growth rates for a sample of 16 countries in the MENA region over the period 2010–2025. Each sub-graph corresponds to a country, highlighting the macroeconomic fluctuations specific to each economy.

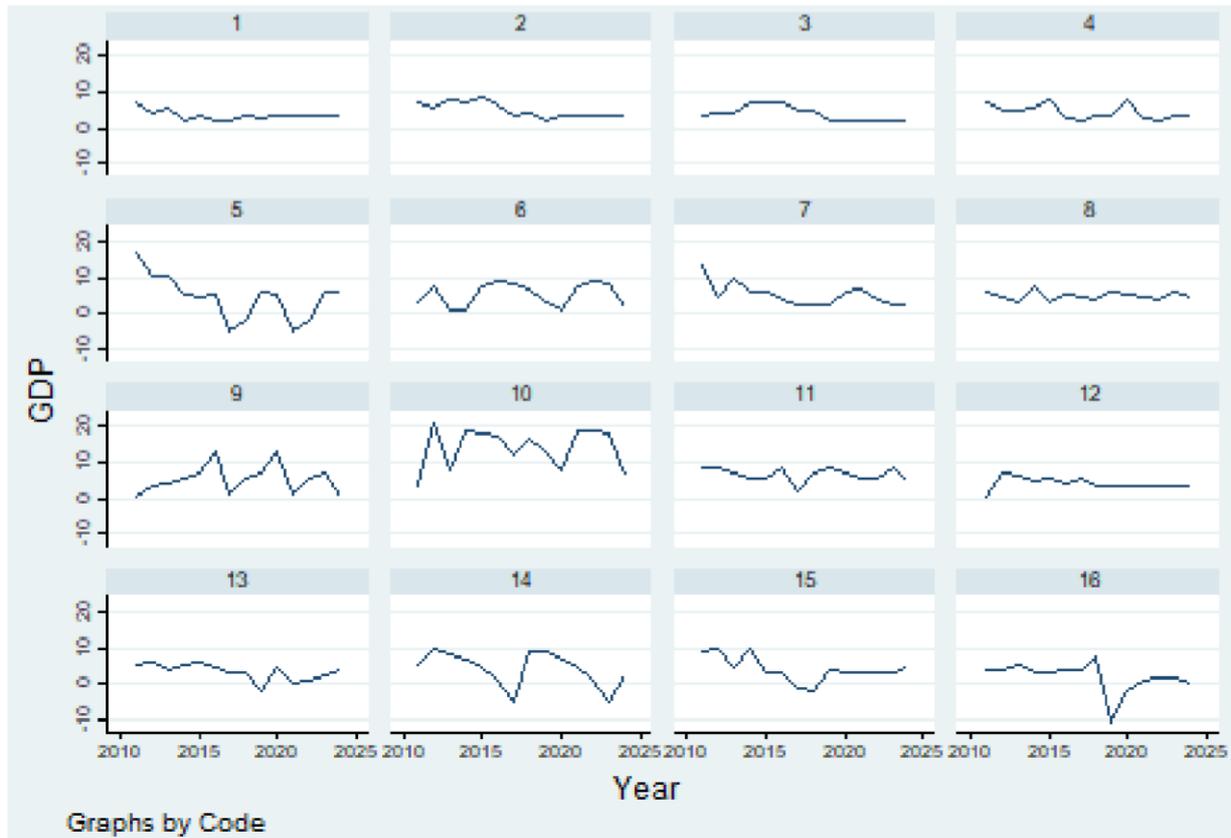


Figure 1. Real GDP growth in MENA countries².

Source: created using STATA 14.1

Overall, GDP dynamics reveal significant heterogeneity between countries:

- Some countries show relatively stable growth (Figures 1, 3, 8, 12), reflecting economic resilience and better macroeconomic governance.
- Others show marked cycles of volatility (charts 5, 6, 9, 10, 14), often linked to dependence on hydrocarbons, geopolitical shocks, or external vulnerability.
- Finally, a few countries (charts 13, 15, 16) experience sharp variations in growth, reflecting episodes of crisis and temporary recession.

These divergences illustrate the heterogeneous nature of growth in the MENA region, where economic performance depends largely on institutional quality, economic diversification, and the ability to attract and absorb FDI. This observation justifies the use of a dynamic panel approach (GMM) to capture these differentiated effects and the interactions between growth, institutions, and FDI within the MENA region.

2.3.2. Institutional quality in MENA countries

Figure 2 above shows the variation in the institutional quality index for 16 countries in the MENA region over the period 2010–2025. Each sub-graph corresponds to a country and allows us to observe the temporal dynamics of institutional governance in the region.

² Real GDP growth in MENA countries “Source: Stata 14.2, prepared by the authors.”

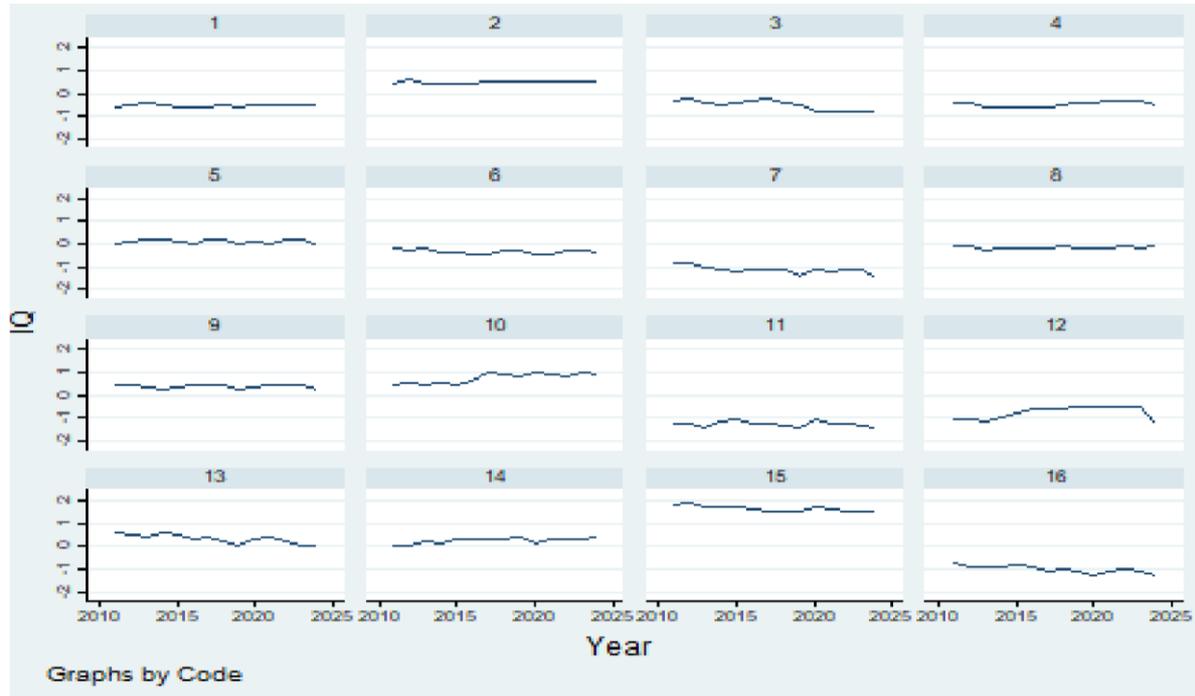


Figure 2. Institutional quality in MENA countries³.

Source: created using STATA 14.1

In general, the series show relative stability over time, reflecting slow progress in institutional reforms.

- Some countries (Figures 1, 2, 5, 6, 10, 11) show a moderate improvement in institutional quality, often linked to policies of administrative modernization and transparency.
- Others (charts 7, 9, 13, 15, 16) show a downward trend, reflecting persistent corruption, political instability, or structural weaknesses in the rule of law and economic governance.
- A few cases (Figures 4, 12) suggest recent improvement, linked to institutional reforms or a more favorable political transition.

Overall, this limited progress underscores that institutional quality remains a factor of fragility in the MENA region. Yet it is a crucial lever for strengthening the effectiveness of economic policies and maximizing the impact of foreign direct investment (FDI) on long-term growth.

2.3.3. Dynamic Interactions between Economic Growth, FDI, and Institutional Quality in MENA Countries

Figure 3 above illustrates the joint evolution of real GDP, foreign direct investment (FDI), and institutional quality (IQ) for 16 countries in the MENA region between 2010 and 2025. Each subgraph represents a country, allowing us to observe the dynamics of interaction between these three key variables.

³ Institutional quality in MENA countries: "Source: Stata 14.2, prepared by the authors"

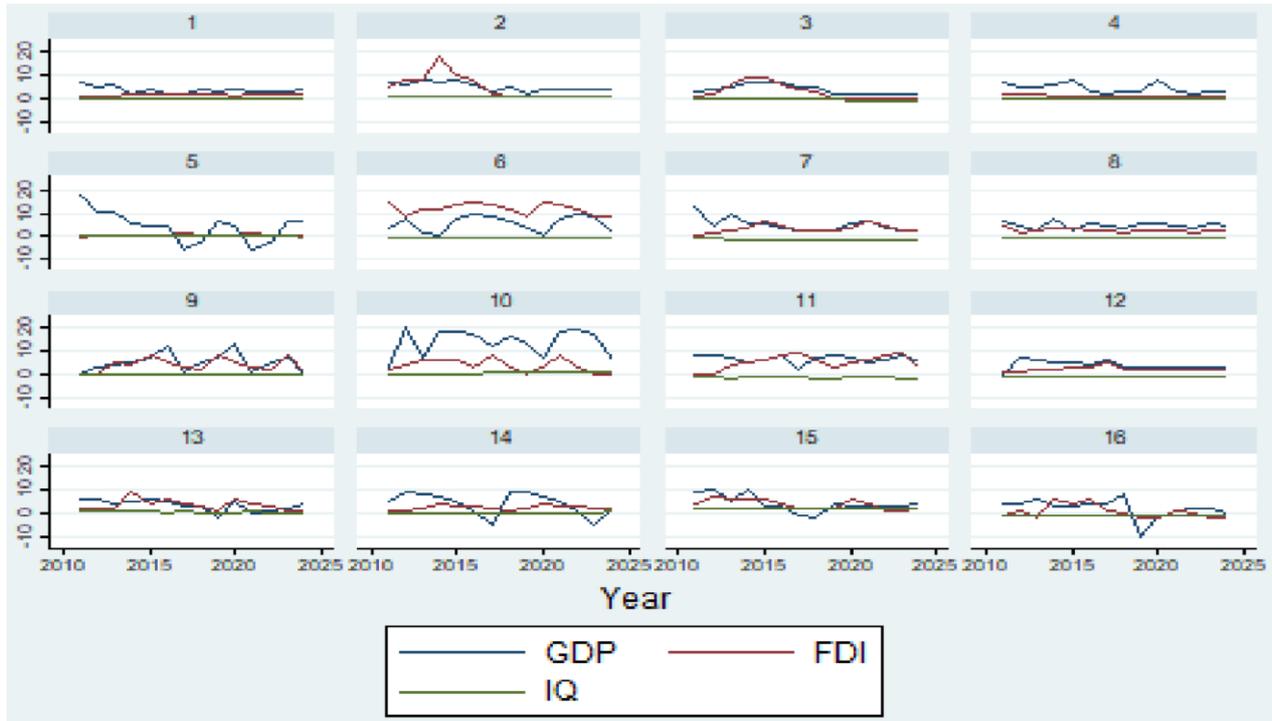


Figure 3. Dynamic interactions between FDI, IQ, and GDP for MENA countries⁴.

Source: created using STATA 14.1.

In most countries, there is a positive correlation between economic growth and FDI flows, although the strength of this relationship varies considerably:

- In several cases (Figures 2, 3, 6, 9, 10, 14), peaks in FDI coincide with increases in GDP, suggesting a productive spillover effect when foreign capital is accompanied by technology transfers and job creation.
- However, in other economies (Figures 5, 13, 16), growth remains unstable despite FDI inflows, reflecting weak institutional absorption and the absence of effective economic governance mechanisms.
- Institutional quality (IQ), represented by the green curve, remains relatively flat in most cases, revealing weak structural reform dynamics.

This figure highlights the moderating role of institutions: when institutional quality is high, FDI contributes more to growth. Conversely, in countries where institutions remain weak or corrupt, foreign investment flows struggle to generate lasting effects on GDP.

3. ESTIMATION METHODOLOGY

Economic growth (GDP) in MENA countries depends not only on foreign direct investment (FDI) flows, but also on institutional quality, which determines their effectiveness. Weak institutions (corruption, political instability, lack of rule of law) limit the positive impact of FDI, while strong governance promotes its integration into the productive fabric⁵.

3.1. Assumptions

To study the impact of institutional quality on attracting FDI capital for economic growth (GDP). Based on the literature, we have formulated the following hypotheses:

H₁: FDI has a positive effect on economic growth in MENA countries.

H₂: Institutional quality improves economic performance.

H₃: The interaction between FDI and institutional quality reinforces the effect of FDI on economic growth.

3.2. Sample, Period, and Data

- Sample:

Our sample of countries consists of 16 countries in the Arab world, namely: 6 countries in Africa and 10 countries in the Gulf. In fact, this study region consists of 16 countries, namely: *Bahrain, Oman, Kuwait, Jordan, Iraq, Iran, Yemen, United Arab Emirates, Qatar, Saudi Arabia, Tunisia, Turkey, Morocco, Egypt, Sudan, and Algeria*.

- Period:

Depending on data availability, our study period covers 14 years, from 2011 to 2024.

- Data:

⁴ Dynamic interactions between FDI, IQ, and GDP for MENA countries: "Source: Stata 14.2, prepared by the authors"

⁵ Mтираoui, A. et al. (2021): "FDI Between Institutional Quality And The Revival of Economic Growth in the Arab World." *IJEMS*, Vol. 8(3), 25-34.

We have compiled a database of international data available in *the World Bank's World Development Indicators (WDI) CD*.

3.3. Definitions and Measurements of Variables³

- **Economic growth indicator (GDP)**

Levine et al., 2000, Beck et al., 2000, and Beck and Levine, 2004) noted (GDP). Similarly, Mohem and Mairesse (1999, 2001) provide some orders of magnitude for the contribution of R&D to GDP growth.

- **Control Variables**

For our work, we use the ratio of trade value (*exports + imports*) to GDP to capture the degree of openness (Sachs and Warver (1995)), denoted (TRADE), and the tertiary enrollment rate to control for human capital accumulation, denoted (HK).

- **Investment:**

Business investment includes gross fixed capital formation (INV) and stock variation, which is considered one of the catalysts of any growth variable because it makes human labor more efficient.

- **Foreign Direct Investment (FDI)**

This variable is justified by the abundant literature stating that foreign direct investment has a positive impact on economic growth, such as Ikiara, Moses M. (2003) and Fosto, who prove that technology transfers have a positive effect on growth and is denoted by (FDI).

- **Institutional Quality (IQ)**

IMGs are not used by the World Bank Group to allocate resources. The impact of institutional factors, namely institutional quality (IQ), which combines six indicators and was developed by Kaufman D., Kraay A., and Mastruzzi M. (2003)⁴⁶.

Variable type	Variable	Measure/Indicator	Source
Dependent	Economic growth	Real GDP growth rate (%)	World Bank (WDI)
Explanatory Variable	FDI	Inward FDI flows (% of GDP)	UNCTAD, WDI
Institutional	Institutional quality	Normalized average of six WGI (World Governance Indicators) indicators	World Bank
Interaction	FDI x Institutions	Interaction between FDI and institutions	Calculated by the authors
Control	Trade	(Exports + Imports) / GDP	WDI
	Humn capital	Secondary school enrollment rate (Barro, 1990)	World Bank
	Investment	Gross fixed capital formation	

3.4. Estimation Model

3.4.1. Generalized Method of Moments (GMM): Dynamic Panel□

The dynamic panel method "*Generalized Moments*" was introduced by Holtz-Eakin, Newey, and Robsen (1988), Arellano Bond (1991), and Arrelano and Bover (1995). It offers several specific advantages in terms of the nature of the panel data and the solutions it provides. Indeed, the dynamic GMM panel method provides solutions to problems of simultaneity bias, reversed causality, and omitted variables. This method allows for the control of both individual and temporal effects and the specific endogenous carryover bias of variables, especially when there are one or more lags of the dependent variable included as an explanatory variable. According to Blundel and Bond (1991), the GMM estimator system that combines first difference equations with level equations in which the variables are instrumented by their first differences appears to be more powerful. The dynamic panel GMM estimator combines two tests⁵⁷:

- The Sargan/Hansen over-identification tests.
- The Arrelano-Bonde test and autocorrelation, such as the two hypotheses of the absence of autocorrelation of the errors in the difference equation.

In our empirical work, it is clear that lagged variables exist and persist according to our theoretical development, so it will be necessary to distinguish the nature of the explanatory variables. The dynamic model is expressed in first differences, the instruments are level, and vice versa. In the estimation model, the use of lagged variables as instruments differs according to the nature of the explanatory variables:

- For exogenous variables, their current values are used as instruments.

⁶ Kaufman D., Kraay A., and Mastruzzi M. (2003): "Governance Matters III: Governance Indicators for 1996-2002." <https://econpapers.repec.org/paper/wpawuwprma/0308006.htm>.

⁷ Mtraoui, A. (2016). "Corruption, Human Capital and Economic Growth in the OECD Region: An Empirical Test." MPRA Paper 68996, University Library of Munich, Germany.

- For predetermined or weakly exogenous variables (variables that may be influenced by past values of the dependent variable but remain uncorrelated with future realizations of the error term), their values shifted by at least one period can be used as instruments, and for variables and their values shifted by two or more periods can be valid instruments.
- The validity of the selected instruments can be confirmed or rejected based on Hansen and Sargan tests.

In total, Arellano and Bond (1991) add to this list of instruments the lags of the endogenous variable by showing the orthogonality residuals. We will therefore use the generalized method of moments (GMM) based on dynamic panel data that are used as the instruments emerge.

3.4.2. Model Description

To empirically study the role played by institutional quality in a pandemic context in determining economic growth, the following simple model is used:

$$Y_{i,t} - Y_{i,t-1} = \varnothing K_{i,t} + \varphi Z_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} + \gamma Y_{i,t-1} + X \quad (E)$$

$$Y_{i,t} - Y_{i,t-1} = \gamma Y_{i,t-1} + \beta_1 X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (E')$$

$K_{i,t}$: With: Y : The growth rate of *GDP per capita* at time t .
 X : The vector of *standard* variables related to growth.
 $Z_{i,t}$: The vector of institutional and interaction variables *related* to growth.

$Z_{i,t}$: are respectively *the unobservable and identifiable factors* that affect all countries in the sample.

$$\mu_t \text{ and } \eta_i \quad Y_{i,t} = \beta_0 + \gamma Y_{i,t-1} + \beta_1 X_{i,t} + \varnothing K_{i,t} + \varphi Z_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad (E1)$$

Thus, the model that will serve as a reference for assessing the role played by institutional quality ($IQ_{i,t}$) in determining economic growth, for which $X_{i,t}$ represents the following indicators: $INV_{i,t}$, $TRADE_{i,t}$ et $HK_{i,t}$ by adding $FDI_{i,t}$ in the first regression.

In our econometric analysis of the effect of structural and institutional variables in the MENA region, the equation used takes the following general form:

$$GDP_{i,t} = \beta_0 + \gamma GDP_{i,t-1} + \beta_1 INV_{i,t} + \beta_2 TRADE_{i,t} + \beta_3 HK_{i,t} + \eta_i + \varepsilon_{i,t} \quad (E3- (1))$$

The second equation describes the integration of the fundamental indicator $FDI_{i,t}$, to show its effect on economic growth for the region under study during the period indicated.

It therefore takes the following form:

$$GDP_{i,t} = \beta_0 + \gamma GDP_{i,t-1} + \beta_1 INV_{i,t} + \beta_2 TRADE_{i,t} + \beta_3 HK_{i,t} + \beta_4 FDI_{i,t} + \eta_i + \varepsilon_{i,t} \quad (E3-2)$$

Regarding the third equation, these indicators will be added, namely $FDI_{i,t}$ et $IQ_{i,t}$, to clarify their impact on economic growth during the study period for the MENA region.

$$GDP_{i,t} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 INV_{i,t} + \beta_3 TRADE_{i,t} + \beta_4 HK_{i,t} + \beta_5 FDI_{i,t} + \varphi_1 IQ_{i,t} + \eta_i + \varepsilon_{i,t} \quad (E3-3)$$

For the last equation, the main idea is to study, in the context of interaction (FDIIQ), the effects of institutional quality in attracting FDI on economic growth, for which three indicators

will be added as follows $FDI_{i,t}$, $IQ_{i,t}$ et $FDIIQ_{i,t}$:

$$GDP_{i,t} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 INV_{i,t} + \beta_3 TRADE_{i,t} + \beta_4 HK_{i,t} + \beta_5 FDI_{i,t} + \varphi_1 IQ_{i,t} + \varphi_2 FDIIQ_{i,t} + \eta_i + \varepsilon_{i,t} \quad (E3-4)$$

The dynamic linear panel data model includes lags p of the dependent variable as covariates and contains unobserved effects at the panel level, which are either fixed or random. By construction, the unobserved panel level effects are correlated with the lagged dependent variables, which makes standard estimators inconsistent.

Arellano and Bond (1991) derived a consistent estimator from the generalized method of moments (GMM) for the parameters of this model; `xtabond` fits this estimator. Anderson and Hsiao (1981, 1982) propose using other *lags* or difference- of the dependent variable to instrument the lagged dependent variables that are included in a dynamic panel data model once the panel effects have been removed by initial differentiation.

3.4.3. One-Step Estimator

Arellano and Bond (1991) apply their new estimators and test statistics to a dynamic panel model (GMM).

All variables are indexed on countries i and time t . The Arellano and Bond (1991) model presents the results they obtained from several specifications. Arellano and Bond report the coefficients and their standard errors from the one-step robust estimators of a dynamic model.

4. DESCRIPTIVE ANALYSES, PRESENTATION OF RESULTS, AND COMMENTS

4.1. Descriptive Analyses⁸

First, our analysis will focus on descriptive measures, namely the position (mean), dispersion (standard deviation), and coefficients of variation of the explanatory variables. This will allow us to understand the distribution and degree of homogeneity of the series. *Mean: The mean is a measure of position, identifying the value around which the observations are distributed.

*Standard deviation: The standard deviation is a measure of dispersion, assessing the variability of the series. In other words,

⁸ Mtraoui, A. (2021): "Corruption, Human Capital and Economic Development in the Mean Region: Empirical Test." J. Econ. Managem. Res. Volume 2(1): 1-8

it measures the fluctuations of the observations around the arithmetic mean. *Coefficient of variation: The coefficient of variation is a composite measure consisting of the mean and the standard deviation. It allows us to estimate the average value of all observations.

Table 1. Descriptive statistics for all variables used.

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
GDP	224	4.9806	4.2433	-10.4797	20.8432
FDI	224	3.2871	3.5267	-2.2469	18.3833
IQ	224	-0.1413	0.7610	-1.4900	1.9000
INV	224	1.4986	4.8457	0.0992	23.5562
TRADE	224	3.9657	12.0551	0.4618	57.9950
HK	224	27.3685	14.5752	6.0975	60.6836
FDIIQ	224	-0.2859	3.4691	-13.2322	12.8574

Source: Output from STAT 14.1

4.1.1. Matrix Tables

Secondly, we present the correlation matrix tables, i.e., the analysis of the graphs that will allow us to assess the nature and type of relationship that exists between the endogenous variable and the exogenous variables taken. In other words, it allows us to detect the presence of a statistical relationship between the variables.

Table 2. Correlation matrix between variables.

Variables	GDP	FDI	IQ	INV	TRADE	HK	FDIIQ
GDP	1.0000						
FDI	0.2528	1.0000					
IQ	-0.1642	0.0656	1.0000				
INV	-0.0257	-0.0706	0.1315	1.0000			
TRADE	-0.0486	-0.0748	0.1417	0.1940	1.0000		
HK	-0.0793	0.2942	-0.3504	0.2665	0.2706	1.0000	
FDIIQ	-0.0788	-0.1956	0.7369	0.0638	0.0698	-0.4551	1.0000

Source: Stata15.1 output generated by the author.

4.1.2. Multivariate Analysis

At this stage, we will seek to specify the model. Unlike linear regression models, where we can specify a one-dimensional model based on economic theories and then perform model validation tests, in the case of panel models, the analysis focuses on two dimensions.

4.1.3. Presentation of results

The results, summarized in Table 3, are broken down into four successive equations that allow us to progressively test the impact of FDI and institutional quality on economic growth.

Table 3. Interaction between FDI, institutional quality (IQ), and growth (GDP) in the MENA region.

<i>Variables</i> \ <i>Reqs.</i>	Eq (1)	Eq (2)	Eq (3)	Eq (4)
GDP _{i,t-1}	.1365024 (1.69)*	.1200991 (1.49)	.1341097 (1.66)*	.1235300 (1.52)
Cost	6.913898 (2.85)**	5.111688 (2.03)	7.027592 (2.88)	6.913691 (2.85)
INV	1.06105 2 (2.24)	1.044864 (2.21)**	1.086187 (2.28)	1.068017 (2.25)
TRADE	0.0567887 (0.14)	0.011960 9 (0.03)	0.0293535 (0.07)	0.048594 (0.12)
HK	0.164862 9 (1.84)*	0.122975 (-1.36)	-0.160759 6 (-1.79)*	-0.1591036 (-1.77)*
FDI	–	0.2758099	–	–

	(2.32)			
IQ	–	–	-1.011657 (-2.22)**	–
FDIIQ	–	–	–	0.311377 3 (-2.15)**
N.Obs.	190	190	190	190
Group No.	16	16	16	16
N. of instruments	82	83	83	83
Wald χ^2	22.46	27.93	22.65	24.57
Prob > χ^2	0.0002	0.0000	0.0004	0.0002



Source: Output from STAT 14.1.

- ✚ Equation 1: Arellano-Bond dynamic panel data estimation: Estimation of this first equation without FDI, IQ, and FDIIQ
- ✚ Equation 2: Arellano-Bond dynamic panel-data estimation: Estimation of this first equation with FDI
- ✚ Equation 3: Arellano-Bond dynamic panel-data estimation; Estimation of this first equation with IQ
- ✚ Equation 4: Arellano-Bond dynamic panel-data estimation: Estimation of this first equation with QIDI *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

4.2. Interpretations

The dynamic estimation of the Arellano-Bond model, applied to a panel of 16 countries in the MENA region for the period 2011–2024, measures the combined impact of foreign direct investment (FDI), institutional quality (IQ) and their interaction (FDIIQ) on economic growth (GDP). The model has good overall explanatory power ($R^2 \approx 0.66$) and confirms several predictions from contemporary economic literature.

4.2.1. First Equation: Without (FDI), (IQ), and (FDIIQ)

In this first case, the model considers only internal variables such as domestic investment (INV), trade openness (TRADE), and human capital (HK). The results show a positive and significant relationship between domestic investment and economic growth (coefficient = 1.061052 at the 5% threshold). Thus, a 5% increase in domestic investment is associated with an increase of nearly 2 points in GDP.

This result is consistent with classical growth theory (Solow, 1956) and endogenous growth theory (Romer, 1990), which emphasize the central role of capital accumulation in the dynamics of development.

In contrast, the trade openness variable (TRADE) shows a positive but insignificant relationship (0.0567), suggesting that the benefits of international trade remain unevenly distributed within MENA countries.

This result reflects a structural imbalance: natural resource-exporting countries do not always benefit from global trade, unlike diversified economies with a competitive manufacturing sector.

4.2.2. Second Equation: With (FDI)

The results indicate a positive and significant relationship at 5% between FDI and economic growth (coefficient = 0.275; at the 5% threshold). A 5% increase in FDI thus translates into an increase of approximately 2 points in GDP.

This result is consistent with the conclusions of Aitken & Harrison (1991) and Borensztein et al. (1998), according to which FDI constitutes a channel for technology transfer, the creation of skilled jobs, and the dissemination of modern management practices. Domestic investment remains significant (1.04 at the 5% threshold), confirming the complementarity between local and foreign capital. However, human capital (HK) has a negative and insignificant coefficient, suggesting that the effect of human capital on growth may be delayed over time or hampered by mismatches between training and market needs.

This observation is consistent with the work of Blomström and Kokko (2003) and Belderbos et al. (2012), who highlight the gap between investment in education and real productivity in emerging economies.

4.2.3. Equation 3: With (IQ)

The third equation incorporates the institutional quality variable (IQ) alongside FDI. The coefficient associated with IQ (-1.011657) is significantly negative at 5%, suggesting that institutional improvement has limited effects in the MENA region. This situation can be explained by weak governance, persistent corruption, and political instability, factors that have been extensively

documented by Mтираoui (2018, 2021), Sanders (1981), and Jong-A-Pin (2009).

4.2.4. Final Equation: With (FDIIQ)

The coefficient associated with the FDIIQ interaction variable is negative and significant at 5% (-0.3113773 at the 5% threshold), indicating that, paradoxically, periods of health crisis have been accompanied by increased public and foreign investment in the health and infrastructure sectors. According to Arezki and Nguyen (2020), several countries in the MENA region have demonstrated a certain institutional resilience in the face of political circumstances, promoting a faster economic recovery.

This reflects an economic context marked by persistent political and economic instability, where the potential positive effects of governance and foreign investment are mitigated by external shocks.

5. CONCLUSION

The dynamic estimation of the Arellano-Bond GMM model applied to the economies of the MENA region over the period 2011–2024 highlights several key lessons regarding the determinants of economic growth. The model has a generally satisfactory explanatory power and reveals that the region's economic performance is the result of a complex interaction between structural, institutional, and external factors.

First, domestic investment is confirmed as the main driver of economic growth. Its positive and highly significant relationship validates the predictions of classical and endogenous growth theories (Solow, 1956; Romer, 1990), emphasizing that physical capital accumulation remains a key determinant of production and employment in the region. This result reflects the importance of strengthening internal productive capacities and mobilizing national savings to stimulate sustainable endogenous growth. On the other hand, trade openness has a weak and statistically insignificant effect, reflecting the structural limitations of MENA economies, which are often characterized by excessive dependence on raw material exports and weak industrial diversification.

Second, foreign direct investment (FDI) has an overall positive impact on growth, confirming its role as a catalyst for technology transfer, the dissemination of know-how, and productivity enhancement (Aitken & Harrison, 1991; Borensztein et al., 1998). However, this beneficial effect remains conditional on certain internal prerequisites. In particular, it depends on the quality of human capital and the institutional framework.

The insignificance of the variable representing human capital suggests a mismatch between the education system and the needs of the productive fabric, which limits the ability of MENA economies to transform knowledge into effective productivity.

This result highlights the need for structural reform of education and vocational training in order to strengthen the complementarity between FDI and local skills. Third, institutional quality, although statistically significant, has a negative sign. This paradoxical relationship reflects the persistence of structural institutional weaknesses: corruption, political instability, administrative inefficiency, and weak rule of law. These factors continue to be a major obstacle to the optimal return on investment and the creation of an economic environment conducive to sustained growth. These results are consistent with the analyses of Mтираoui (2018, 2021) and Jong-A-Pin (2009), which emphasize that institutional fragility remains one of the main obstacles to sustainable development in the MENA region.

Finally, the interaction variable between FDI and institutional quality (FDI×IQ) reveals a negative and significant effect, indicating that the region's economies are struggling to convert foreign investment flows into a driver of growth in a still fragile institutional environment. This result confirms the hypothesis of imperfect complementarity between foreign capital flows and economic governance in the MENA context. However, the period marked by the COVID-19 pandemic seems to have sparked a resurgence of public and foreign investment in certain strategic sectors, notably health, infrastructure, and digital technologies, demonstrating a certain degree of economic and institutional resilience (Arezki & Nguyen, 2020). Ultimately, empirical results suggest that the growth potential of FDI in the MENA region cannot be fully exploited without substantial improvements in institutional quality, human capital reform, and structural diversification of economies. These dimensions appear to be essential levers for transforming foreign investment flows into a sustainable driver of inclusive development.

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