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Research paper

Do Trade Openness and FDI Drive Economic Growth in MENA Countries? Insights from A Panel ARDL Approach

Ritahi Oussama [1] *, Dafir Amine [1], Es-Sabir Abdelouahad [1], Echaoui Abdellah [2], Mansouri Mohamed [3]

[1] *University Hassan II – Casablanca*
[2] *University Mohammed V - Rabat*
[3] *University Ibn Tofail - Kénitra*
**Corresponding author E-mail: Oussama.ritahi@univh2c.ma*

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Abstract

Against the backdrop of persistent growth disparities and economic volatility in the Middle East and North Africa (MENA) region, understanding the role of external flows such as foreign direct investment (FDI) and trade openness has become increasingly crucial. This study investigates the dynamic linkages between economic growth, FDI, trade openness, and key macro-financial variables—namely domestic credit, gross fixed capital formation, and inflation—across 17 MENA countries over the period 1990–2023. Employing PMG, MG, DFE, and their Common Correlated Effects variants (CCE–PMG, CCE–MG)—the analysis addresses heterogeneity and cross-sectional dependence. Empirical findings reveal that FDI and trade openness exert significant positive effects on long-run GDP growth, while domestic credit negatively affects growth in the short run. Long-run effects of fixed capital formation and inflation vary across models, underscoring structural differences. The robustness of results under CCE estimators confirms the importance of correcting for global shocks. The study underscores policy implications: enhancing absorptive capacity, targeting quality FDI in manufacturing, deepening export diversification, reinforcing institutions, and coordinating regional economic policies to sustainably leverage external flows for long-term growth.

Keywords: *Economic Growth; Foreign Direct Investment; Trade Openness; Panel ARDL; CCE-PMG; MENA Region.*

1. Introduction

Over the past two decades, a substantial body of research has examined the impact of trade liberalization and foreign direct investment (FDI) on the economic performance of host countries globally (Carbonell & Werner, 2018; Tsimpida & Bitzenis, 2023). Foreign direct investment (FDI) and trade openness are broadly acknowledged as key catalysts of economic growth, especially within increasingly globalized and interconnected economies (Yeboah et al., 2025).

In theory, openness to international trade allows countries to specialize according to comparative advantage and gain access to larger markets and technologies, thereby fostering efficiency and innovation. Likewise, inflows of FDI bring capital, advanced technologies, and managerial expertise into host economies, which can boost productivity and output (Zhang 2006; De Mello 1999). Empirical evidence from a wide range of countries generally supports the growth-enhancing roles of both trade openness and FDI. For instance, Sachs and Warner (1995) find that economies with more open trade policies grew substantially faster than those with restrictive policies in the post-war period. Similarly, Frankel and Romer (1999) show that higher trade shares (as instrumented by geographic characteristics) have a significant positive effect on national income. The remarkable growth of East Asian "tiger" economies is often attributed in part to export-oriented strategies, underscoring the potential gains from trade liberalization (Panagariya 2004). On the FDI side, many cross-country studies report a positive impact of foreign investment on growth – for example, Borensztein et al. (1998) find that FDI contributes to long-run economic growth by transferring technology, although the effect is strongest when the host country has a minimum threshold of human capital to absorb these technologiesdocs.neu.edu.tr. Further research has highlighted that the benefits of trade and FDI are not automatic, but depend on complementary conditions. Rodriguez and Rodrik (2000), for instance, questioned the robustness of the openness-growth link by pointing out measurement problems and omitted variable biases, suggesting that simple indicators of trade barriers may not always correlate with growth once such issues are addressed. In the context of FDI, studies have found that local financial markets and institutional quality determine whether FDI effectively translates into growth (Alfaro et al. 2004; Hermes & Lensink 2003). In fact, Carkovic and Levine (2005) report no robust independent effect of FDI on growth when controlling for endogeneity, implying that FDI's positive impact tends to emerge only under supportive economic conditions. Notwithstanding these debates, the prevailing view in recent literature is that outward-oriented trade policies and FDI inflows can serve as engines of growth, especially when accompanied by sound domestic policies and absorptive capacity (Panagariya 2004; Tahir 2014). Recent surveys conclude that, on balance, open trade regimes contribute to higher

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growth rates and that FDI generally promotes growth in countries with adequate human capital and financial development to harness its spillovers.

Within this global context, the Middle East and North Africa (MENA) region presents a unique and important case to examine the nexus of trade openness, FDI, and economic growth. Many MENA economies have historically been less integrated into global trade and investment flows than other developing regions, apart from their exports of oil and gas. Starting in the 1990s, a number of MENA countries undertook economic liberalization measures – for example, reducing tariff and non-tariff barriers, joining the World Trade Organization, and enacting investment-friendly reforms – with the aim of boosting growth through greater openness. These efforts have met with some success, yet the region's overall trade openness and FDI inflows remain modest relative to its potential. Factors such as heavy reliance on primary commodities, political instability, and weaknesses in the business climate have often been cited as obstacles to deeper integration (Gammoudi et al. 2016). Indeed, MENA has received far less FDI (as a share of GDP) than other regions (except Sub-Saharan Africa), in part due to governance and conflict risks (Gammoudi et al. 2016). At the same time, there is significant heterogeneity within MENA: some smaller Gulf countries are very open and attract substantial FDI (largely in the energy sector), whereas other countries maintain more protective trade regimes or struggle to attract foreign investment outside of natural resource industries. This diversity makes it particularly interesting to investigate how trade and FDI influence growth in the MENA context.

Another motivation for focusing on MENA is the region's mixed economic performance over the past decades. Despite periods of high oil revenue, overall GDP growth in MENA has often lagged behind the dynamic emerging economies of Asia and Latin America. This has raised the question of whether greater openness and FDI have translated into the expected growth dividends in MENA, or whether their impact has been muted by structural challenges. Empirical studies on this topic have reported mixed findings for the region. On the one hand, some evidence suggests that openness and FDI do contribute positively to MENA's growth. For example, a recent study by Ben Abdallah (2023) covering 15 MENA countries found that, in the long run, trade openness and FDI have indeed promoted economic growth in the region. On the other hand, other studies point to limited or even negative impacts. Onifade et al. (2022) analyze a set of MENA economies and report that, over their study period, trade openness actually showed a negative effect on economic growth. They attribute this counterintuitive result to issues like the dominance of unrefined commodity exports and the lack of diversified industrial bases in some MENA countries, which can weaken the benefits of openness. Similarly, the growth impact of FDI appears to vary across the MENA region. Gammoudi et al. (2016) find that FDI inflows have stimulated per capita income growth in the GCC (Gulf Cooperation Council) countries, which generally boast higher income levels and stronger institutions, but had an insignificant or even negative effect in many non-GCC MENA countries. This discrepancy is explained by differences in absorptive capacity and institutional quality: outside the Gulf, several MENA countries have struggled with governance issues and underdeveloped financial systems, limiting their ability to productively absorb foreign investments. These contrasting findings highlight that the relationship between trade, FDI, and growth in MENA is complex and may depend on country-specific conditions.

Given the ongoing debate and the significance of the issue for the region's development, this study aims to provide a comprehensive empirical analysis of whether trade openness and FDI are driving economic growth in MENA. We use a panel data set spanning 1990–2023 for countries in the MENA region, a period that captures the liberalization waves of the 1990s, the globalization boom of the 2000s, as well as recent developments. By covering this extended timeframe, our analysis can assess long-run relationships and capture structural breaks or policy regime shifts in the region. The study is guided by the following key research questions:

1) Does greater trade openness lead to higher economic growth in MENA countries?
2) Do FDI inflows have a significant positive impact on economic growth in MENA countries?
3) Are the effects of trade openness and FDI on growth complementary, and under what conditions are these effects most pronounced?

In addressing these questions, our work contributes to the literature by updating and expanding the evidence on the trade–FDI–growth nexus for MENA, utilizing contemporary panel econometric techniques to control for country-specific effects and endogeneity.

The remainder of this paper is structured as follows. Section 2 provides a review of related literature on trade openness, FDI, and growth, with an emphasis on theoretical mechanisms and prior findings both globally and in MENA. Section 3 describes the data and methodology, including the construction of openness and FDI measures and the panel estimation approach. Section 4 presents the empirical results of the analysis. Section 5 discusses the results, highlighting their implications and how they compare with existing studies. Finally, Section 6 concludes the paper with a summary of the main findings and policy recommendations for leveraging trade and FDI to stimulate growth in the MENA region.

2. Literature Review

2.1. Brief on growth models

Early economic growth theories viewed capital accumulation and technological progress as the primary engines of growth. The neoclassical growth model developed by Solow (1956) is an exogenous growth model in which long-run per capita growth is driven by an external factor – technological progress – while capital and labor contribute only to transitional growth and level increases. In Solow's framework, output is produced with capital and labor under diminishing returns, so investing in physical capital (e.g., machinery or FDI inflows) boosts growth temporarily but eventually yields smaller gains. Ultimately, sustained growth in output per worker can only be explained by exogenous technological advancement (the Solow "residual"), which is not modeled and must come from outside the economic system. This implies that policies which increase investment or openness might raise a country's income level and short-run growth rate, but without continual technological improvement, growth will slow as the economy approaches its steady-state. In other words, in traditional neoclassical theory, FDI and trade openness can facilitate capital deepening and efficiency gains, but their long-term growth effect would depend on whether they also augment technological progress (which Solow treats as exogenous).

Endogenous growth models, pioneered in the 1980s and 1990s, relax the Solow model's assumptions by making technological change and innovation an internal outcome of the economy. Researchers like Romer (1986) and Lucas (1988) introduced models where knowledge, human capital, and innovation drive persistent growth with increasing returns to scale. In these models, investments in R&D, education, and new technologies can generate self-sustaining growth because knowledge is only partially rival and can spill over to raise productivity economy-wide. For instance, Romer's endogenous growth model incorporates a technological knowledge stock (an "intangible" capital) that firms accumulate, leading to continuous growth without the need for exogenous tech progress. Schumpeterian models (e.g., Aghion and Howitt 1992) further emphasize innovation through research and creative destruction as the engine of growth, where entrepreneurs invest in new products and processes to gain profits, thereby advancing the technological frontier. Trade openness and FDI take on new importance in endogenous models: they can affect the rate of innovation and knowledge diffusion. For example, an open trading regime

may accelerate technology transfer and innovation adoption from abroad, and FDI by multinational firms can bring managerial know-how and create knowledge spillovers in the host economy. Unlike in the Solow model, policies that influence the incentives to innovate – such as protecting intellectual property, investing in human capital, or encouraging foreign technology inflows – can permanently raise an economy's growth rate in an endogenous growth framework.

It is important to note that real-world development can be influenced by additional perspectives beyond these formal models. In development economics, modernization theory holds that foreign investment and integration into global markets will modernize a developing economy's productive capabilities and spur growth, whereas dependency theory warns that FDI and trade can sometimes lead to exploitation or hinder domestic industrialization if a country remains in a subordinate position (for example, relying on raw commodity exports). These viewpoints underscore that the growth impact of FDI or trade may depend on a country's specific conditions – such as its level of human capital, financial system, institutional quality, or economic structure. The literature reviewed in the following sections reflects both the optimistic and cautious views, with empirical findings that vary across countries and time periods.

2.2. FDI and economic growth

Foreign direct investment is widely hypothesized to promote economic growth through multiple channels. From a theoretical standpoint, FDI represents an inflow of capital that can augment domestic investment and stimulate employment and production. Beyond the immediate capital injection, FDI often brings advanced technology, managerial skills, and access to international markets, which can lead to productivity gains in the host economy. Indeed, endogenous growth models explicitly acknowledge that FDI can elevate efficiency and innovation: by playing the dual role of physical capital in production and a vehicle for new technical knowledge, FDI is expected to have a positive externality effect on the host country's productivity. Zhang (2006) categorizes FDI's growth contributions into four groups: (1) expanding trade (exports and imports) of the host country, (2) adding to national income, capital stock, and employment, (3) transferring management and technical knowledge and upskilling the labor force, and (4) generating technology spillovers and other positive externalities in the economy. These benefits align with modernization theory, which sees FDI as a catalyst for modern economic growth. Empirical research also indicates that FDI tends to be a more stable source of external finance for developing countries (compared to volatile portfolio flows), making it an attractive means to supplement domestic savings.

However, the empirical evidence on FDI's impact is not uniformly positive. While many studies find that FDI inflows correlate with faster GDP growth, especially in countries with conducive environments, others fail to find a significant effect once other factors are controlled. Early influential work suggested that FDI contributes to growth only when host countries have a minimum threshold of human capital or financial market depth to absorb foreign technology (e.g., Borensztein et al. 1998). Recent research indicates the FDI–growth relationship can vary over time and across methodologies. A World Bank survey by Bénétrix et al. (2023) finds that the strong complementary roles of human capital and financial development in facilitating FDI-led growth, which were documented in pre-1990 data, became less evident in the post-1990 period. The nature of FDI itself has changed with globalization – for instance, the rise of global value chains means multinational firms may offshore only certain low-value segments to developing countries, limiting the local technological spillovers. This could partly explain why the growth impact of FDI appears unstable or conditional in newer data.

Indeed, some studies report mixed or even negative effects of FDI under certain conditions. Dependency theorists argue that if FDI flows are concentrated in extractive industries or low-value-added activities, host countries might experience enclave development or outflows of profits that offset the benefits. An empirical example is Sabir et al. (2019), who find a negative correlation between FDI and economic development when FDI leads to trade deficits – i.e., when foreign firms import more inputs than the additional exports they produce, domestic industries can be hurt, and the net growth impact becomes negative. Similarly, Almfraji and Almsafir (2014) caution that excessive FDI could crowd out domestic investment, causing reliance on foreign capital and potential balance of payments strains. Nonetheless, the preponderance of recent evidence leans toward FDI being growth-enhancing in most developing economies, especially when FDI is oriented towards productive manufacturing and when host countries implement policies to maximize knowledge spillovers (such as investing in education and infrastructure to complement FDI). Empirical research in the MENA region supports this qualified optimism. For instance, Ebghaei (2023) conducted a panel study of eight MENA countries over 1980–2020 and found that FDI had a positive and statistically significant impact on economic growth in the region overall. The same study noted that in all individual MENA countries examined except two (Jordan and Iran), increases in FDI were associated with significantly higher GDP growth, consistent with expectations that foreign investment bolsters the capital stock and productivity.

Ritahi et al. (2025) analyze the effects of FDI, human capital, capital formation, domestic credit, and inflation on GDP in 16 MENA countries from 1990 to 2023 using the CS-ARDL model. The study finds that FDI alone does not significantly influence economic growth. However, when interacting with human capital, FDI shows a marginally positive effect, suggesting that its growth-enhancing potential depends on the absorptive capacity of the host economy.

Recent empirical works also emphasize the composition of FDI as a crucial factor. Manufacturing-oriented FDI appears to yield the most growth benefits, whereas FDI into primary sectors (like oil and minerals) or into certain service industries may have less favorable effects. Emako, Nuru, and Menza (2022) analyze 19 developing countries from 2005 to 2018 and show that FDI in manufacturing has a positive and significant influence on economic growth, while FDI in the service sector had a statistically significant negative effect on growth (FDI in primary industries had a negative but negligible effect). These findings suggest that attracting FDI into higher value-added and export-oriented manufacturing can be especially beneficial for host economies, whereas relying on FDI in resource extraction or non-tradable services might not propel growth and could even hinder the development of other sectors. Another study of 90 middle-income countries finds that a 1% increase in FDI inflows is associated with a roughly 0.093 percentage point increase in annual GDP growth on average. Moreover, that study observes an interactive effect whereby FDI's impact on growth is stronger in the presence of improvements in total factor productivity (TFP) – implying that the innovation capacity of the host economy magnifies the gains from FDI. This aligns with the idea that FDI and domestic innovation are complementary: foreign investments can provide new technologies, but economies with better absorptive capacity (higher TFP via skilled labor and R&D) reap larger growth dividends.

Bouchrika and Bardi (2025) employed the Dumitrescu and Hurlin panel causality test to examine heterogeneous relationships between FDI and economic growth from 1980 to 2021. Their findings highlight that FDI significantly drives economic growth in several countries, as evidenced by the rejection of the null hypothesis of non-causality for eight cases. However, the reverse causality—economic growth influencing FDI—was found only for two countries, underscoring the asymmetric nature of these interactions.

Similarly, Ben Yedder and Ellouze (2024) investigated the dynamic relationship between FDI and economic growth across 22 MENA countries between 1985 and 2020, using the Generalized Method of Moments (GMM) alongside the Dumitrescu and Hurlin test. Their results indicate a unidirectional causality running from FDI to economic growth, reinforcing the notion that FDI plays a pivotal role in stimulating economic performance in the region.

The literature over the past decade largely supports a positive long-run effect of FDI on growth in developing regions, while highlighting important caveats. The consensus is that FDI tends to boost growth by raising investment and productivity, provided that host countries have adequate human capital, infrastructure, and policies to harness FDI spillovers. Without these conditions, the growth benefits of FDI may be muted or, in unusual cases, FDI could even be associated with imbalances that detract from growth. Table 1 summarizes selected empirical studies on the FDI–growth nexus across global, MENA, and other developing-country samples.

Table 1: Selected Empirical Studies on the FDI-Growth Nexus

Authors (Year)	Countries (Sample)	Years	Methodology	Main Findings
Ebghaei (2023)	8 MENA countries	1980–2020	Panel cointegration (second-generation)	FDI had a positive and significant impact on GDP growth in the MENA panel as a whole.
Emako et al. (2022)	19 developing countries (Africa, Asia & Latin America)	2005–2018	Dynamic panel GMM	The growth impact of FDI depends on sectoral composition. FDI in manufacturing had a significantly positive effect on growth, whereas FDI in the tertiary (service) sector had a significant negative effect.
Phan Le et al. (2024)	90 middle-income countries (global sample)	1990–2020	Dynamic panel GMM	Found a positive linkage between FDI and growth: a 1% increase in FDI inflows raised economic growth by ~0.093% on average.
Balasubramanyam et al. (1996)	46 developing countries	1970–1985	Cross-sectional OLS	FDI positively impacts growth in countries with export-promotion policies; it has weaker effects in import-substitution economies.
Borensztein et al. (1998)	69 developing countries	1970–1989	Cross-country regression	Positive correlation, contingent on human capital; technology diffusion is key.
De Mello Jr (1999)	32 developed and developing countries	Various	Time-series & panel data	Technology and management improvements attract FDI, but the growth impact is inconclusive.
Dinh et al. (2019)	30 developing countries	2000–2014	Short- & long-run panel analysis	Long-run FDI impact is positive; short-run effect is negative.
Osei & Kim (2020)	62 middle- and high-income countries	1987–2016	Dynamic panel threshold model	FDI promotes growth unless private credit/GDP exceeds 95.6%.
Carkovic & Levine (2002)	72 developed and developing countries	1960 - 1995	Dynamic panel GMM	Weak link between FDI inflows and growth.
Jyun-Yi & Chih-Chiang (2008)	62 countries	1975–2000	Threshold regression analysis	The FDI effect is significant only with high initial GDP and human capital.
Acquah & Ibrahim (2020)	45 African countries	1980–2016	Panel data regression	FDI stimulates growth when infrastructure and human capital are sufficient; it has a negative effect otherwise.

2.3. Trade openness and economic growth

Economic theory has long posited that trade openness – the liberalization of international trade in goods and services – can be a powerful driver of growth. In classical theory, the principle of comparative advantage (Ricardo, 1817) shows that when countries open up to trade, each can specialize in producing what it does relatively more efficiently, thereby increasing overall output and consumption possibilities. Openness to trade enlarges markets, allowing firms to achieve economies of scale and access a greater variety of inputs and technologies from abroad. Higher import competition can also spur domestic firms to become more efficient or innovate. In new growth theory, trade is viewed as a channel for knowledge spillovers and technology diffusion – for example, through imports of high-tech capital goods or learning from foreign buyers. Endogenous growth models by Grossman and Helpman (1991) and others formally include trade as a conduit that can raise the rate of innovation and thus long-run growth. In short, standard economic reasoning predicts a positive net effect of trade openness on aggregate growth, even though there will be distributional winners and losers in the short run. Historical evidence is often cited in support: many high-growth economies (East Asian tigers, China, etc.) followed export-oriented development strategies, whereas highly protectionist economies generally underperformed. Indeed, Panagariya (2004) argues that decades of experience provide strong support for free trade, noting that no credible evidence shows trade liberalization to be harmful for long-term growth.

Empirical studies over the past decade have predominantly found that greater trade openness is associated with higher economic growth, although the magnitude of the effect can vary, and some results have been debated. An extensive 2014 literature survey by Tahir et al. concludes that the "compelling message from [the] literature" is a positive relationship between trade openness and growth, notwithstanding various measurement and methodological issues. For instance, Chandrashekar Raghutla (2020) conducted a panel analysis of five major emerging markets (the BRICS economies) from 1993–2016, finding that trade openness has a "positive and considerable impact" on long-run economic growth. That study also detected that the causality may run both ways in the long run – openness drives growth, and growing economies tend to further open up – but in the short run, it found evidence that growth leads to greater openness (perhaps because higher income allows more imports). The overall finding was unambiguous: trade openness plays a substantial role in promoting growth in those emerging economies. Similarly, research focusing on sub-Saharan Africa and other developing regions often reports positive growth payoffs from trade liberalization. Huchet-Bourdon et al. (2018) examine different measures of openness and find a robust positive link between trade openness and GDP growth in West African countries over time. Their work highlights that how openness is measured can affect the empirical results, but when using comprehensive trade share indices, the positive impact in the ECOWAS West African region is clear. These findings align with the mainstream view that outward-oriented policies tend to foster higher growth, as also reflected in public opinion: surveys show that in many countries, a majority believes trade is beneficial for the economy and job creation, especially where economic performance is strong.

That said, there is also evidence of varied and context-dependent outcomes, which has led to ongoing debate in the literature. Some researchers find that the growth benefits of trade openness are not automatic and may depend on complementary factors – such as macroeconomic stability, labor market flexibility, or the sectoral structure of exports. For example, a study by Onifade et al. (2022) on selected MENA countries yielded the counterintuitive result that trade openness hurt economic growth in those countries during the study period. In their panel analysis (using FMOLS and DOLS methods), greater trade openness was associated with slower growth, whereas domestic investment and labor force growth had positive effects. The authors suggest that in some MENA economies, high openness might have been accompanied by exporting primarily raw commodities and importing most value-added goods, leading to trade imbalances or limited domestic value creation. Their policy recommendation was that MENA countries invest in enhancing productivity and moving up value chains (e.g., exporting more processed goods rather than raw materials) to harness the benefits of trade openness. This illustrates that simply having open trade policies is not a panacea – the quality of a country's trade (what goods are produced and traded) matters for

whether openness translates into growth. Other studies echo this nuance: for instance, some Asian developing countries experienced export-led growth in manufacturing, whereas others that opened up but remained dependent on commodity exports did not see the same gains.
Another dimension is the short-run vs. long-run effects of trade. In the short run, opening to trade can cause disruptions in certain industries and labor markets, potentially hurting growth temporarily if resources cannot be reallocated smoothly (Bacchetta et al., 2021). Over the long run, however, most empirical analyses find either neutral or positive aggregate effects of trade liberalization on growth. For example, an IMF (2021) review finds that while trade can create some losers, its net impact on GDP and productivity is positive in the long term, and that countries with complementary policies (such as education and social safety nets) tend to maximize the inclusive benefits of trade. Furthermore, studies have started examining how trade openness interacts with other factors. One recent finding is that trade openness can enhance technology spillovers: for instance, knowledge flows via trade may improve domestic innovation, which in turn propels growth (this links trade with the innovation topic discussed later). A study by Molepo and Jordaan (2024) suggests that for developed countries, trade openness serves as a carrier of knowledge spillovers that boost productivity – an effect likely relevant for middle-income countries as well.
Pea-Assounga et al. (2023) investigate this nexus using a panel of fifteen Arab oil-exporting countries from 2000 to 2021. Their results suggest that trade openness does not exert a statistically significant impact on GDP growth, indicating that in resource-dependent economies, the benefits of openness may be limited when export structures are concentrated in primary commodities. In contrast, Halmuratov et al. (2024), focusing on Uzbekistan, adopt a Vector Error Correction Model (VECM) to analyze long-term effects from 1990 to 2023. They reveal that while energy consumption positively drives GDP growth, a higher level of trade openness is associated with a decline in GDP per capita, which they attribute to the dominance of imports and the low competitiveness of local industries.

Table 2: Selected Empirical Studies on the Trade Openness-Growth Nexus

Authors (Year)	Countries (Sample)	Years	Methodology	Main Findings
Onifade et al. (2022)	Selected MENA countries	1990s–2017 (panel)	Panel FMOLS & DOLS estimations	In contrast to conventional wisdom, this MENA-region study found that greater trade openness negatively impacted economic growth during the period. While a long-run relationship exists among trade, investment, labor, and GDP, the coefficient on trade openness was significantly negative.
Raghutla (2020)	5 emerging economies (BRICS)	1993–2016	Panel cointegration & causality tests	Confirms a positive long-run relationship between trade openness and GDP growth in major emerging markets.
Huchet-Bourdon et al. (2018)	West Africa (ECOWAS countries)	1980s–2010s (various measures)	Panel econometric analysis (openness indices)	Taking into account improved measures of trade integration, the study finds a robust positive link between trade openness and economic growth in West African nations.
Rani & Kaur (2018)	BRICS	1991–2016	Time series, descriptive & econometric analysis	Trade liberalization post-1991 enhanced growth and reduced poverty via job creation in export sectors.
Majumder et al. (2020)	95 countries	1980–2017	Dynamic panel data, fixed effects model	Trade openness reduces the negative impact of resource abundance (resource curse) on growth.
Fatima et al. (2020)	Developing countries	1980–2014	SGMM dynamic panel estimator	Trade openness and growth have a non-linear relationship; low human capital makes trade openness detrimental.
Tahir & Azid (2015)	Developing countries	Not specified	Various econometric methods	Trade openness has a significant positive impact; price instability harms long-run growth.
Cheung & Ljungqvist (2021)	Panel of countries	Not specified	Panel data, fixed effects linear regression	Trade openness is significantly and positively associated with growth.
Ajayi & Araoye (2019)	Nigeria	1970–2016	Cointegration, Engle-Granger test	Long-run equilibrium relationship between trade liberalization and growth.
Rasoanomenjanahary et al. (2022)	Madagascar	1993–2020	VECM (Vector Error Correction Mechanism)	Trade openness negatively affects growth; other factors (FDI, labor force) contribute positively.
Amar & Ichiro (2023)	Asia (South & East)	75 studies (meta)	Meta-analysis of 748 estimates	Finance significantly enhances growth; evidence of publication bias; stronger finance-growth link in South Asia.
Abdul Jalil et al. (2021)	Panel of countries	1960 - 2019	CCEMG & GMM estimators	Trade openness promotes GDP growth; findings contradict earlier studies that viewed trade restrictions as growth-enhancing.

To conclude this section, empirical studies over the past decade show that FDI and trade openness generally promote economic growth, especially in developing and MENA countries. FDI supports growth by providing capital and technology, but its benefits depend on sectoral allocation, human capital, and institutional quality. Trade openness also fosters growth by enhancing efficiency and market access, though its impact varies with export structure and domestic capacities. Overall, their positive effects are conditional on supportive policies and strong economic fundamentals.

3. Data and Methodology

3.1. Data description and sources

In this study, we analyze a panel of 17 MENA countries over the period 1990–2023. All variables were sourced from the World Bank's World Development Indicators (WDI) database. The selection of countries was guided by data availability, ensuring a consistent time span across key macroeconomic indicators. Panel estimation techniques are employed in order to account for unobserved individual heterogeneity, to capture country-specific effects, and to provide more robust and consistent estimators, as suggested by Baltagi (2005). Given the structure of our dataset—with the time dimension (T = 34) exceeding the cross-sectional dimension (N = 17)—the use of dynamic panel estimators such as the Generalized Method of Moments (GMM) is not considered appropriate. Instead, the Autoregressive Distributed Lag

(ARDL) approach is preferred, particularly in the context of panel settings where T > N, as it allows for heterogeneity in both short-run dynamics and long-run equilibrium relationships across countries.

Table 3: Data Sources and Description

Variable	Description	Source
GDP	Gross Domestic Product (constant 2015 USD)	World Bank (WDI)
Domestic Credit	Domestic credit to private sector (% of GDP)	World Bank (WDI)
FDI	Foreign Direct Investment, net inflows	World Bank (WDI)
GFC	Gross Fixed Capital Formation (% of GDP)	World Bank (WDI)
Inflation	Inflation, consumer prices (annual %)	World Bank (WDI)
Trade Openness	Sum of exports and imports (% of GDP)	World Bank (WDI)

One key limitation of this study concerns data collection, particularly the availability and completeness of information across countries. While the dataset provides extensive coverage, there are notable data gaps for several conflict-affected countries. Political instability, weak institutional capacity, and disruptions in statistical reporting often lead to missing or unreliable data from these regions.

3.2. Cross-sectional dependence test

Before conducting any panel data analysis, it is essential to test for cross-sectional dependence (CSD) to ensure the validity and reliability of the results. This step is particularly crucial in macro-panel datasets, where economic interconnections across cross-sectional units—such as countries—are common and expected. To detect the presence of such interdependencies, we employ both the Lagrange Multiplier (LM) test proposed by Breusch and Pagan (1980) and the Pesaran (2006) CD test. These tests are complementary in identifying cross-sectional correlation across units. Utilizing both allows for a more robust verification of CSD presence, thereby enhancing the credibility of the findings. Ignoring cross-sectional dependence can lead to biased or inconsistent parameter estimates, which may misrepresent the true nature of the underlying relationships.

3.3. Slope heterogeneity test

The slope heterogeneity test, which was conceived by Pesaran and Yamagata (2008) is used to test if the slope coefficients are homogeneous across countries in a panel dataset. The slope test has several advantages over traditional heterogeneity tests, and is believed to be a more accurate representation of heterogeneity in a panel data setting because it considers information about cross-section dependence (CSD) (Khan et al. 2020). Identifying heterogeneity is important in panel datasets because assuming that homogeneity is present may result in poor and invalid results. Given the anticipated dissimilarity in the structures, circumstances, and economies of the panel countries, the slope coefficient for this study will likely differ. In conclusion, testing for slope heterogeneity is an important step in justifying the use of heterogeneous panel models like CCE-PMG.

3.4. Unit root tests

We begin our empirical analysis by conducting panel unit root tests to assess the stationarity properties of the variables before the main estimations. These preliminary tests are essential to determine whether the series exhibits unit roots, which would imply non-stationarity and influence the choice of appropriate econometric techniques. To ensure robustness, we employ multiple panel unit root tests, including the following:

Fisher-type ADF panel unit root test, based on Maddala and Wu (1999) and Choi (2001). This approach, falling among first-generation tests, relies on estimating separate ADF regressions for each country and combining the resulting p-values using four different methods: inverse chi-squared (P), inverse normal (Z), inverse logit (L*), and a modified inverse chi-squared statistic (Pm). While it does not explicitly correct for cross-sectional dependence, the Fisher methodology strengthens test power via p-value aggregation—a meta-analytic approach—accommodating heterogeneity across units and time periods.

Cross-Sectionally Augmented Dickey–Fuller (CADF) test, as developed by Pesaran (2003), was applied. This second-generation test enhances the standard Augmented Dickey–Fuller framework by incorporating cross-sectional averages of both lagged levels and first differences into each country-specific regression. This adjustment mitigates the impact of common shocks and unobserved global components across MENA economies. Individual CADF t-statistics are then combined to compute the standardized Z-t-bar statistic, which, under the null hypothesis of a unit root, follows an approximate normal distribution. By allowing heterogeneous autoregressive dynamics and controlling for cross-sectional dependence, this procedure provides a robust test of non-stationarity when dealing with panel data featuring interrelated units.

3.5. Panel cointegration tests

In this study, we apply two complementary panel cointegration tests following initial unit-root testing to assess whether long-run equilibrium relationships among our variables exist:

First, we employ the Pedroni (1996) panel cointegration test, which investigates the null hypothesis of no cointegration using four within-dimension tests. This method allows for heterogeneous cointegrating vectors across countries and incorporates generalized least squares (GLS) corrections to adjust for individual-specific error term heteroscedasticity and autocorrelation.

Second, we utilize the Westerlund (2007) error correction–based cointegration test, which also evaluates the null of no cointegration but differs by focusing on the adjustment dynamics within each country. A rejection of the null indicates that at least one panel member exhibits a significant error-correction mechanism. Westerlund's procedure accommodates heterogeneity in both the long-run and short-run dynamics across countries.

3.6. Dynamic panel ARDL approach

To investigate the relationship between FDI, trade openness, and economic growth in the MENA region, this study employs a range of econometric techniques that allow for the analysis of both short-run and long-run dynamics, as well as potential cross-sectional dependencies. In particular, the panel ARDL framework developed by Pesaran and Smith (1995) and further extended by Pesaran et al. (1999) is utilized to estimate heterogeneous short-run coefficients and country-specific long-run equilibria. In line with the dynamic panel literature, we implement three complementary estimators to examine the nexus between trade openness, FDI and economic growth in our study: the Mean Group (MG) estimator (Pesaran & Smith, 1995), the Pooled Mean Group (PMG) estimator (Pesaran et al., 1999), and the Dynamic Fixed Effects (DFE) estimator (Weinhold, 1999).
The Mean Group (MG) estimator fits separate regressions for each country and averages the estimated coefficients:

$$y_{it} = \alpha_i + \phi_i(y_{i,t-1} - x'_{it}\beta_i) + \sum_{k=1}^{p_i} \gamma_{ik}\Delta y_{i,t-k} + \sum_{k=0}^{q_i} \delta_{ik}\Delta x_{i,t-k} + u_{it}$$

To address the issue of contemporaneous correlation across countries—which may arise due to global shocks or regional spillovers—we apply the Common Correlated Effects Pooled Mean Group (CCE-PMG) and the Common Correlated Effects Mean Group (CCE-MG) estimators (Pesaran, 2006).

$$\Delta y_{it} = \phi_i(y_{i,t-1} - x'_{it}\beta_i) + \sum_{\ell} \delta_{i\ell}\bar{z}_{t-\ell} + \cdots + u_{it}$$

These estimators are robust to cross-sectional dependence and account for unobserved common factors.

4. Results

Across our MENA sample, the Gross Domestic Product (GDP) variable shows a mean value of 25.05 and a median of 24.84, with a modest standard deviation of 1.03. These figures suggest a relatively consistent level of economic output among the countries over the period reviewed. The slight positive skewness (0.26) and nearly normal kurtosis (2.15) further indicate the absence of significant outliers, implying most countries share similar GDP performance with only a few marginally higher observations.
Foreign Direct Investment (FDI) displays a mean of 20.59 and a higher dispersion (std. dev. 3.48), alongside pronounced negative skewness (–4.82) and extreme kurtosis (28.76). This pattern reflects a situation where several countries attract average to high levels of investment, but a select few experience persistently low FDI inflows—significantly pulling the distribution tail downward.

Fig. 1: GDP and Trade Openness Trends by Country.

The distribution of Trade Openness, with a mean of 3.58 and a median of 3.66, aligns with moderate trade integration across the region. Nevertheless, its marked negative skew (–6.48) and exceptional kurtosis (64.14) reveal that certain countries are markedly more closed to trade, diverging substantially from the group norm. This discrepancy shows that, whereas MENA countries as a whole show a steady trade pattern, there are still some outliers with low levels of openness.

Table 4: Descriptive Statistics of the Variables

Variable	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis
GDP	25.05	24.84	27.39	22.97	1.03	0.26	2.15
Domestic Credit	3.41	3.61	4.93	0.24	0.86	-0.94	3.29
FDI	20.59	21.21	24.18	0.00	3.48	-4.82	28.76
GFC	3.18	3.22	4.08	0.20	0.40	-1.35	9.28
Inflation	4.69	4.67	6.21	4.27	0.17	3.04	22.17
Trade Openness	3.58	3.66	4.62	-4.56	0.75	-6.48	64.14

The correlation analysis provides preliminary insights into the linear relationships among the key macroeconomic variables examined in this study. As expected, GDP exhibits relatively weak correlations with most of the explanatory variables. Specifically, it shows a slight positive correlation with FDI (0.1737) and GFC (0.1107), suggesting that increases in foreign investment and capital formation are modestly associated with higher output. However, the negative correlation between GDP and Domestic Credit (–0.1844) implies that an expansion in private sector credit is weakly associated with lower GDP levels, potentially reflecting inefficiencies in credit allocation or structural rigidities in some countries.
The strongest association in the matrix is observed between GDP and Trade Openness, where the correlation is notably negative (–0.3925). This counterintuitive relationship may reflect that more open economies in the region face external vulnerabilities or structural constraints that limit the growth benefits of trade liberalization. On the other hand, Trade Openness shows a moderate positive correlation with Domestic Credit (0.3203), indicating that financially more liberalized economies also tend to be more open to trade.

Table 5: Correlation Analysis

	GDP	Domestic Credit	FDI	GFC	Inflation	Trade Openness

GDP	1.0000					
Domestic Credit	-0.1844	1.0000				
FDI	0.1737	0.0421	1.0000			
GFC	0.1107	0.2326	0.0434	1.0000		
Inflation	0.0857	-0.2464	0.0503	-0.0345	1.0000	
Trade Openness	-0.3925	0.3203	0.0749	0.0041	-0.1610	1.0000

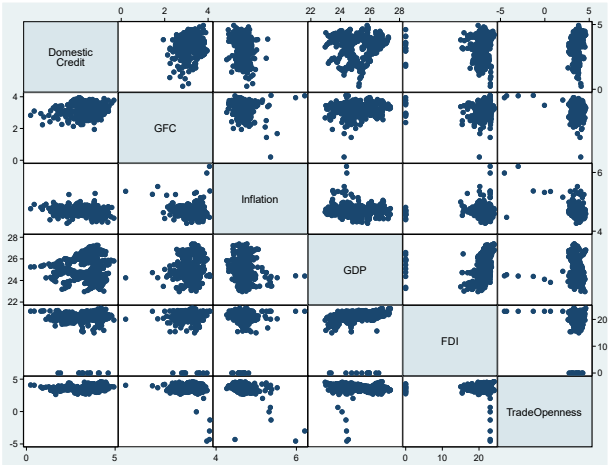

Fig. 2: Matrix Scatter Plot.

The results of the Cross-Sectional Dependence (CD) test reveal strong evidence of cross-sectional correlation among all variables under study. Specifically, the CD statistics are statistically significant at the 1% level for GDP (CD = 51.206), Domestic Credit (CD = 19.457), FDI (CD = 7.963), GFC (CD = 5.943), Inflation (CD = 17.671), and Trade Openness (CD = 11.762), with all corresponding p-values equal to 0.000. These findings suggest that the behavior of each variable in one country is not independent of the behavior of the same variable in other countries—reflecting the presence of interdependencies across the panel. As such, econometric approaches that account for cross-sectional dependence, such as the Common Correlated Effects (CCE) estimators or second-generation panel unit root and cointegration tests, are necessary to ensure the robustness and validity of the empirical findings.

Table 6: Cross-Sectional Dependence Test Results

Variable	CD-test	p-value
GDP	51.206	0.000
Domestic Credit	19.457	0.000
FDI	7.963	0.000
GFC	5.943	0.000
Inflation	17.671	0.000
Trade Openness	11.762	0.000

The slope heterogeneity test results, based on the methodology of Pesaran and Yamagata (2008), provide strong evidence of heterogeneous slope coefficients across countries in the panel. Both statistics are statistically significant at the 1% level since the p-value of both tests is less than 1%, leading to the rejection of the null hypothesis of slope homogeneity.

Table 7: Slope Heterogeneity Test Results

Test	Delta	p-value
Unadjusted	15.825	0.000
Adjusted	18.091	0.000

The results of the panel unit root tests using both the CADF (Cross-sectionally Augmented Dickey-Fuller) and Fisher-type tests indicate that most variables are non-stationary at the level but become stationary after first differencing, suggesting they are integrated of order one, I(1). For the CADF test, GDP, Domestic Credit, GFC, Inflation, and Trade Openness all exhibit non-significant statistics at the level (with p-values above 5%), but become statistically significant at the 1% level after first differencing, indicating rejection of the null hypothesis of non-stationarity. FDI, however, is already stationary at a level in the CADF test, confirming it as I(0). Similarly, the Fisher test corroborates these findings: for GDP, Domestic Credit, GFC, Inflation, and Trade Openness, the Z-statistics at level are mostly insignificant or even positive (e.g., GDP = 3.17, p = 1.00), while at first difference they show highly significant negative Z-statistics (e.g., GDP = -17.22, p = 0.00), confirming stationarity in first differences. Again, FDI is stationary at a level with a strongly significant Z-statistic (-14.43, p = 0.00). Consequently, it is essential to conduct cointegration tests between real GDP, trade openness, and FDI in order to examine the potential existence of a long-run equilibrium relationship between the variables within the context of the study.

Table 8: Unit Root Test Results

Variable	CADF Test				Fisher test			
	Level		First Difference		Level		First Difference	
	Z[t-bar]	p-value	Z[t-bar]	p-value	Z	p-value	Z	p-value
GDP	0.57	0.72	-3.00	0.00	3.17	1.00	-17.22	0.00
Domestic Credit	0.56	0.71	-3.92	0.00	0.03	0.51	-14.46	0.00
FDI	-3.87	0.00	-7.04	0.00	-14.43	0.00	-28.82	0.00
GFC	2.32	0.99	-3.15	0.00	-2.84	0.00	-14.83	0.00
Inflation	0.15	0.56	-6.55	0.00	-12.13	0.00	-24.99	0.00
Trade Openness	0.34	0.63	-3.94	0.00	-2.28	0.01	-16.21	0.00

Before getting Panel ARDL model results, we've estimated the regression results from the three panel data models—Pooled OLS, Fixed Effects (FE), and Random Effects (RE)—to get first insights into the determinants of economic growth (measured by the log of GDP) across 15 countries, with a focus on five explanatory variables: Domestic Credit, Foreign Direct Investment (FDI), Gross Fixed Capital Formation (GFC), Inflation, and Trade Openness.

FDI consistently shows a positive and significant impact on economic growth across all three models. In the Pooled OLS model, FDI has a relatively strong coefficient (0.057, significant at 1%), while the magnitude is smaller but still statistically significant (at 5%) in the FE and RE models (0.011 and 0.012, respectively). These results highlight how foreign investment improves the sample countries' economic capabilities.

As for Trade Openness, the results are notably divergent. In the Pooled OLS model, the coefficient is negative and highly significant (–0.953), suggesting that higher openness is associated with lower growth when heterogeneity is not controlled. However, in the FE model, the coefficient becomes positive and significant at the 5% level (0.192), indicating that once time-invariant country characteristics are accounted for, openness contributes positively to growth. In the RE model, the coefficient remains positive (0.141) but loses significance.

Regarding model selection, the Hausman test yields a large statistic (736.39) with a p-value of 0.000, indicating a strong rejection of the null hypothesis that the RE estimator is consistent. Therefore, the Fixed Effects model is preferred, as it better accounts for unobserved heterogeneity across countries.

Table 9: Baseline Panel Data Models Analysis

Variable	Pooled OLS	Fixed Effects	Random Effects
Domestic Credit	-0.135**	0.359***	0.341***
	(0.061)	(0.039)	(0.039)
FDI	0.057***	0.011**	0.012**
	(0.012)	(0.005)	(0.005)
GFC	0.364***	0.103	0.127
	(0.124)	(0.079)	(0.079)
Inflation	-0.053	-0.197	-0.182
	(0.381)	(0.160)	(0.163)
Trade Openness	-0.953***	0.192**	0.141
	(0.114)	(0.091)	(0.091)
Constant	27.041***	23.548***	23.678***
	(1.930)	(0.821)	(0.858)
Hausman Test		736.39	
Hausman p-value		0.000	
R-squared (within)	—	0.235	0.234
No. of Observations	447	447	447
No. of Groups	—	17	17

The results of both the Pedroni and Westerlund panel cointegration tests suggest no strong evidence of a long-run cointegration relationship among the variables in the panel. In the Pedroni test, none of the four statistics are statistically significant at conventional levels. The Modified Variance Ratio and Modified Phillips-Perron t-statistics report p-values of 0.2182 and 0.1035, respectively, while the Phillips-Perron t-statistic and the Augmented Dickey-Fuller (ADF) t-statistic have marginal or high p-values (0.0849 and 0.4611), indicating that the null hypothesis of no cointegration cannot be rejected. Similarly, the Westerlund test statistics (Gt, Ga, Pt, and Pa) all yield high p-values and robust p-values (e.g., 0.905 and 0.610 for Gt; 1.000 and 0.993 for Ga), further reinforcing the absence of a statistically significant cointegration relationship.

Table 10: Pedroni Cointegration Test Results

Statistic	Value	P-value
Modified Variance Ratio	-0.7783	0.2182
Modified Phillips-Perron t	1.2621	0.1035
Phillips-Perron t	-1.3731	0.0849
Augmented Dickey-Fuller t	0.0978	0.4611

Table 11: Westerlund Cointegration Test Results

Statistic	Value	Z-value	P-value	Robust P-value
Gt	-1.632	1.308	0.905	0.610
Ga	-1.760	4.422	1.000	0.993
Pt	-2.759	2.764	0.997	0.873
Pa	-0.779	2.826	0.998	0.915

As previously mentioned, the panel ARDL approach is suitable for capturing both long-run and short-run dynamics, even in the presence of non-stationary variables that are not cointegrated. In this study, three estimation techniques are employed to implement the panel ARDL framework: the Pooled Mean Group (PMG), the Mean Group (MG), and the Dynamic Fixed Effects (DFE) estimators (Asteriou et al. 2021).

In the long run, the PMG and DFE models generally show consistent and statistically significant relationships for several variables, while the MG model displays greater variation, reflecting its allowance for heterogeneity across countries. Specifically, FDI exerts a significant positive effect on economic growth in both the PMG (0.064, $p < 0.01$) and DFE (0.039, $p < 0.1$) models, supporting the view that foreign investment contributes to long-term growth by enhancing capital accumulation and technology transfer. However, the MG model reports an insignificant coefficient for FDI (0.014), suggesting country-specific disparities in its growth effects.

GFC (Gross Fixed Capital Formation) is also shown to be a key long-run driver of growth. In the PMG and DFE estimations, their coefficients are positive and statistically significant (0.711 and 0.859, both $p < 0.01$), indicating that increased investment in fixed assets supports economic expansion. Conversely, the MG model returns a large negative and insignificant coefficient (–2.801), which could reflect heterogeneity in capital efficiency or misallocation across the countries.

Inflation demonstrates mixed results across models. It has a significant positive effect on the PMG estimation (0.764, $p < 0.05$), suggesting moderate inflation might signal demand-driven growth. However, it is negative and insignificant in the DFE model and significantly negative (though insignificant) in the MG model (–3.887), indicating potential instability or country-specific inflation-growth dynamics.

The long-run coefficient for Trade Openness is positive and highly significant in the PMG model (0.884, $p < 0.01$), implying that greater integration into global markets supports economic growth. This effect is weaker and insignificant in the DFE model (0.233) and negative in the MG model (–0.577), again highlighting substantial cross-country differences.

The error correction terms in all three models are negative and statistically significant, confirming the existence of a long-run equilibrium relationship and a stable adjustment mechanism. The PMG model reports an adjustment coefficient of –0.048 ($p < 0.01$), while the MG and DFE models yield values of –0.111 and –0.066, respectively, also significant at the 1% level. These suggest that deviations from long-run equilibrium are corrected over time, though at differing speeds.

In the short run, Domestic Credit consistently shows a negative and statistically significant impact across all models (PMG: –0.106, MG: –0.129, DFE: –0.089), indicating that short-term increases in credit may be associated with inefficiencies or financial instability. GFC has a positive and marginally significant short-run impact in the PMG and MG models (0.038 and 0.048), whereas it is insignificant in the DFE model. Interestingly, Trade Openness only shows a significant short-run impact in the DFE model (0.126, $p < 0.01$), suggesting that trade dynamics may influence short-term growth under more constrained assumptions.

Table 12: Panel ARDL Estimation Results

	Variable	PMG	MG	DFE
Long Run	Domestic Credit	0.005 (0.066)	1.564 (1.915)	-0.138 (0.152)
	FDI	0.064*** (0.014)	0.014 (0.051)	0.039* (0.020)
	GFC	0.711*** (0.121)	-2.801 (3.020)	0.859*** (0.291)
	Inflation	0.764** (0.338)	-3.887 (2.916)	-0.656 (0.671)
	Trade Openness	0.884*** (0.194)	-0.577 (0.914)	0.233 (0.301)
Error Correction		-0.048*** (0.017)	-0.111*** (0.042)	-0.066*** (0.010)
Short Run	ΔDomestic Credit	-0.106** (0.045)	-0.129*** (0.044)	-0.089*** (0.017)
	ΔFDI	0.000 (0.002)	-0.000 (0.001)	-0.001 (0.001)
	ΔGFC	0.038* (0.023)	0.048** (0.023)	0.014 (0.021)
	ΔInflation	-0.047 (0.031)	-0.012 (0.027)	-0.004 (0.033)
	ΔTrade Openness	-0.008 (0.022)	-0.041 (0.035)	0.126*** (0.031)
	Constant	0.738*** 0.250)	2.471** (1.191)	1.645*** (0.328)

As previously noted, the PMG estimator is considered the most appropriate for this study. It allows for country-specific short-run dynamics while assuming homogeneity in the long run. PMG is especially suitable for small panels, such as ours with 14 countries, due to its robustness against outliers and its ability to address serial autocorrelation (Pesaran et al., 1999). The use of panel ARDL with sufficient lags also helps mitigate endogeneity issues (Pesaran & Smith, 1999).

This estimator is valid only if the long-run homogeneity assumption holds—an outcome confirmed by the results in Table 5, Panel B, and supported by the Hausman test, which favors PMG over alternative models. The I(0) residuals further confirm the validity of the regressions. However, a key limitation of the ARDL approach is its neglect of contemporaneous cross-country correlations caused by unobserved common factors. The presence of significant cross-sectional dependence, as indicated by the Pesaran CD test, suggests that ignoring such correlations can reduce estimation efficiency. This issue is expected to be addressed through the adoption of the Common Correlated Effects (CCE) models.

In the long run, Foreign Direct Investment (FDI) demonstrates a positive and statistically significant effect on economic growth under both models. The coefficient is 0.03 ($p < 0.01$) in the CCE-PMG and 0.005 ($p < 0.05$) in the CCE-MG, confirming that FDI serves as a reliable driver of growth across the panel. Similarly, Trade Openness is positively associated with growth in both models, with coefficients of 0.03 ($p < 0.01$) and 0.103 ($p < 0.01$), respectively. These results underscore the importance of open trade regimes and capital inflows in stimulating long-run economic expansion in the sample countries.

By contrast, Domestic Credit, Gross Fixed Capital Formation (GFC), and Inflation do not exhibit statistically significant effects in the long run across either model. This suggests that while these variables may play important roles in the short term or in country-specific contexts, their long-run influence on economic growth is more ambiguous or potentially mediated by other structural factors.

In the short run, Domestic Credit shows a consistent and significant negative effect on growth in both models (–0.111 in CCE-PMG and –0.129 in CCE-MG), which suggests that, in many cases, credit allocation was inefficient, subject to weak regulation, or distorted by state intervention according to Falahaty and Hook (2013). GFC only has a significant effect in the CCE-MG model (0.048, $p < 0.05$), highlighting possible heterogeneity in investment effectiveness across countries. Other variables, including FDI, inflation, and trade openness, are statistically insignificant in the short term under both models.

Table 13: Panel ARDL Estimation - with Common Correlated Effect

	Variable	CCE-PMG	CCE-MG
Long run	Domestic Credit	0.023 (0.067)	0.001 (0.025)
	FDI	0.03*** (0.004)	0.005** (0.002)
	GFC	-0.062 (0.076)	0.020 (0.024)
	Inflation	0.098 (0.195)	-0.038 (0.057)
	Trade Openness	0.03*** (0.0054)	0.103*** (0.032)

Short run	ΔDomestic Credit	-0.111** (0.047)	-0.129*** (0.044)
	ΔFDI	-0.001 (0.001)	-0.001 (0.001)
	ΔGFC	0.014 (0.031)	0.048** (0.023)
	ΔInflation	0.023 (0.030)	-0.012 (0.027)
	ΔTrade Openness	-0.007 (0.041)	-0.041 (0.035)
Statistic			
CD statistic (p-value)		1.80 (0.0711)	0.26 (0.7944)
Number of groups		17	17

The Cross-Sectional Dependence (CD) test statistics provide additional validation. The CCE-MG model reports a CD statistic of 0.26 (p = 0.7944), suggesting weak or no residual cross-sectional dependence and confirming the effectiveness of the CCE correction. The CCE-PMG model shows a higher CD statistic (1.80, p = 0.0711), indicating marginal cross-sectional dependence, though not at a strongly significant level.

5. Discussion

The empirical results from this study underscore the complex but largely positive relationship between foreign direct investment (FDI), trade openness, and economic growth in MENA countries over the period 1990–2023. Using advanced panel data techniques, including PMG, MG, DFE, and common correlated effect (CCE) estimators, we find robust evidence that FDI and trade openness contribute positively to long-term economic performance, albeit with significant variation across models and countries.

The study's findings on FDI are consistent with the theoretical expectation that foreign investment enhances economic growth through both capital deepening and knowledge spillovers. In particular, FDI shows a significant and positive long-run effect on GDP in the PMG and CCE-PMG models, reinforcing the idea that FDI serves not merely as a financial inflow but also as a transmission mechanism for technological diffusion, managerial expertise, and global market integration. This aligns with the broader theoretical frameworks discussed by Zhang (2006) and endogenous growth models, which posit that FDI can play a dual role—as capital input and as a vector of innovation. Empirically, our results support the conclusions of Borensztein et al. (1998), who argue that FDI fosters growth when host countries have sufficient human capital to absorb foreign technologies.

However, our findings also reveal heterogeneity. In the MG estimator, which allows for full heterogeneity across countries, the FDI coefficient is positive but not statistically significant. This reflects the diversity in institutional frameworks, sectoral FDI allocation, and absorptive capacities across MENA countries. It resonates with the conclusions of Bruno and Campos (2021), who found that FDI's growth-enhancing effects have become less systematic in the post-1990 period, possibly due to the fragmentation of global value chains and the rise of enclave investments. In some cases, especially when FDI is concentrated in extractive sectors, the anticipated productivity gains and spillovers may be limited or even negative—as argued by Sabir et al. (2019) and Almfraji and Almsafir (2014).

This underscores the importance of the sectoral composition of FDI. The results from Emako et al. (2022) provide strong evidence that FDI in manufacturing significantly enhances growth, while FDI in services or primary sectors may have neutral or negative effects. The findings of this study (while not sectorally disaggregated) suggest that the MENA countries in the panel may be attracting more productive types of FDI, especially in infrastructure and tradable sectors, as indicated by the overall positive long-run effects. However, the short-run impact of FDI is found to be statistically insignificant across most models, suggesting that FDI-led growth is more of a gradual, cumulative process than an immediate stimulus.

Trade openness is another key variable that exhibits a positive and significant impact on economic growth in the long run, especially in the CCE estimators that correct for cross-sectional dependence. This finding confirms the classical and endogenous growth theories that link trade liberalization with enhanced efficiency, market expansion, and technology transfer. The positive effect of trade openness also corroborates empirical evidence from studies such as Raghutla (2020) on BRICS countries and Huchet-Bourdon et al. (2018) on West African nations. These studies emphasize that open trade regimes can be powerful growth drivers, provided they are supported by sound macroeconomic and institutional conditions.

Nonetheless, the presence of mixed signs in other estimators (notably, a negative coefficient in the pooled OLS model) suggests that trade openness does not universally yield growth dividends. This nuanced result is echoed by Onifade et al. (2022), who found that in some MENA countries, greater trade openness was associated with weaker economic performance. A possible explanation, relevant to the MENA context, is that several countries in the region rely heavily on commodity exports while importing high-value-added goods. This pattern of trade can result in persistent trade deficits and limit the development of domestic industries, thereby diluting the growth effects of openness. This duality highlights the importance of quality over quantity in trade. As the literature suggests, the nature of exported and imported goods, the degree of diversification, and integration into global value chains are all critical determinants of whether trade contributes positively to growth. For MENA countries, policies that promote export diversification, support high-value manufacturing, and reduce dependence on raw material exports are essential to reap the full benefits of openness.

When comparing this study's results to earlier empirical works, it becomes evident that the impact of FDI and trade openness on growth is conditional, rather than automatic. The effectiveness of FDI depends on a country's absorptive capacity, institutional stability, and targeted sectoral policies. Similarly, the gains from trade openness are amplified in economies that are institutionally robust, diversified, and capable of scaling up value-added exports.

UNCTAD identifies a significant rise in FDI into the digital economy (14% annual growth in ICT manufacturing, digital services, and semiconductors), and OECD reports that greenfield investment in renewable energy rose from a mere 1% in 2003 to 26% in 2023, while digital industry FDI grew from 12% to 22%. Moreover, IMF analysis notes that global green FDI tripled as a share of GDP between 2014 and 2022. These shifts suggest that MENA countries—particularly those launching green energy and digital infrastructure initiatives—could derive stronger growth and ESG benefits if they can attract such "smart," sustainable investments.

Similarly, digital trade is emerging as a powerful engine of growth. Digitally delivered services accounted for over US $3.8 trillion in exports in 2022—about 54% of total global services trade and 12% of all goods and services exports—growing at 8.1% annually since 2005, outpacing traditional goods and services exports. However, many developing countries are underrepresented in digital trade due to

infrastructure and regulatory gaps. As MENA nations continue digital transformation (e.g., Egypt's Digital Egypt strategy and growing ICT market), integrating digital trade policy could amplify their growth prospects and trade performance.

6. Conclusion

This study investigated the relationship between economic growth and key macroeconomic variables—foreign direct investment (FDI), domestic credit, trade openness, inflation, and gross fixed capital formation (GFC)—across 15 MENA countries over the period 1990–2023, employing a comprehensive panel data econometric approach. Using multiple estimators, including Pooled Mean Group (PMG), Mean Group (MG), Dynamic Fixed Effects (DFE), and advanced techniques such as Common Correlated Effects estimators (CCE-PMG and CCE-MG), the study accounted for both short-run dynamics and long-run equilibrium relationships while controlling for heterogeneity and cross-sectional dependence.

The empirical findings highlight several key insights. First, FDI and trade openness exhibit robust and statistically significant positive effects on economic growth in the long run across most estimators. This confirms that outward-oriented policies and a favorable investment climate are essential for sustained growth in the MENA region. Conversely, domestic credit presents a nuanced picture: while its long-run effects are generally weak or ambiguous, short-run coefficients suggest a negative and statistically significant relationship with growth, potentially reflecting inefficiencies in credit allocation or weaknesses in the financial sector.

Additionally, gross fixed capital formation shows strong long-run significance in some models (PMG and DFE), reaffirming the critical role of investment in infrastructure and productive capacity. Inflation does not exhibit consistent effects, suggesting that its growth implications may be context-dependent or subject to threshold dynamics not captured in the linear framework.

From a policy standpoint, the results underscore the importance of strengthening regional frameworks that promote FDI and liberalize trade. Governments should continue to improve the legal and institutional environments for foreign investors, reduce bureaucratic barriers, and ensure political stability. Regional integration initiatives, such as preferential trade agreements and harmonized customs procedures, should be deepened to foster intra-regional trade and external competitiveness.

At the same time, financial sector reforms are necessary to enhance the efficiency of credit allocation. Policymakers should focus on improving banking supervision, expanding access to credit for productive enterprises (particularly SMEs), and fostering financial inclusion. The observed short-run negative effect of credit suggests that without targeted and well-regulated lending mechanisms, financial development may not translate into growth-enhancing outcomes.

Moreover, investment in infrastructure and public capital should be prioritized, especially given the positive role of the GFC in stimulating long-term growth. Public-private partnerships can be an effective vehicle to close investment gaps, provided transparency and accountability are maintained.

Finally, while inflation was not a consistent determinant of growth, prudent macroeconomic management remains crucial to maintaining stable price levels, which indirectly supports investor confidence and consumption.

7. List of countries

Algeria
Bahrain
Egypt, Arab Rep.
Iran, Islamic Rep.
Iraq
Jordan
Kuwait
Lebanon
Libya
Morocco
Oman
Qatar
Saudi Arabia
Syrian Arab Republic
Tunisia
United Arab Emirates
Yemen, Rep.

8. Conflicts of Interest

The authors declare no conflict of interest.

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