FINANCIAL DEVELOPMENT, FINANCIAL ACCESS, AND ECONOMIC GROWTH IN SELECTED MENA COUNTRIES: EVIDENCE FROM A DYNAMIC PANEL ANALYSIS

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Abstract
This study examines the short-run associations between financial development, financial access, and economic growth in Algeria, Egypt, Kuwait, Morocco, and Tunisia during 2004–2024. Financial depth and physical access to banking services are measured using separate indices constructed through principal component analysis. Using a balanced panel of five countries, the study estimates a dynamic fixed-effects model with country and year effects and Driscoll–Kraay standard errors. The findings indicate a negative association between changes in financial development and real GDP growth, while changes in financial access and gross capital formation exhibit positive associations. Sensitivity analyses excluding 2020 and Kuwait preserve the directions of these associations, although statistical significance weakens when Kuwait is excluded. The results highlight differences between financial depth and physical banking access, while the small sample, potential endogeneity, and measurement limitations preclude causal interpretations. The study offers cautious evidence on financial–growth relationships in selected MENA economies.

Keywords
Economic Growth; Financial Access; Financial Development; MENA Countries; Dynamic Panel Model.

JEL Classification
C23; G21; O16; O47.

Introduction

Financial systems influence economic performance by mobilizing savings, facilitating investment, reducing financing constraints, and directing resources towards productive activities. While the traditional finance–growth literature focused mainly on financial depth and the expansion of banking activity, recent policy and academic debates have increasingly emphasized financial inclusion. This shift reflects the view that the contribution of finance depends not only on the size of the financial system but also on

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whether households and firms can effectively access and use formal financial services. Financial development and financial inclusion may therefore represent complementary, but conceptually distinct, dimensions of the financial system (Levine, 2005; Saha et al., 2023; Cavallaro and Villani, 2022).

This question is especially relevant to the Middle East and North Africa (MENA), where financial reforms, banking modernization, and the expansion of digital financial services have not been accompanied by equally consistent economic growth. Countries in the region differ substantially in banking depth, access to financial services, institutional capacity, and the allocation of credit between productive and consumption-oriented activities. Consequently, the expansion of finance may not generate similar economic outcomes across countries, and increases in financial depth or access cannot automatically be interpreted as improvements in the efficiency of financial intermediation.

Empirical research has not produced a settled conclusion. Several studies report that financial development or inclusion enhances growth by easing financing constraints and supporting investment, whereas others identify weak, insignificant, or negative effects when finance is excessive, poorly regulated, or directed towards low-productivity uses (Azimi, 2022; Khan et al., 2022; Chehayeb and Taher, 2024; Odame et al., 2024). These differences suggest that the finance–growth relationship is context-dependent and may vary according to measurement, country characteristics, institutional conditions, and the distinction between short- and long-run effects.

Important limitations also remain in the literature. Financial development and financial access are frequently examined separately, despite representing distinct dimensions of financial systems. In addition, many studies rely on individual banking indicators that capture only limited aspects of financial depth or access to formal financial services. Evidence for selected MENA economies based on recent observations remains relatively limited, particularly regarding the joint association of these financial dimensions with economic growth and the sensitivity of empirical findings to common macroeconomic shocks and differences in country composition. These limitations motivate an analysis that distinguishes financial depth from physical banking access and focuses on short-run associations rather than imposing a common long-run equilibrium relationship.

Accordingly, this study investigates the associations between financial development, physical banking access, and economic growth in Algeria, Egypt, Kuwait, Morocco, and Tunisia over the period 2004–2024. Two separate indices are constructed using Principal Component Analysis (PCA): a Financial Development Index (FDEV), reflecting banking-sector depth, and a Financial Access Index (FAI), capturing the physical availability of banking services through automated teller machines and commercial bank branches. The empirical analysis employs a dynamic fixed-effects panel model with country and year effects and Driscoll–Kraay standard errors to examine the relationships between changes in financial indicators and annual economic growth. Additional specifications excluding 2020 and Kuwait are estimated to assess the sensitivity of the results to major shocks and sample composition.

The study contributes to the finance–growth literature in three respects. First, it distinguishes banking-sector depth from physical access to banking services by constructing separate PCA-based indices, thereby avoiding the treatment of financial access as a comprehensive measure of financial inclusion. Second, it provides updated

empirical evidence on the short-run associations between these financial dimensions and economic growth in five structurally diverse MENA economies over 2004–2024. Third, it examines the sensitivity of the estimated relationships to the exclusion of the COVID-19 shock year and Kuwait, whose hydrocarbon-dependent economic structure differs from that of the North African countries in the sample. The findings are interpreted as conditional associations rather than causal effects, given the limited sample size and potential endogeneity of financial variables. The findings may clarify whether the expansion and accessibility of financial systems have translated into stronger growth or whether the effectiveness of finance continues to depend on the productive allocation of financial resources. The remainder of the paper reviews the relevant literature, presents the data and methodology, reports and discusses the empirical findings, and concludes with policy implications.

1. Review of the scientific literature

The theoretical finance–growth argument maintains that financial systems can foster economic growth by mobilizing savings, producing information about investment opportunities, facilitating risk management, and allocating capital efficiently (McKinnon, 1973; King and Levine, 1993; Levine, 2005). Financial inclusion broadens these mechanisms by integrating previously underserved households and firms into formal financial markets. Broader access can enlarge the savings base, ease credit constraints, and support entrepreneurship. These benefits are not automatic, however, because financial expansion may have limited or adverse consequences when credit is allocated to consumption, speculative activities, or inefficient investment rather than productive uses.

A large part of the recent evidence supports a positive financial inclusion–growth relationship. Saha, Qin and Inaba (2023), using a composite index and dynamic panel estimation for 104 developing countries, found that inclusion was particularly beneficial where access to formal finance created new opportunities for lower-income groups. Azimi (2022) similarly reported positive effects across global, regional, and income-based samples, together with bidirectional causality. Using a PCA-based index and panel ARDL methods, Jima and Makoni (2023) identified a long-run relationship between financial inclusion and growth in Sub-Saharan Africa. Khan et al. (2022) also found positive long-run effects in G20 countries, although their short-run estimates were weaker. Collectively, these findings indicate that the growth benefits of inclusion may emerge gradually as improved access is converted into savings, investment, and productive activity.

The magnitude of these effects nevertheless differs across financial and economic conditions. Siddiki and Bala-Keffi (2024) showed that the impact of inclusion changes across thresholds of financial development, income groups, regions, and economic fragility. Hussain et al. (2024) also found that its positive long-run effect was stronger in developing Asian countries than in developed economies. Regarding financial development more broadly, Cavallaro and Villani (2022) concluded that finance supports growth mainly when financial systems are inclusive, efficient, and resilient; its marginal effect may become negative in financially mature economies and remain insignificant in economies trapped on low-growth paths. Thus, additional finance produces different

outcomes depending on financial maturity, institutional capability, and the economy's capacity to direct resources towards productive sectors.

Other findings challenge the assumption of an inherently positive relationship. Chehayeb and Taher (2024) reported no significant effect of a multidimensional financial inclusion index on growth in 13 MENA countries, although economic growth appeared to encourage inclusion. Odame, Appiah and Gyimah (2024) found a negative relationship between financial access and growth in Ghana, with the results varying across access and penetration measures. Isiaka et al. (2021) likewise documented a robust negative effect of financial depth in middle-income economies, suggesting that credit expansion does not necessarily support growth when funds are not channelled into productive investment. These results emphasize that the quality and allocation of finance may be more important than its quantity. Theoretically, financial deepening may support growth by mobilising savings and financing productive investment, but excessive credit expansion, misallocation, and financial instability may weaken this relationship. Accordingly, the expected association between banking-sector depth and growth is ambiguous, whereas greater physical financial access may facilitate economic activity without necessarily ensuring productive financial use.

Further evidence challenges the assumption that financial deepening invariably promotes economic growth. Arcand et al. (2015) identify a non-linear relationship, finding that the association between private-sector credit and output growth becomes negative when credit exceeds approximately 100% of GDP. Rousseau and Wachtel (2011) document a weakening of the positive finance–growth relationship in more recent periods, emphasizing the potential consequences of financial crises and excessive credit expansion. In the MENA region, Ben Naceur and Ghazouani (2007), examining 11 countries, find no significant positive relationship between financial development and economic growth, while banking development is negatively associated with growth after controlling for stock market development. These findings reinforce the importance of distinguishing financial expansion from its productive contribution to economic activity, although the present study does not directly test non-linear thresholds or credit-allocation mechanisms.

Recent evidence from MENA economies further highlights the importance of institutional conditions and the measurement of financial inclusion. Boukhatem and Ben Moussa (2025), examining 16 MENA countries over 1997–2018, find no statistically significant direct effect of financial inclusion on economic growth, while reporting a positive long-run relationship between institutional quality and growth. Similarly, Boussaidi and Hakimi (2025), using a sample of 12 MENA countries over 2004–2021, find that financial inclusion does not exert a statistically significant direct effect on economic growth, whereas its interaction with institutional quality is positively associated with growth. These findings suggest that the finance–growth relationship may depend on institutional characteristics and the dimensions of financial inclusion being measured. Nevertheless, the broader financial inclusion measures employed in these studies differ from the physical banking access index used in the present analysis.

The literature therefore remains inconclusive because of differences in financial measurement, geographical coverage, estimation strategies, and institutional conditions. Financial access is frequently represented by individual banking indicators or

incorporated into broader financial development measures, making it difficult to distinguish physical accessibility from financial depth. Moreover, evidence jointly examining these dimensions in selected MENA economies remains limited. The present study addresses this gap by constructing separate PCA-based indices and estimating their short-run associations with economic growth using a dynamic fixed-effects panel model with Driscoll–Kraay standard errors.

2. Research methodology

2.1. Data, Variables and Construction of Composite Financial Indices

2.1.1. Data and Sample

This study examines the associations between financial development, physical banking access, and economic growth in five selected Middle East and North African (MENA) countries: Algeria, Egypt, Kuwait, Morocco, and Tunisia. The dataset covers the period 2004–2024 and comprises a balanced panel of 105 country-year observations. The sample includes four North African economies and Kuwait, a hydrocarbon-dependent Gulf economy, thereby capturing differences in financial structures and macroeconomic conditions. The countries were selected based on the availability of the variables required for the empirical analysis over the study period. Given the small and structurally heterogeneous sample, the findings should not be generalized to the entire MENA region. To assess the influence of sample composition, an additional specification excludes Kuwait.

All study variables were retrieved from the World Bank's World Development Indicators (WDI) database using the wbopendata command in Stata. The indicators measuring automated teller machines and commercial bank branches per 100,000 adults (FB.ATM.TOTL.P5 and FB.CBK.BRCH.P5, respectively) are published through WDI and originate from the IMF Financial Access Survey (FAS). The composite financial indices were subsequently constructed from the collected indicators using Principal Component Analysis (PCA). Table 1 summarizes the definitions, measurements, and data sources of the study variables.

Table no. 1. Definition of the Study Variables

Variable	Symbol	Measurement	Expected Sign	Source
Economic Growth	GDPG	Annual real GDP growth (%)	Dependent	World Bank (WDI)
Financial Development Index	FDEV	PCA index of broad money and private-sector credit (% of GDP)	±	Author's PCA calculations using WDI data
Financial Access Index	FAI	PCA index of ATMs and commercial bank branches per 100,000 adults	±	Author's PCA calculations using WDI data
Inflation	INF	Consumer price inflation (annual %)	±	World Bank (WDI)
Trade Openness	TRADE	Trade (% of GDP)	±	World Bank (WDI)

Gross Capital Formation	GCF	Gross capital formation (% of GDP)	+	World Bank (WDI)

Source: Author's compilation based on World Development Indicators (World Bank) and Principal Component Analysis (PCA) calculations.

2.1.2. Construction of the Composite Financial Indices

Financial development and financial inclusion are multidimensional concepts encompassing several aspects of financial systems. Given the available data, this study focuses on two narrower dimensions: banking-sector depth and physical access to banking services. Two separate composite indices are constructed using Principal Component Analysis (PCA), which extracts linear combinations of correlated indicators that maximize explained variance (Jolliffe and Cadima, 2016). The Financial Development Index (FDEV) is used as a proxy for banking-sector depth, while the Financial Access Index (FAI) measures the physical availability of banking infrastructure. Neither index is intended to represent all dimensions of financial development or financial inclusion, particularly financial efficiency, stability, service usage, and digital financial access. Unlike the broader IMF Financial Development Index developed by Svirydzenka (2016), which encompasses financial depth, access, and efficiency, the present indices focus specifically on banking-sector depth and physical access. They are therefore intended as narrower, complementary measures rather than substitutes for comprehensive financial development indicators.

The Financial Development Index (FDEV) is constructed using two banking-sector depth indicators: broad money (% of GDP) and domestic credit to the private sector (% of GDP). Principal Component Analysis (PCA) is applied to the standardized indicators to obtain a composite measure of their common variation. The first principal component has an eigenvalue of 1.370 and explains 68.49% of the total variance. Both indicators have positive first-component coefficients of approximately 0.707, indicating equal contributions to the retained component. Higher index values therefore represent greater monetary and credit depth within the sample. However, the index does not directly measure financial efficiency, stability, or the quality of credit allocation.

The Financial Access Index (FAI) is constructed using two indicators of physical banking infrastructure: automated teller machines (ATMs) per 100,000 adults and commercial bank branches per 100,000 adults. Principal Component Analysis (PCA) is applied to the standardized indicators to summarize their common variation. The first principal component has an eigenvalue of 1.431 and explains 71.54% of the total variance. Both indicators have positive first-component coefficients of approximately 0.707, indicating equal contributions to the retained component. Higher FAI values therefore reflect greater physical availability of formal banking services within the sample. However, the index does not capture actual account ownership, the frequency or intensity of financial service usage, or access through digital financial channels.

PCA was performed separately for each index using the pooled sample of 105 country-year observations, rather than estimating country-specific components. Both indices were derived from correlation matrices, thereby standardising the underlying indicators and applying common component coefficients across countries and years. The resulting

scores were oriented consistently so that higher values represent greater banking-sector depth or physical financial access, respectively.

The PCA results indicate that the first principal component explains a substantial proportion of the variation in the two underlying indicators for each index. Accordingly, the retained components are used as summary measures of banking-sector depth (FDEV) and physical banking access (FAI). Nevertheless, the proportion of explained variance alone does not establish the validity or comprehensive coverage of these indices. Their interpretation is therefore restricted to the specific financial dimensions represented by the selected indicators. Table 2 reports the underlying variables and the corresponding PCA results.

Table no. 2. Construction of the Composite Financial Indices

Composite Index	Underlying Indicator	PC1 Coefficient	Eigenvalue (PC1)	Explained Variance (%)
Financial Development Index (FDEV)	Broad Money (% of GDP)	0.707	1.370	68.49
	Domestic Credit to Private Sector (% of GDP)	0.707	—	—
Financial Access Index (FAI)	ATMs per 100,000 adults	0.707	1.431	71.54
	Commercial Bank Branches per 100,000 adults	0.707	—	—

Source: Author's calculations using Principal Component Analysis (PCA) based on World Development Indicators data.

Note: PC1 denotes the first principal component. The reported coefficients refer to the weights of the standardized underlying indicators in the first principal component. Eigenvalues and explained variance are reported once for each composite index.

2.2. Model Specification

To examine the short-run associations between financial development, physical banking access, and economic growth, this study employs a dynamic fixed-effects panel model with country and year effects. The specification includes lagged economic growth to account for persistence in growth dynamics, while the financial indices and macroeconomic control variables enter in first differences to capture annual changes. Country fixed effects control for time-invariant national characteristics, whereas year fixed effects account for common shocks affecting the sampled economies. Given the possibility of cross-sectional dependence and serial correlation, the model is estimated using Driscoll–Kraay standard errors (Driscoll and Kraay, 1998). This approach focuses on short-run conditional associations without imposing a common long-run equilibrium relationship across countries. The results are interpreted cautiously because the small number of countries and potential endogeneity limit causal identification.

The dynamic fixed-effects panel specification is expressed as follows:

$$GDPG_{it} = \alpha_i + \lambda_t + \rho GDPG_{i,t-1} + \beta_1 \Delta FDEV_{it} + \beta_2 \Delta FAI_{it} + \beta_3 \Delta INF_{it} + \beta_4 \Delta TRADE_{it} + \beta_5 \Delta GCF_{it} + \varepsilon_{it}$$

where:

$\boldsymbol{GDPG_{it}}$ denotes the annual real GDP growth rate (%) in country i at time t.

$\boldsymbol{GDPG_{i,t-1}}$ represents the annual real GDP growth rate lagged by one year.

$\boldsymbol{FDEV_{it}}$ denotes the Financial Development Index, constructed using broad money and domestic credit to the private sector as percentages of GDP.

$\boldsymbol{FAI_{it}}$ represents the Financial Access Index, constructed using automated teller machines and commercial bank branches per 100,000 adults.

$\boldsymbol{INF_{it}}$ denotes annual consumer price inflation (%).

$\boldsymbol{TRADE_{it}}$ represents trade openness, measured as total trade in goods and services as a percentage of GDP.

$\boldsymbol{GCF_{it}}$ denotes gross capital formation as a percentage of GDP.

$\boldsymbol{\Delta}$ is the first-difference operator, representing the change in a variable between two consecutive years.

$\boldsymbol{\alpha_i}$ represents country-specific fixed effects that capture time-invariant characteristics.

$\boldsymbol{\lambda_t}$ represents year fixed effects that capture common time-specific shocks.

$\boldsymbol{\rho}$ is the coefficient of lagged economic growth, while β_1–β_5 denote the coefficients associated with the first-differenced explanatory variables.

$\boldsymbol{\varepsilon_{it}}$ is the idiosyncratic error term.

The empirical analysis follows a sequential procedure. First, descriptive statistics, pairwise correlations, and variance inflation factors are examined to characterise the data and assess potential multicollinearity. Second, cross-sectional dependence and panel unit-root tests are considered to evaluate the statistical properties of the variables and inform the choice of specification. Third, the dynamic fixed-effects model is estimated using first-differenced explanatory variables, country fixed effects, and year fixed effects, with Driscoll–Kraay standard errors to account for cross-sectional and temporal dependence in statistical inference. Finally, two sensitivity analyses are conducted: the first excludes 2020 to assess the influence of the COVID-19 shock, while the second excludes Kuwait to examine the sensitivity of the findings to the inclusion of a structurally distinct Gulf economy. The analysis focuses on short-run conditional associations and does not estimate or interpret common long-run equilibrium coefficients. Year fixed effects absorb common time shocks, including global oil-price movements, but do not capture heterogeneous country-specific exposure to such shocks. Institutional quality and differential oil-price sensitivity are not explicitly modelled and therefore remain potential sources of omitted-variable bias.

3. Results and discussion

3.1. Exploratory analysis

To provide an initial overview of the data, Figures no. 1–3 illustrate economic growth patterns and cross-country differences in banking-sector depth and physical banking access across the five selected MENA economies during 2004–2024. Figure 1 presents the evolution of annual real GDP growth, while Figures 2 and 3 compare country-level averages of the Financial Development Index (FDEV) and the Financial Access Index

(FAI), respectively. These descriptive illustrations highlight differences in growth performance and financial structures across the sample. However, they do not establish causal relationships between financial indicators and economic growth; these associations are examined subsequently using the dynamic panel specification.

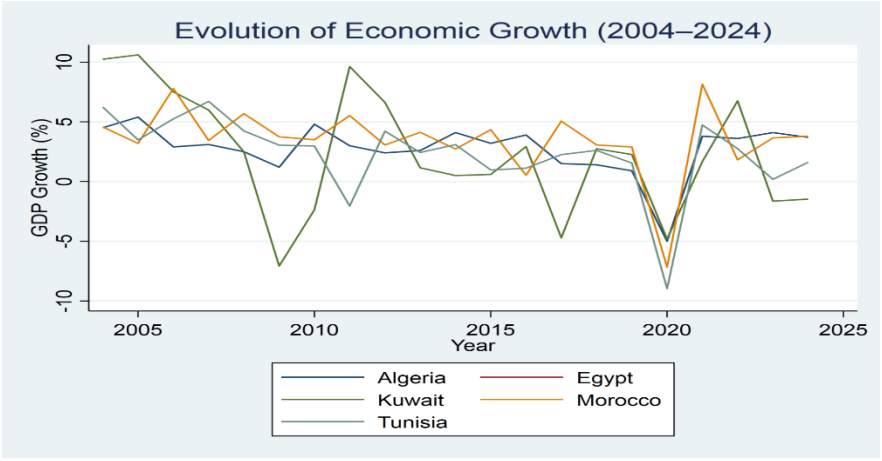


Figure no. 1: Evolution of GDP Growth in Selected MENA Countries (2004–2024)
Source: Author's calculations based on the study dataset using Stata 17.

Figure 1 illustrates the evolution of annual real GDP growth in the five selected MENA countries over 2004–2024. The series exhibit considerable fluctuations across countries and years, reflecting heterogeneous macroeconomic conditions and exposure to economic shocks. The marked downturn in 2020 is consistent with the widespread economic disruption associated with the COVID-19 pandemic, although the magnitude of the contraction differs across the sampled economies. These patterns highlight the importance of accounting for common year-specific shocks and country-level heterogeneity in the empirical analysis. The figure provides descriptive evidence of growth volatility but does not, by itself, establish the appropriateness of a particular econometric estimator.

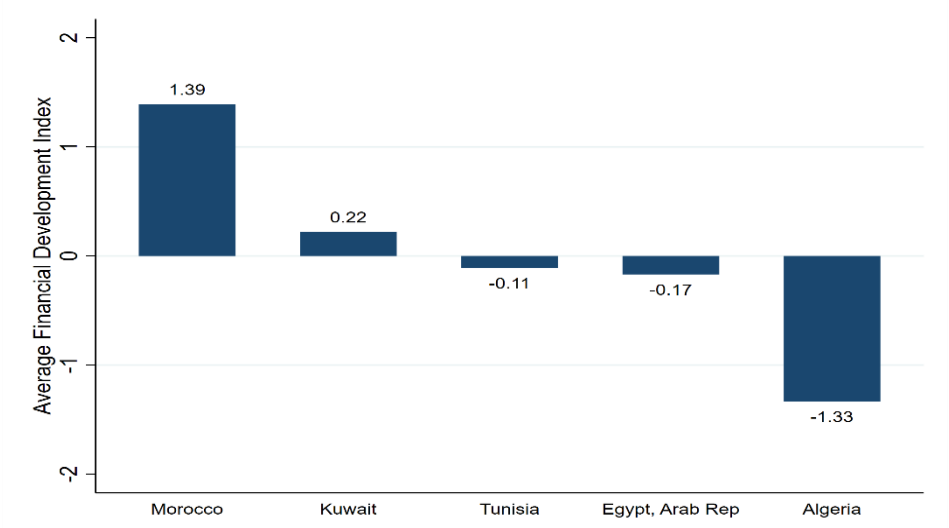


Figure no. 2: Average Financial Development Index (FDEV) by Country (2004–2024)

Source: Author's calculations based on the study dataset using Stata 17.

Figure 2 compares the average Financial Development Index (FDEV) across the five selected MENA countries during 2004–2024. Morocco records the highest average index value, followed by Kuwait, while Egypt and Tunisia exhibit slightly negative averages. Algeria has the lowest average FDEV value in the sample. These differences indicate substantial variation in banking-sector depth across the selected economies, as captured by broad money and domestic credit to the private sector relative to GDP. Because the index is derived from standardised indicators using PCA, negative values represent positions below the sample reference level rather than negative amounts of financial development. Furthermore, higher index values do not necessarily imply greater financial efficiency or a more productive allocation of credit.

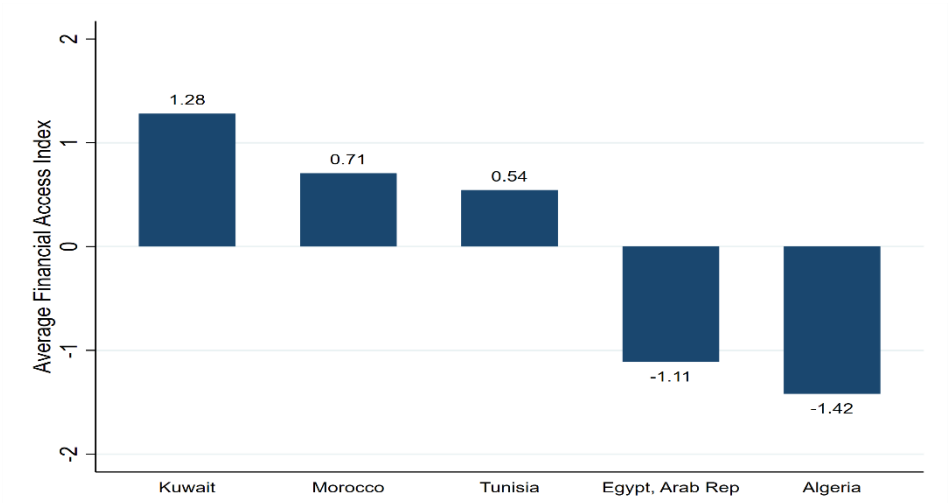


Figure no. 3: Average Financial Access Index (FAI) by Country (2004–2024)
Source: Author's calculations based on the study dataset using Stata 17.

Figure 3 presents the average Financial Access Index (FAI) across the five selected MENA countries during 2004–2024. Kuwait records the highest average index value, followed by Morocco and Tunisia, whereas Egypt and Algeria exhibit negative average values, with Algeria ranking lowest. These differences reflect cross-country disparities in the physical availability of banking infrastructure, as measured by automated teller machines and commercial bank branches per 100,000 adults. Negative index values indicate positions below the sample reference level rather than an absence of banking services. Importantly, higher FAI values should not be interpreted as evidence of greater overall financial inclusion, since the index does not capture account ownership, actual financial service usage, affordability, or digital financial access.

3.2. Descriptive Statistics

Table 3 presents the descriptive statistics of the variables employed in the empirical analysis for Algeria, Egypt, Kuwait, Morocco, and Tunisia over the period 2004–2024. The original dataset comprises a balanced panel of 105 country-year observations, with 21 annual observations for each country. These statistics describe the variables in their original levels, including the two PCA-based financial indices, before applying the transformations required for the dynamic panel estimation. Consequently, the number of observations reported in Table 3 differs from the effective estimation sample of 100 observations, which reflects the inclusion of lagged economic growth and first-differenced explanatory variables.

The average annual real GDP growth rate across the sample is 3.058%, with a standard deviation of 3.281 percentage points and values ranging from −8.975% to 10.609%. This dispersion indicates substantial differences in economic growth performance across countries and years, including periods of economic contraction and relatively rapid

expansion. Inflation averages 5.653%, with a standard deviation of 5.546 percentage points and a maximum of 33.885%, highlighting considerable variation in price developments within the sample. These descriptive patterns suggest that the selected economies experienced heterogeneous macroeconomic conditions during 2004–2024. However, the summary statistics alone do not identify the underlying causes of these fluctuations.

Trade openness (TRADE), measured as the sum of exports and imports of goods and services relative to GDP, averages 73.657%, with a standard deviation of 22.748 percentage points and values ranging from 29.857% to 116.096%. This variation indicates substantial differences in the relative importance of international trade across the sampled economies. Gross capital formation (GCF) averages 25.828% of GDP, with a standard deviation of 10.024 percentage points and values ranging from 7.858% to 51.780%. These figures reveal considerable variation in the share of economic resources allocated to capital formation across countries and years. Nevertheless, the descriptive statistics do not establish whether greater trade openness or capital formation is associated with higher economic growth after accounting for other relevant factors.

The Financial Development Index (FDEV) and the Financial Access Index (FAI) are composite indicators constructed using Principal Component Analysis (PCA). Both indices have sample means of approximately zero, reflecting the centring of the standardised variables used in their construction. FDEV has a standard deviation of 1.170 and ranges from −2.079 to 2.863, while FAI has a standard deviation of 1.196 and ranges from −1.722 to 1.930. These distributions indicate variation in banking-sector depth and physical banking access across the sampled country-year observations. Negative index scores represent relative positions below the sample reference level and should not be interpreted as negative financial development or an absence of financial services. Moreover, FAI captures the availability of physical banking infrastructure rather than the broader concept of financial inclusion.

Overall, the descriptive statistics reveal substantial variation in economic growth, banking-sector depth, physical banking access, and macroeconomic conditions across the selected MENA countries. These differences provide useful context for the subsequent dynamic panel analysis but do not establish causal or long-run equilibrium relationships.

Table no. 3. Descriptive Statistics of the Study Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
GDPG	105	3.058	3.281	-8.975	10.609
FDEV	105	0.000	1.170	-2.079	2.863
FAI	105	0.000	1.196	-1.722	1.930
INF	105	5.653	5.546	0.303	33.885
TRADE	105	73.657	22.748	29.857	116.096
GCF	105	25.828	10.024	7.858	51.780

Source: Author's calculations using Stata 17

3.3. Correlation Analysis and Multicollinearity

Table 4 presents the pairwise correlations among the study variables. The coefficients indicate varying degrees of association, with no pairwise correlation exceeding 0.80 in

absolute value. However, pairwise correlations alone are insufficient to rule out multicollinearity, which is further assessed using the Variance Inflation Factor (VIF).

Economic growth is negatively correlated with the Financial Access Index (FAI) ($r = -0.258$, $p < 0.01$), while its correlation with the Financial Development Index (FDEV) is negative but statistically insignificant ($r = -0.161$). FDEV and FAI are positively correlated ($r = 0.614$, $p < 0.01$), indicating an association between banking-sector depth and physical banking access. These correlations are descriptive and do not imply causality.

Trade openness is positively correlated with FDEV ($r = 0.308$) and FAI ($r = 0.718$), while inflation is negatively correlated with FAI ($r = -0.306$). Gross capital formation is also negatively correlated with FAI ($r = -0.370$), inflation ($r = -0.308$), and trade openness ($r = -0.281$). All reported correlations are statistically significant at the 1% level, but they do not establish causal relationships.

Table no. 4. Pairwise Correlation Matrix

Variable	GDPG	FDEV	FAI	INF	TRADE	GCF
GDPG	1.000					
FDEV	-0.161	1.000				
FAI	-0.258***	0.614***	1.000			
INF	0.115	-0.174	-0.306***	1.000		
TRADE	-0.105	0.308***	0.718***	-0.394***	1.000	
GCF	-0.016	-0.128	-0.370***	-0.308***	-0.281***	1.000

Note: $p < 0.01$***.

Source: Author's calculations using Stata 17.

Multicollinearity Test

Table 5 reports VIF values ranging from 1.57 to 3.55, with a mean of 2.17. These values fall below the conventional thresholds of 5 and 10, suggesting no severe multicollinearity among the explanatory variables examined. However, the results should be interpreted as preliminary diagnostics because the final dynamic specification includes differenced regressors and fixed effects.

Table no. 5. Variance Inflation Factor (VIF)

Variable	VIF	Tolerance (1/VIF)
Financial Access Index (FAI)	3.55	0.281
Trade Openness (TRADE)	2.41	0.415
Financial Development Index (FDEV)	1.74	0.575
Inflation (INF)	1.58	0.633
Gross Capital Formation (GCF)	1.57	0.637
Mean VIF	**2.17**	

Source: Author's calculations using Stata 17.

3.4. Preliminary Diagnostic Tests

Preliminary diagnostics examine cross-sectional dependence, stationarity, and cointegration using Pesaran's CD and CADF tests and the Westerlund test, respectively (Tables 6–8). These results inform the choice of empirical specification but do not establish the validity of a long-run relationship involving economic growth rates.

Accordingly, the main analysis focuses on a dynamic fixed-effects model with differenced explanatory variables.

3.4.1. Cross-Sectional Dependence Test

Pesaran's (2004) CD test rejects the null hypothesis of cross-sectional independence (CD = 3.185, p = 0.0014), indicating significant dependence across the selected economies (Table 6). This finding supports the use of second-generation panel unit-root tests and motivates accounting for cross-sectional dependence in subsequent statistical inference.

Table no. 6. Pesaran Cross-Sectional Dependence Test

Test	Statistic	p-value	Decision
Pesaran CD	3.185	0.0014	Cross-sectional dependence exists

Source: Author's calculations using Stata 17.

3.4.2. Panel Unit Root Test

Given the evidence of cross-sectional dependence, stationarity was examined using Pesaran's (2007) cross-sectionally augmented panel unit-root procedure. Table 7 indicates that GDP growth (GDPG) is stationary in levels, I(0), whereas FDEV, FAI, INF, TRADE, and GCF are classified as I(1). These findings support the use of first differences for the explanatory variables in the revised dynamic panel specification, while retaining GDP growth in levels.

Table no. 7. Pesaran CADF Panel Unit Root Test

Variable	Level t-bar	Level Z[t-bar]	p-value	First-difference t-bar	First-difference Z[t-bar]	p-value	Integration order
GDPG	−2.939	−2.718	0.003***	—	—	—	I(0)
FDEV	−1.959	−0.460	0.323	−2.843	−2.416	0.008***	I(1)
FAI	−0.787	2.242	0.988	−2.824	−2.376	0.009***	I(1)
INF	−2.134	−0.861	0.194	−3.784	−4.460	0.000***	I(1)
TRADE	−0.889	2.009	0.978	−2.877	−2.491	0.006***	I(1)
GCF	−1.335	0.980	0.837	−3.127	−3.032	0.001***	I(1)

Notes: The null hypothesis states that the series contains a unit root. The CADF specifications include a constant and one lag. The critical values at level are −2.210, −2.330, and −2.570 at the 10%, 5%, and 1% levels, respectively. At first difference, the corresponding critical values are −2.210, −2.340, and −2.600. *** indicates significance at the 1% level.

Source: Author's calculations using Stata 17.

3.4.3. Westerlund Panel Cointegration Test

Table 8 reports the results of the Westerlund (2007) error-correction-based panel cointegration test, using bootstrap p-values based on 400 replications. Although three statistics reject the null hypothesis of no cointegration at the 5% level, these findings require caution because GDP growth is stationary in levels, whereas the explanatory variables are predominantly I(1). Consequently, the test does not provide a sufficient basis for estimating a long-run equilibrium relationship with GDP growth as the dependent

variable. The revised analysis therefore relies on a dynamic fixed-effects specification rather than the PMG estimator.

Table no. 8. Westerlund Panel Cointegration Test

Statistic	Test value	Z-value	Asymptotic p-value	Robust p-value	Decision
Gt	−4.999	−6.155	0.000***	0.000***	Reject H₀ (1%)
Ga	−7.163	1.328	0.908	0.080*	Reject H₀ (10%)
Pt	−9.770	−4.552	0.000***	0.003***	Reject H₀ (1%)
Pa	−8.214	−0.051	0.480	0.033**	Reject H₀ (5%)

Notes: The null hypothesis is no cointegration. Robust p-values were obtained using 400 bootstrap replications. The test was estimated with zero lags and zero leads because the available time dimension did not permit the specification of one lag and one lead. Gt and Ga are group-mean statistics, whereas Pt and Pa are panel statistics. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Author's calculations based on Stata 17.

3.5. Dynamic Panel Estimation

The empirical analysis employs a dynamic fixed-effects model incorporating lagged GDP growth, first-differenced explanatory variables, and country and year fixed effects. Driscoll–Kraay standard errors are used to account for potential cross-sectional and serial dependence. This specification focuses on short-run associations rather than long-run equilibrium coefficients. Given the limited number of countries, the estimates are interpreted cautiously, without causal claims.

3.5.1. Baseline Dynamic Fixed-Effects Estimates

Table no. 9. Baseline Dynamic Fixed-Effects Estimation Results

Variable	Coefficient	p-value
Lagged GDP growth	0.0729	0.541
ΔFDEV	−3.1658	0.003
ΔFAI	6.8172	0.005
ΔINF	0.0117	0.818
ΔTRADE	−0.0622	0.408
ΔGCF	0.3646	0.001

Notes: The dependent variable is annual real GDP growth. The model includes country and year fixed effects. Driscoll–Kraay standard errors are computed using a maximum lag of two. The estimation sample comprises 100 observations from five countries. Reported p-values correspond to the Driscoll–Kraay standard errors.
Source: Author's calculations based on Stata 17.

Table 9 shows that changes in financial development are negatively associated with GDP growth ($\beta = -3.166$, $p = 0.003$), whereas changes in physical financial access are positively associated with growth ($\beta = 6.817$, $p = 0.005$). Gross capital formation also exhibits a positive and statistically significant coefficient ($\beta = 0.365$, $p = 0.001$). In contrast, lagged GDP growth, inflation, and trade openness are statistically insignificant. These findings indicate differing short-run associations between banking-sector depth, physical access, and economic growth, without establishing causal effects.

3.5.2. Estimation Strategy and Limitations

The revised specification uses country and year fixed effects to account for unobserved country characteristics and common time shocks. Driscoll–Kraay standard errors address potential cross-sectional and serial dependence. Nevertheless, the small number of countries and possible endogeneity limit statistical inference and preclude causal interpretation. Robustness checks excluding 2020 and Kuwait are therefore conducted to assess the sensitivity of the baseline findings.

3.6. Robustness Analysis

To assess the sensitivity of the baseline findings, two robustness checks are conducted. The first excludes 2020 to examine whether the results are driven by the exceptional economic disruption associated with the COVID-19 pandemic. The second excludes Kuwait to assess the influence of its distinct economic structure on the estimates. Both specifications retain the baseline model's variables and estimation approach.

3.6.1. Robustness Checks

Table no. 10. Robustness Checks of the Dynamic Fixed-Effects Model

Variable	Excluding 2020 β	p-value	Excluding Kuwait β	p-value
Lagged GDP growth	0.0824	0.499	−0.0503	0.688
ΔFDEV	−3.5052	0.027	−2.9350	0.130
ΔFAI	3.7185	0.047	3.4541	0.167
ΔINF	0.0595	0.140	−0.0331	0.560
ΔTRADE	−0.0986	0.124	−0.0127	0.834
ΔGCF	0.3512	<0.001	0.2325	0.109
Observations	95	—	80	—
Countries	5	—	4	—
Within R^2	0.5298	—	0.6749	—
Country fixed effects	Yes	—	Yes	—
Year fixed effects	Yes	—	Yes	—

Notes: The dependent variable is annual real GDP growth, and Δ denotes first differences. Both specifications include country and year fixed effects, with Driscoll–Kraay standard errors computed using two lags. Excluding 2020 yields 95 observations across five countries, while excluding Kuwait yields 80 observations across four countries. Reported p-values are based on Driscoll–Kraay standard errors.
Source: Author's calculations based on Stata 17.

As shown in Table 10, excluding 2020 preserves the baseline coefficient signs and the statistical significance of financial development ($\beta = -3.505$, $p = 0.027$), physical financial access ($\beta = 3.719$, $p = 0.047$), and gross capital formation ($\beta = 0.351$, $p < 0.001$). Excluding Kuwait also preserves these coefficient signs, but none remains statistically significant at the 5% level. Thus, the findings are relatively insensitive to the exclusion of 2020 but sensitive to the country composition of the sample.
Additional sensitivity checks using Driscoll–Kraay lag lengths of one and three, instead of the baseline value of two, leave the estimated coefficients unchanged. The negative association of FDEV and the positive associations of FAI and GCF remain statistically

significant, while the other regressors remain insignificant. These findings support the stability of the baseline statistical inference across alternative covariance lag specifications.

3.7. Discussion of findings

The dynamic fixed-effects estimates reveal contrasting short-run associations between financial development, physical financial access, and economic growth in the selected MENA economies. Changes in the Financial Development Index (FDEV) are negatively and significantly associated with GDP growth, whereas changes in the Financial Access Index (FAI) exhibit a positive and significant association. These findings suggest that banking-sector depth and physical access should not be treated as interchangeable dimensions of financial development. The negative association with financial depth challenges the conventional supply-leading expectation that financial expansion necessarily accompanies stronger growth, while the positive association with physical access is more consistent with that perspective. Nevertheless, these estimates identify conditional short-run relationships rather than causal effects or long-run equilibrium outcomes.

The contrasting associations of financial depth and physical financial access with economic growth are broadly consistent with the mixed evidence reported in the finance–growth literature. The negative coefficient of FDEV is consistent in direction with the findings of Ben Naceur and Ghazouani (2007) for MENA economies and with the broader concerns raised by Rousseau and Wachtel (2011) and Arcand et al. (2015) regarding the limits of financial deepening. However, the present study does not test non-linear thresholds or credit-allocation mechanisms, and these explanations remain tentative. By contrast, the positive coefficient of FAI differs from the insignificant direct growth effects of broader financial inclusion measures reported by Boukhatem and Ben Moussa (2025) and Boussaidi and Hakimi (2025). These differences may reflect variations in financial measurement, sample composition, institutional conditions, and econometric specifications. Importantly, the present findings concern conditional short-run associations and should not be interpreted as evidence of causal effects or directly compared with long-run estimates from previous studies.

The negative short-run association between FDEV and GDP growth may reflect limitations in the productive allocation of financial resources. In the five countries examined, financial intermediation is largely bank-based, while alternative financing channels differ in their development. Additional liquidity and private-sector credit may not immediately translate into productive investment, particularly when financing is concentrated in established sectors or consumption-oriented activities. However, the estimated coefficient does not directly identify credit allocation as the underlying mechanism. This interpretation is broadly consistent with Isiaka et al. (2021), who highlight potential adverse growth implications of financial deepening in middle-income economies. It also relates to Cavallaro and Villani (2022), who emphasise that the contribution of finance to economic growth depends on financial-system characteristics and the broader institutional and productive environment. Thus, the negative coefficient should be understood as a conditional empirical association rather than evidence that financial development inherently constrains growth.

The regional context provides a useful perspective on this finding. Algeria, Egypt, Morocco, and Tunisia have undertaken banking and financial reforms, yet their financial systems continue to differ in competition, state involvement, credit allocation, and financing opportunities for small and medium-sized enterprises. Kuwait has a comparatively developed banking sector, but its economic growth remains strongly influenced by hydrocarbon-related activity and public expenditure. These structural differences may help explain why changes in banking-sector depth are not uniformly associated with stronger economic growth. However, the present model does not directly measure institutional quality, sectoral credit allocation, or the mechanisms linking finance to productive investment. Moreover, the negative FDEV coefficient remains statistically significant when 2020 is excluded but loses significance when Kuwait is removed. Accordingly, the result should be interpreted as a sample-sensitive short-run association rather than evidence that financial expansion necessarily undermines economic growth.

The positive short-run association between FAI and GDP growth suggests that improvements in physical banking access may accompany stronger economic activity in the selected MENA economies. The index is constructed from the availability of ATMs and commercial bank branches, capturing the geographical outreach of formal banking services rather than comprehensive financial inclusion. Greater physical access may facilitate financial transactions, reduce certain access barriers, and improve the availability of basic banking services for households and businesses. Nevertheless, these indicators do not measure account usage, affordability, digital financial services, credit availability, or the quality of financial intermediation. Consequently, the positive coefficient should not be interpreted as evidence that broader financial inclusion necessarily causes economic growth. Furthermore, although the association remains positive when Kuwait is excluded, it loses statistical significance, indicating sensitivity to sample composition. These findings highlight the importance of distinguishing physical banking access from the wider economic and institutional dimensions of financial inclusion.

The positive association between physical financial access and economic growth is broadly consistent with Saha et al. (2023), Azimi (2022), and Jima and Makoni (2023), who report favourable relationships between financial inclusion and growth in developing-country contexts. However, their findings are not directly comparable because financial inclusion may encompass dimensions beyond the physical banking infrastructure measured in this study. Conversely, Chehayeb and Taher (2024) report an insignificant relationship in MENA economies, while Odame, Appiah and Gyimah (2024) document evidence of a negative association in Ghana. Such differences may reflect variations in country characteristics, measurement approaches, and empirical specifications. Furthermore, the loss of statistical significance when Kuwait is excluded suggests that the positive association identified here is not robust to all sample configurations. Accordingly, the findings support a distinction between physical banking access and broader financial inclusion, rather than establishing a universally positive growth effect.

The positive short-run association between gross capital formation and economic growth is particularly relevant to Algeria, Egypt, and Kuwait, where public investment programmes represent an important component of economic activity and may be

influenced by government revenue, public debt, or hydrocarbon cycles. In Morocco and Tunisia, infrastructure and industrial investment may also support economic activity, although financing constraints, external shocks, and implementation challenges can influence their effectiveness. These considerations suggest that the positive association observed in the baseline model should be interpreted alongside differences in investment composition and efficiency. However, the present estimates cannot determine whether such investments generate lasting productivity gains.

Changes in trade openness and inflation are not statistically significant in the baseline dynamic fixed-effects model. The insignificant coefficient of trade openness may reflect differences in the economic structures of the sampled countries, including varying degrees of dependence on hydrocarbon exports, manufacturing, tourism, and services. Trade openness may create growth opportunities through market expansion and technology transfer, while also increasing exposure to external shocks and import dependence. Similarly, the insignificant inflation coefficient does not imply that price stability is unimportant. Rather, the relationship between changes in inflation and economic growth may vary across countries and periods. These interpretations remain tentative, as the model does not directly test the underlying mechanisms or country-specific effects.

Overall, the findings contribute to the literature by demonstrating that banking-sector depth and physical financial access exhibit contrasting short-run associations with economic growth in the selected MENA economies. While changes in financial depth are negatively associated with growth, improvements in physical banking access show a positive association in the baseline model. By constructing separate PCA-based indices and examining them jointly, the study highlights the importance of distinguishing between the expansion of financial resources and the availability of banking infrastructure. This distinction offers additional evidence for a region where these dimensions are often examined separately or measured using individual indicators. Nevertheless, the sensitivity of statistical significance to the exclusion of Kuwait, together with the limited country sample and potential endogeneity, calls for cautious interpretation and further investigation. From a policy perspective, these findings support attention to both the quality of financial intermediation and the accessibility of banking services. Measures aimed at improving credit allocation, facilitating productive financing for small and medium-sized enterprises, and reducing barriers to financial access may be relevant. However, the estimated associations do not establish the effectiveness of particular policy interventions, which requires further investigation.

Conclusions

This study examined the relationships between financial development, physical financial access, and economic growth in five selected MENA countries over the period 2004–2024. Using Principal Component Analysis (PCA), two separate indices were constructed to capture banking-sector depth and physical banking access. The empirical analysis employed a dynamic fixed-effects panel model incorporating lagged GDP growth, first-differenced explanatory variables, and country and year fixed effects, with Driscoll–Kraay standard errors. This framework provides evidence on short-run associations between distinct dimensions of the financial system and economic growth, while

accounting for unobserved country characteristics and common time shocks. The empirical findings reveal contrasting short-run associations between the two financial indices and economic growth. Changes in financial development (FDEV) are negatively and significantly associated with GDP growth, whereas changes in physical financial access (FAI) exhibit a positive and significant association. Gross capital formation also shows a positive and statistically significant coefficient, while inflation, trade openness, and lagged GDP growth are statistically insignificant. Robustness checks indicate that the principal findings remain statistically significant when 2020 is excluded, but lose significance when Kuwait is removed, despite retaining their coefficient signs. These results highlight the importance of distinguishing banking-sector depth from physical financial access and interpreting the estimated relationships cautiously.

The study contributes to the literature by jointly examining banking-sector depth and physical financial access through distinct PCA-based indices within a dynamic panel framework. This approach provides evidence on their differing short-run associations with economic growth in selected MENA economies, rather than treating financial expansion as a single dimension. From a policy perspective, the findings suggest the relevance of improving financial intermediation, facilitating productive lending to small and medium-sized enterprises, and strengthening financial governance. Expanding banking infrastructure may also help reduce access barriers, although the availability of branches and ATMs does not necessarily imply effective financial inclusion. These recommendations should be regarded as policy considerations rather than interventions whose growth effects have been established by the estimates. Further research is needed to assess the roles of credit allocation, financial-service usage, and institutional conditions in shaping economic outcomes.

Despite these contributions, several limitations should be acknowledged. The sample comprises only five MENA countries, limiting the generalisability of the findings. Moreover, the PCA-based indices capture selected dimensions of banking-sector depth and physical access rather than comprehensive financial development or inclusion. Although the model incorporates country and year fixed effects and Driscoll–Kraay standard errors, potential endogeneity, reverse causality, and omitted variables remain concerns. The sensitivity of statistical significance to excluding Kuwait further highlights the importance of sample composition. Future research could expand geographical coverage, incorporate digital financial services and actual usage indicators, and examine institutional quality and credit allocation. Alternative estimation strategies addressing endogeneity and potential nonlinearities would also help assess the robustness of the relationships identified.

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