



Digital Banking, Financial Inclusion and FDI Inflows: Reassessing the Institutional Channel in Arab Countries

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Abstract

This study provides a comprehensive reassessment of the nexus between digital banking, financial inclusion, and foreign direct investment inflows within ten Arab countries over the period from 2010 to 2021, with a specific focus on the Institutional Channel hypothesis.

Utilizing Principal Component Analysis (PCA) to construct multidimensional indices, the research employs a panel data methodology, investigating the long-term impact on foreign direct investment inflows when considered in isolation from institutional quality.

The evidence concludes that digital transformation within the banking sector has not yet reached the threshold of significance required to pivot foreign capital flows independently. The empirical inquiry into the Arab region's financial landscape yields nuanced insights that challenge simplistic assumptions regarding technological adoption. The findings reveal that while digital banking and financial inclusion are rapidly evolving, their individual capacity to stimulate foreign direct investment remains statistically latent in the long term.

Keywords: Digital Banking, Financial Inclusion, FDI Inflows, Institutional Channel, FMOLS, PCA.

I. Introduction:

The global financial system has experienced profound transformations driven by technological innovation and increasing economic integration. Financial digitalization has emerged as a central force reshaping financial intermediation, improving efficiency, and expanding access to financial services manifested through fintech platforms, mobile payments, and digital banking (Butt, Lu, & Mia, 2026). These developments have enabled financial institutions to reduce operational costs, enhance service delivery, and reach previously underserved populations, thereby reinforcing the role of digital finance as a catalyst for modern economic systems.

In addition, financial inclusion has gained prominence as a fundamental driver of sustainable development. It refers to the ability of individuals and businesses to access affordable and appropriate financial services, which contributes to poverty reduction, economic empowerment, and social equity. Beyond its traditional developmental role, financial inclusion is increasingly linked to environmental sustainability and long-term economic resilience, particularly within the framework of the



Sustainable Development Goals (Surwanti, Mahmoud, & Sano, 2026). This evolving perspective highlights the multidimensional nature of financial systems, where economic, social, and environmental dimensions are deeply intertwined.

The rapid diffusion of financial technology has further strengthened this nexus by transforming the accessibility and functionality of financial services. Innovations such as peer-to-peer lending and electronic transactions have demonstrated significant positive effects on economic growth by facilitating access to capital, especially for small and medium-sized enterprises, and by enhancing the efficiency of financial transactions (Meliza & Ayuningrum, 2025).

At a broader level, the interaction between financial development and global economic flows, particularly foreign direct investment (FDI) has attracted increasing scholarly attention. FDI plays a crucial role in promoting economic growth through technology transfer, productivity enhancement, and integration into global markets. However, this relationship is complex and influenced by multiple structural and institutional factors. Recent studies emphasize that digital finance and financial inclusion can enhance investment environments by improving transparency, reducing transaction costs, and strengthening financial infrastructure (Khan & & Shahid, 2026).

Despite these advances, the existing literature reveals several important gaps. First, most studies tend to examine fintech, financial inclusion, or economic performance separately, without fully capturing their combined effects within a unified framework. Second, although the importance of institutional factors is widely acknowledged, their moderating role in shaping the relationship between financial development and FDI remains insufficiently explored. Third, empirical evidence focusing on Arab countries is relatively limited, despite the region's ongoing digital transformation and increasing engagement with global financial markets.

In light of these limitations, this study aims to provide a comprehensive analysis of the relationship between digital banking, financial inclusion, and FDI inflows by incorporating the institutional dimension as a key explanatory factor. Specifically, it seeks to examine how financial digitalization and inclusion influence the attraction of foreign investment and how these effects are conditioned by the quality of institutions.

To achieve these objectives, the study adopts an empirical approach based on panel data analysis covering a sample of Arab countries. By integrating variables related to digital banking, financial inclusion, and foreign direct investment, the analysis captures both direct and interaction effects, offering a deeper understanding of the mechanisms linking financial development to international capital flows.

This research contributes to the literature in three main ways; developing an integrated framework that simultaneously examines fintech, financial inclusion, and FDI; highlighting the critical role of institutional factors in mediating these relationships; providing new empirical evidence from the Arab region, offering valuable insights for policymakers seeking to enhance financial development and attract foreign investment in an increasingly digitalized global economy. . (Padmaja, Narayan, & Purna, 2024); (Magbondé, Thiam, & Konté, 2025) and (Ben Belgacem, Younsi, Bechtini, Alzuman, & Khalfaouia, 2024)

Despite the growing body of literature on financial digitalization, financial inclusion, and economic development, several critical gaps remain:



- (1) More previous and existing studies tend to examine digital finance and financial inclusion separately, without adequately capturing their joint impact on foreign direct investment inflows.
- (2) This study positions itself among the newest studies in the literature to explore the role of institutional quality in reshaping economic outcomes, its moderating effect on the relationship between financial development and FDI remains insufficiently explored.
- (3) Empirical evidence from Arab countries is still limited, despite the region's ongoing digital transformation and its increasing integration into global investment flows. Therefore, a comprehensive framework that integrates digital banking, financial inclusion, and the institutional environment in explaining FDI inflows is still lacking.

Research Hypotheses

Based on the theoretical framework and the specific developmental context of the Arab region, this study tests the following hypotheses:

The Digitalization-FDI Nexus (H1); High levels of digital banking development (proxied by the Digital Banking Index) exert a significant positive impact on FDI inflows by enhancing the transparency of the financial infrastructure and lowering the costs of market entry.

The Inclusion-Investment Link (H2); Enhanced financial inclusion (proxied by the Financial Inclusion Index) acts as a catalyst for FDI by expanding the domestic consumer base, improving capital allocation, and signaling economic maturity to foreign investors.

The Institutional Channel as a moderating effect Hypothesis (H3); the impact of digital banking and financial inclusion on FDI is not unconditional; rather, it is significantly amplified by the quality of the institutional environment. In the absence of robust governance and regulatory frameworks, the positive effects of financial digitalization on investment inflows are substantially diminished or rendered non-significant in the long term.

II. Theoretical framework:

Financial development has an intrinsically relationship with economic outcomes. Foundations, have shown that it is a central theme in economic theory. Early contributions by Schumpeter (1939) emphasized the crucial role of financial systems in promoting innovation and economic growth through efficient allocation of resources. (Croitoru, 2017) This perspective was further developed by McKinnon and Shaw (1973), who argued that financial liberalization enhances savings and investment, thereby stimulating economic development (Blassa, 1989).

Building on these foundations, Levine (1997) highlighted that well-functioning financial systems reduce information asymmetries, facilitate risk management, and improve capital allocation, ultimately contributing to economic performance. Within this framework, financial inclusion emerges as a key dimension of financial development, as it extends access to financial services to a broader segment of the population, thereby enhancing economic participation and productivity. (Sahay, et al., 2015)

More recently, the emergence of digital finance has transformed traditional financial intermediation. Digital banking and fintech innovations reduce transaction costs, increase efficiency, and improve accessibility, thereby strengthening the role of financial systems in supporting economic activities. However, the effectiveness of these mechanisms depends on the broader institutional environment. (Sahay, et al., 2015) According to institutional theory, strong governance structures, regulatory



quality, and rule of law are essential for ensuring the proper functioning of financial systems and fostering investor confidence. (Meliza & Ayuningrum, 2025); (De La Cruz Cortegana, et al., 2023). In this context, the institutional channel provides a useful theoretical lens for understanding how financial development influences economic outcomes. It suggests that the impact of digital banking and financial inclusion on investment flows is mediated by institutional quality, which shapes transparency, reduces uncertainty, and enhances the overall investment climate.

Digitalization in banking enables financial institutions to optimize operational processes, reduce transaction costs, and enhance service delivery through technological platforms. Empirical evidence indicates that digital banking adoption significantly improves operational efficiency and profitability while increasing customer satisfaction and accessibility to financial services (De La Cruz Cortegana, et al., 2023)

However, the impact of digital banking is not uniformly positive across all contexts. Several studies emphasize that its effectiveness depends on supporting factors such as digital infrastructure, regulatory frameworks, and institutional readiness. In environments characterized by weak governance or limited technological capacity, the benefits of digitalization may be constrained, highlighting the importance of contextual factors in shaping outcomes. (Sahay, et al., 2015); (Sarker, Sarker, Shaha, & Borddin, 2025)

Table 1: Methodologies and variables measuring composite indexes

Author(s)	Variables	Findings
(Meniago, 2025)	Digital financial inclusion index, GDP, Institutional quality index	Strengthening governance and regulatory frameworks ensure transparency, security, and effective management of digital financial services. Improving legal protections, particularly around data security and consumer rights, is crucial to building trust in digital finance.
(Butt, Lu, & Mia, 2026)	Fintech, Performance, Financial	Fintech enhances efficiency, reduces costs, and improves financial inclusion, contributing to overall economic performance.
(Khan & Shahid, 2026)	Fintech, Finance, Green Sustainability	Fintech improves financial inclusion and transparency, but its effectiveness depends on regulatory and institutional conditions.
(De La Cruz Cortegana, et al., 2023)	Banking Digitalization, Costs,	Digital banking reduces operational costs and improves financial performance and service efficiency.
(Meliza & Ayuningrum, 2025)	Peer-to-peer lending, e-money, economic growth	Digital transformation positively affects economic growth by facilitating transactions and improving access to capital.



(Surwanti, Mahmoud, & Sano, 2026)	Financial Inclusion, Sustainable Development Quantitative Study	Financial inclusion contributes to sustainable development through improved access to financial services.
(Al-Samadi & Al-Samadi, 2024)	FDI, GDP, Number of ATMs, Change of consumer price index	The study underscores the critical role of financial inclusion in shaping monetary policy and mitigating investment risks. By facilitating access to capital and reducing uncertainty, financial inclusion promotes transparency and stability, thereby enhancing the attractiveness of foreign markets for investment.

Empirical studies show that financial inclusion contributes significantly to economic performance by improving capital allocation and facilitating investment activities. (Surwanti, Mahmoud, & Sano, 2026) Moreover, financial inclusion is increasingly linked to technological advancement, as digital finance serves as a key enabler of inclusive financial systems. The integration of fintech solutions enhances the reach and efficiency of financial services, allowing previously excluded populations to participate in formal financial activities. This synergy between financial inclusion and digitalization represents a critical pathway toward achieving inclusive and sustainable development. (Abdullah & Inaba, 2020)

The growing literature on fintech highlights its transformative role in shaping economic outcomes. Financial technologies, including peer-to-peer lending and electronic payment systems, have been shown to positively influence economic growth by improving access to credit and reducing transaction inefficiencies. For instance, empirical evidence suggests that fintech lending and e-money transactions significantly contribute to economic growth by facilitating financial transactions and expanding access to capital (Meliza & Ayuningrum, 2025).

Foreign direct investment (FDI) is widely considered a critical driver of economic growth, particularly in developing economies. It facilitates technology transfer, enhances productivity, and promotes integration into global markets. The relationship between financial development and FDI has been extensively studied, with evidence suggesting that well-developed financial systems attract higher levels of foreign investment by reducing information asymmetries and transaction costs.

Recent research highlights the role of financial innovation and digital infrastructure in shaping investment flows. Digital financial systems enhance transparency, improve access to financial information, and create more efficient investment environments, thereby increasing the attractiveness of host countries to foreign investors (Khan & & Shahid, 2026).

However, the relationship between financial development and FDI is not straightforward. It is influenced by a range of structural and institutional factors, including governance quality, regulatory effectiveness, and political stability. In the absence of strong institutional frameworks, the positive effects of financial development on FDI may be limited. (Surwanti, Mahmoud, & Sano, 2026); (Al-Samadi & Al-Samadi, 2024)

The role of institutions has become increasingly central in understanding the effectiveness of financial systems. Institutional quality; reflected in governance structures, regulatory frameworks, and legal systems; plays a crucial role in shaping economic outcomes and investment decisions. Strong



institutions enhance transparency, reduce uncertainty, and improve the overall business environment, thereby facilitating both financial development and investment inflows. (Magbondé, Thiam, & Konté, 2025)

Foreign direct investment (FDI) is widely recognized as a key indicator of economic dynamism and a critical driver of sustainable development, particularly in its economic and institutional dimensions. Beyond being a mere financial flow, FDI represents a major channel for technology transfer, productivity enhancement, job creation, and integration into the global economy. Reports from the World Bank and the United Nations Conference on Trade and Development (UNCTAD) emphasize that FDI plays a central role in fostering sustainable economic growth by improving efficiency, strengthening productive capacities, and enhancing long-term development prospects (World Bank, 2023); (UNCTAD, 2022)

Furthermore, FDI is closely associated with institutional quality, as it requires a stable macroeconomic environment, effective regulatory frameworks, and high levels of transparency. This makes it an indirect proxy for the institutional dimension of sustainable development. Existing literature suggests that FDI inflows are highly sensitive to governance quality and public policy effectiveness, reflecting the readiness of economies to attract and sustain foreign investment. (OECD, 2020)

Recent studies emphasize that the interaction between financial digitalization and institutional quality constitutes a key transmission mechanism influencing economic performance. Fintech and digital banking can improve financial inclusion and efficiency; however, their impact is significantly amplified in environments characterized by strong institutional support. Conversely, weak institutions may hinder the effective utilization of digital financial technologies and limit their contribution to economic development.

This perspective has led to the emergence of the institutional channel hypothesis, which suggests that the impact of financial development on economic outcomes operates through institutional mechanisms. Despite its growing relevance, this channel remains insufficiently explored in empirical studies, particularly in the context of developing regions such as the Arab world.

III. Data and Methodology

III.1. Scope of the Study:

This study focuses on a panel of selected Arab countries. These countries are: Algeria, Jordan, Tunisia, United Arab Emirates, Saudi Arabia, Iraq, Egypt, Kuwait, Lebanon, and Mauritania. Sample was chosen based on available data for the period 2010–2021. The choice of this sample is motivated by several considerations. First, the Arab region has witnessed significant progress in financial digitalization and financial inclusion in recent years, driven by technological advancements and policy initiatives. Second, the region exhibits substantial heterogeneity in terms of economic development, institutional quality, and financial system structures, which provides a suitable context for empirical analysis.

Moreover, Arab economies are increasingly integrated into global financial markets, making foreign direct investment (FDI) a critical component of their development strategies. However, the extent to which financial digitalization and inclusion contribute to attracting FDI remains unclear. Therefore,



analyzing this relationship within the Arab context provides valuable insights into the role of financial systems in shaping investment dynamics.

III.2. Data and construction of composite Indices:

To capture the multidimensional nature of digital banking and financial inclusion, this study constructs composite indices using Principal Component Analysis (PCA). This method is widely used in empirical research to reduce dimensionality and address multicollinearity among highly correlated variables.

The digital banking index is constructed using indicators such as automated teller machines (ATMs), commercial bank branches (CBB), internet usage (IUI), mobile subscriptions (FTS), and secure internet servers (SIS) and population density (POPD). Similarly, the financial inclusion index incorporates variables related to account ownership (FIA), credit and debit card usage (OACC) and (OADC), and access to financial services proxied by receive a government transfer (RGT).

Accordingly, the selection of FDI as a proxy for sustainable development in this study is justified by its multidimensional nature. It simultaneously captures economic performance, global integration, and institutional quality, making it a suitable analytical variable for examining the impact of financial digitalization and financial inclusion on development trajectories in Arab countries.

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Table 2: Variables description

Variables	Indicator	Measurement	Legend	Source
Digital banking Index	Automated machine	Per 100,000 adults	ATM	WB
	Commercial bank branches	Per 100,000 adults	CBB	WB
	Population density	Number of people per square kilometer of land	POPD	WB
	Security internet survey	Number of websites using http per one million people	SIS	WB
	Fixed telephone subscription	Billion people	FTS	WB
	Mobile cellular subscription	Billion people	MCS	WB
	Individuals using internet	Percentage of population density	IUI	WB
Financial inclusion Index	Financial institution account	Percentage of population aged over 15 years	FIA	Findex
	Owners of credit card	Percentage of population aged over 15 years	OACC	Findex
	Owners of debit card	Percentage of population aged over 15 years	OADC	Findex



	Received government transfer	Percentage of population aged over 15 years	RGT	Findex
Sustainable development proxy	Foreign direct investment	Percentage of Gross Domestic Product (GDP)	FDI	WB

The PCA procedure involves three main steps. First, all variables are normalized to ensure comparability. Second, eigenvalue decomposition is applied to extract principal components. Third, the first principal component; representing the largest share of variance; is retained as the composite index. Higher values of the indices indicate greater levels of digital banking development and financial inclusion.

In order to construct a composite index for digital banks (DB) and a composite index for financial inclusion (FI), the following indicators are relied upon in a single variable for each independent variable as follows:

Table 3: Principal components analysis for composite indexes

	Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion
Composite index for DB	1	2.852405	0.927394	0.4075	2.852405	0.4075
	2	1.925012	0.867405	0.2750	4.777417	0.6825
	3	1.057607	0.589742	0.1511	5.835024	0.8336
	4	0.467865	0.093561	0.0668	6.302889	0.9004
	5	0.374305	0.176575	0.0535	6.677194	0.9539
	6	0.197730	0.072673	0.0282	6.874924	0.9821
	6	0.125076	----	0.0179	7.000000	1.0000
	Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion
Composite index for FI	1	2.778992	1.744739	0.6947	2.778992	0.68947
	2	1.034253	0.870051	0.2586	3.813245	0.9533
	3	0.164202	0.0411	0.0411	3.977448	0.9944
	4	0.022552	---	0.0056	4.000000	1.0000

Source: EViews 12 Outputs.

As shown in the table above, the composite index of digital banks; indicator one represents 40.75% of the total inertia, the second indicator represents 27.5% of the total inertia, the third indicator represents 15.11% of the total inertia, and the fourth indicator has 6.68% of the total inertia. Thus, the first four indicators were able to explain 90.04% of the total indicators, a percentage that exceeded 90%, which is considered good to give a clear picture of the point cloud on this axis. Regarding to the composite index of financial inclusion: the first indicator represents 69.47% of the total inertia, and the second indicator represents 25.86% of the total inertia. Thus, the first two



indicators were able to explain 95.33% of the total indicators, a percentage that exceeded 90%, which is considered good to give a clear picture of the point cloud on this axis.

III.3. Model Specification:

Studying the impact of digital banks and financial inclusion on the institutional dimension of sustainable development proxied by the indicator of foreign direct investment as a percentage of net inflows from the Gross Domestic Product:

The mathematical form of the model is defined as follow:

$$FDI = f(DB, FI)$$

Accordingly, the model is expressed in its mathematical form as follows:

$$FDI = \beta_0 + \beta_1 DB + \beta_2 FI + \epsilon_t$$

Where:

- **FDI:** Dependent variable representing Foreign Direct Investment, measured as net inflows as a percentage of GDP.
- **DB:** First independent variable representing the composite index of Digital Banking.
- **FI:** Second independent variable representing the composite index of Financial Inclusion.
- **β₀:** Country-specific effect.
- **β₁, β₂:** Model parameters.
- **ε_t:** Random error term.

After presenting the mathematical form of the model, stationarity test conducted, followed by the estimation of the three panel data models, and then a comparison between them to select the most appropriate model. As a final step, specification tests are carried out to assess the quality of the selected model.

III.4. Result and discussion:

III.4.1. Stationarity and cointegration

As shown in the table above, financial inclusion and foreign direct investment series are stationary at level, as evidenced by the probability value being less than 5%. However, the variable digital banks is not stationary at level. After conducting stationarity tests on the series after taking the first difference, we observe that the time series under study are stationary at level I(1), as confirmed by the probability value being less than 5% in all tests (LLC, IPS, ADF, PP-Fisher).

Table 4: stationarity test results

Variables		DB	FI	FDI
(LLC-2002) Levin lin and Chu				
Level	Statistic	1.61196	-5.57368	-5.5494
	Prob	0.9465	0.0000	0.0000
I(1)	Statistic	-.54123	-1.01887	-11.8795
	Prob	0.0002	0.0154	0.0000
(Ips 2003) IM , Pesaran and Shin				
Level	Statistic	4.01722	-2.15845	-3.50315
	Prob	1.0000	0.0154	0.0002
I(1)	Statistic	-1.87849	0.15540	-8.53748



	Prob	0.0302	0.0368	0.0000
ADF				
Level	Statistic	8.53999	37.7216	49.0287
	Prob	0.9876	0.0096	0.003
I(1)	Statistic	33.0257	9.39401	94.5311
	Prob	0.0335	0.0223	0.0000
PP Ficher x ²				
Level	Statistic	9.74083	40.2357	44.0232
	Prob	0.9726	0.0047	0.0015
I(1)	Statistic	30.0262	8.88932	128.978
	Prob	0.0694	0.0016	0.0000

Source: Eviews 12 Outputs.

Therefore, we reject the null hypothesis and accept the alternative hypothesis, meaning that there is no unit root. And since the time series are stationary at the same level (first difference), i.e., they are integrated of order I(1), we conclude that there is a cointegration relationship between the study variables.

Based on the study of the stationarity of the time series, which showed that they are stationary at their first differences, we now conduct the cointegration test for the variables using the Pedroni test. The test results are shown in the table below:

Table 5: Pedroni cointegration test.

Estimated model	Statistic	P .v
Within dimension		
Panel v- statistique	0.762459	0.2229
Panel Rho- statistique	0.129411	0.0150
Panel PP- statistique	-3.975561	0.0000
Panel ADF- statistique	-7.182614	0.0000
Between dimension		
Group Rho- statistique	0.302423	0.0188
Group PP- statistique	-14.31948	0.0000
Group ADF- statistique	-10.53572	0.0000

Source: Eviews 12 Outputs .

The results of the Pedroni test statistics show the existence of cointegration between the variable foreign direct investment and the explanatory variables represented by digital banks and financial inclusion, through the probability of all tests being at the 5% significance level. Accordingly, we can estimate the long-term relationship.

III.4.2. Model Specification Tests

The model specification tests used in our study consist of determining the type of effect by comparing the three models and testing the quality of the selected model.



First: Determining the type of effect between digital banks and financial inclusion on foreign direct investment.

In the following table; three models were estimated; Pooled Regression Model, Fixed Effect Model and Random Effect Model.

Table 6: Measuring the impact of DB index and FI index on FDI in Arab countries

N=10 T=12 Period : 2020- 2021 Total observations= N×T= 120			
Explanatory Variables	Pooled model	Fixed effect model	Random effect model
Constant	2.606704 0.0000	2.628125 0.0000	2.557172 0.0101
DB	0.156977 0.5376	-1.153252 0.321	-0.758790 0.0984
FI	-0.351199 0.2465	0.677170 0.2785	0.397263 0.4264
Nmber of observations	177	117	117
R- squared	0.013311 2.614019	0.516480 2.614019	0.023931 0.678666
Adjusted R- squared	-0.03999 3.801783	0.465825 3.801783	0.006807 2.790786
Prob(F- statistic)	0.465584	0.000000	0.251414

Source: EViews 12 outputs.

Robustness check tests are estimated in two steps. Firstly, we refer to Hausman test to compare between Fixed Effect Model and Random Effect Model as shown below:

Table 7: Hausman Test

Test summary	Chi-sq. statistic	Chi- sq .d.F	Probability
Cross- section random	2.376292	2	0.0304

Source: EViews 12 outputs.

Based on the results presented in the table above, the p-value of the Hausman Test is less than the 5% significance level, which leads us to reject the null hypothesis—that the Random Effects Model is appropriate—and to accept the alternative hypothesis, indicating that the Fixed Effects Model is more suitable for the data.

Secondly, Restricted Fisher test is used to compare the Pooled Regression Model with the Fixed Effects Model, in order to determine whether individual effects should be included in the model.

Table 8: Restricted Fisher Test

Effects test	Statistic	d .f	Probability
Cross- section F	12.140749	(9.105)	0.0000



Cross-square	sectiob	Chi-	83.451577	9	0.0000
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Source: EViews 12 outputs.

From the table above, it appears that the probability of the Restricted Fisher test and likewise the probability of the Hausman test, is less than the 5% significance level, which leads us to reject the null hypothesis (that the Random Effect Model is the most appropriate) and accept the alternative hypothesis (that the Fixed Effect Model is the most appropriate).

Restricted Fisher test for comparing the Pooled Regression Model and the Individual Effects Model: Less than the 5% significance level, which leads us to reject the null hypothesis (that the Pooled Regression Model is the most appropriate) and accept the alternative hypothesis (that the Fixed Effect Model is the most appropriate).

From the two tests above, we conclude that the appropriate model for the study is the Fixed Effect Model.

III.4.3. Robustness check of Selected Model

To test the parameters statistically, we analyze the coefficient of determination test and then study the overall significance of the model (Fixed Effect Model) using the selected tests:

-Coefficient of Determination (R²):

Calculated value of the coefficient of determination for the Fixed Effect Model is 0.516480, which is a moderate value. This means that the explanatory variables — digital banks (DB) and financial inclusion (FI) — account for approximately 51.6480% of the variation in foreign direct investment. The remaining percentage, 48.352%, is explained by other factors not included in the model and contained in the error term. This result is confirmed by the adjusted coefficient of determination (\bar{R}^2), which is 0.465825, indicating that the regression is not spurious (i.e., there is no other factor among the variables causing this result).

-Fisher Test: To test the overall significance of the obtained model, we conduct the Fisher (F) test to study the significance of all parameters simultaneously, based on the following hypotheses:

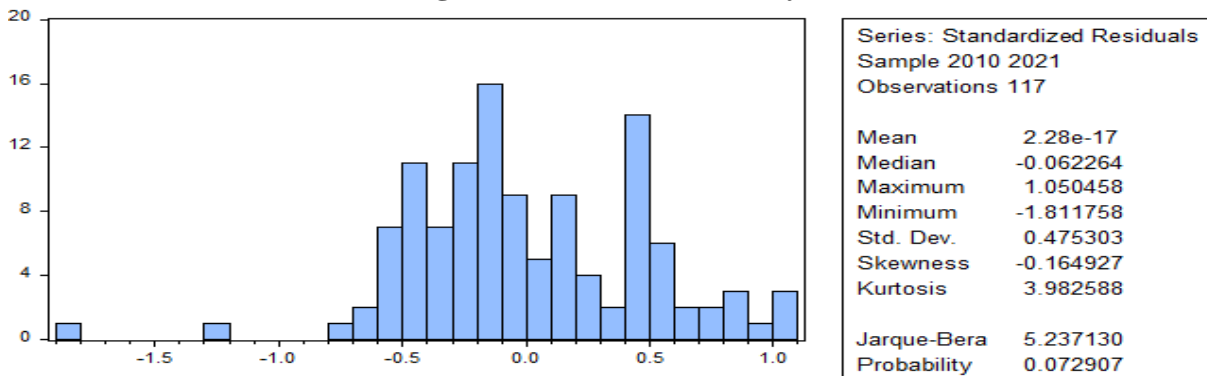
- Null hypothesis H₀: There is no relationship between foreign direct investment (FDI) and the explanatory variables — digital banks (DB) and financial inclusion (FI), i.e., the model is not significant.
- Alternative hypothesis H₁: There is a relationship between foreign direct investment and the explanatory variables — digital banks (DB) and financial inclusion (FI), i.e., the model is significant.

From the Fixed Effect Model table, we observe that the probability value of the Fisher statistic (Prob(F-statistic)) is 0.000000, which is much less than 0.01. Therefore, we reject the null hypothesis and accept the alternative hypothesis (the model is significant), meaning that the model as a whole is statistically significant. Thus, based on statistical evaluation, the model is statistically acceptable.



-Residual Normality Test:

Figure 1: Residual normality test.



Source : Eviews 12 outputs

In order to verify whether the series is normally distributed, we conduct the **Jarque-Bera test**. From the results of Figure 1 above, we observe that the probability of the Jarque-Bera test is greater than 0.05, meaning that the residuals are normally distributed. Hence, it can be said that the residuals follow a normal distribution within a 95% confidence interval.

-Autocorrelation Test of Errors: To ensure that there is no autocorrelation of errors, we resort to autocorrelation tests of the residuals, as shown in the following table.

Table 9: Autocorrelation test of the residuals

Test	statistic	d.f	Probability
Breuch- Pagan LM	355.3931	45	0.4819
Pesaran scaled LM	32.71830		0.5779
Bias- corrected scaled LM	32.26376		0.2562
Pesaran	18.69760		0.1783

Source : Eviews 12 outputs .

IV Long-term Relationship Estimation:

Cointegration models for panel data are estimated to check long-term economic relationships. That become necessary to estimate the regression coefficients and examine whether the conditions meet the theoretical constraints. (H.Baltagi, 2005). Given the non-stationary nature of the variables and the existence of a long-run relationship, the Fully Modified Ordinary Least Squares (FMOLS) estimator is employed. This method is particularly suitable for panel cointegration analysis, as it corrects for endogeneity and serial correlation, providing consistent and efficient estimation. (Pedroni, 2000) Moreover, the results of (Kao & Chen , 1995) indicate that the FMOLS estimator can be considered the most appropriate for estimating cointegrated regressions in panel data. (H.Baltagi, 2005, p. 257) After confirming the stationarity of panel series at their first differences I(1), we can estimate the cointegration models for the long-term relationship using the Fully Modified Ordinary Least Squares (FMOLS) method; regression by fully modified ordinary least squares (error correction), according to (H.Baltagi, 2005) it is necessary to use an efficient estimation method for cointegrated variables, which are variables that are non-stationary at level but become stationary after first differences. These



variables share a cointegration relationship among them, and such methods include the Fully Modified Ordinary Least Squares (FMOLS) regression.

Hence, the form of the resulting model is as follows:

$$FDI = 2.628125 - 1.153252 DB + 0.677170 FI + \epsilon_t$$

Relationship between digital banks and foreign direct investment is negative and not significant at the 5% level; in the long term.

The FI coefficient sign a positive but insignificant at the 5% level on foreign direct investment, meaning that there is no relationship between financial inclusion as an independent variable alone and foreign direct investment in the long term.

Table 10: Estimation results using the FMOLS method

Variable	coefficient	p-value		
DB	-1.159235	0.0572	R-squared	0.537757
FI	0.969693	0.2255	Adjusted R-squared	0.483664
			S.E of regression	2.784761
			Long- run variance	6.909310

Source: Eviews 12 Outputs .

Results shown that obtained value of the coefficient of determination is 0.537757, which is a medium value. This means that there is a medium correlation in the long term between the explanatory variables represented by digital banks (DB) and financial inclusion (FI), and the dependent variable represented by foreign direct investment (FDI). Explanatory variables account about 53% of the change occurring in foreign direct investment (FDI), while the remaining percentage of 46% is explained by other factors not included in the model and contained in the error term. This result was confirmed by the value of the adjusted coefficient of determination (\bar{R}^2), which is 0.483664, indicating that this regression is not spurious.

Conclusion:

This study set out to reassess the relationship between digital banking, financial inclusion, and Foreign Direct Investment inflows within the specific context of the Arab region. By leveraging a panel data approach covering ten Arab countries from 2010 to 2021, the research sought to determine whether the rapid digitalization of financial services acts as a primary driver for international capital or if its efficacy is fundamentally predicated upon the institutional Channel.

Studies emphasized that financial intermediation is the driver of innovation, further modernized by Levine (1997), who posited that well-functioning financial systems mitigate information asymmetries and attract investment. To test these foundations in the digital era, we constructed robust composite indices using Principal Component Analysis (PCA), which successfully explained over 90% of the total inertia for both digital banking and financial inclusion dimensions.

Methodologically, the study navigated through a rigorous selection process. The Hsiao homogeneity test and the Hausman test ($p < 0.05$) collectively confirmed that the Fixed Effects Model provided the most consistent framework for our analysis. Furthermore, the application of the Fully



Modified Ordinary Least Squares (FMOLS) estimator allowed for a nuanced examination of long-term equilibrium relationships, ensuring that the results were corrected for endogeneity and serial correlation (Pedroni, 2000).

Coefficients indicate negative and significant relationship at the 5% level between digital banking and foreign direct investment, but a positive and insignificant at 5% level for financial inclusion on foreign direct investment, meaning that there is no relationship between financial inclusion as an independent variable alone and foreign direct investment.

Results based on the determinant R^2 (53,7) confirms while digital banking and financial inclusion are integral to economic development. Statistical significance failed to achieve FDI as independent driver of financial inclusion; this lack of significance underscores that in the Arab context the digital banking index driven by automated machine and financial inclusion proxied by account owners and other variables are currently operating in an institutional vacuum. Accordingly, insignificant coefficients at the long term conclude that first and second hypothesis says respectively; digital Banking and financial inclusion positively impacts FDI are rejected. The most striking finding of this research is the lack of statistical significance for both digital banking and financial inclusion as independent long-term drivers of FDI at the 5% level. Coefficients for DB and FI do not translate into increased investment inflows in a vacuum. This "Institutional Paradox" suggests that in Arab countries, the mere adoption of fintech or the expansion of account ownership is insufficient to sway foreign investors. Instead, as highlighted by (Magbondé, Thiam, & Konté, 2025) and (Khan & & Shahid, 2026), digital advancements are often bottlenecked by the underlying quality of governance, regulatory frameworks, and the rule of law.

We accept the institutional channel hypothesis precisely because the data suggests that technological adoption without robust governance is insufficient. Foreign investors in the region are not merely looking for digital interfaces; they are seeking the institutional certainty that protects those digital transactions. The negative coefficient of digital banking in the long run suggests that in some cases rapid digitalization without matching regulatory maturity might even signal a risk rather than an opportunity.

Consequently, the path forward for Arab policymakers is clear; the transition must move from quantity (increasing mobile subscriptions and bank accounts) to "Institutional Quality." To unlock the latent potential of the digital-financial nexus, reforms must prioritize the legal infrastructure; specifically, data security and transparency as these are the true conduits through which digital progress translates into sustained international investment.

The reassessment of the institutional channel yields critical insights for policymakers in the Arab world. To transform digital finance into a genuine magnet for global capital, the following strategies are proposed:

Synchronizing Digital and Institutional Reform: Governments must recognize that digital banking is a tool, not a destination. Policy focus should shift toward strengthening the legal protections surrounding data security and consumer rights to build the institutional trust necessary for foreign entities.

Bridging the Regulatory Gap: The lack of long-term significance suggests a disconnect between financial availability and investment security. Arab economies should prioritize the harmonization of



fintech regulations to match international standards, thereby reducing the perceived risks of entry for foreign investors.

Enhancing the quality of Inclusion: Rather than focusing solely on the quantity of bank accounts FIA or ATMs, emphasis should be placed on high-value digital transactions and the integration of small and medium enterprises SMEs into the global digital supply chain.

In conclusion, while the Arab region has made significant strides in financial digitalization, this study underscores that the path to sustainable FDI inflows remains firmly rooted in institutional integrity.

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