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The Dynamics of Foreign Direct Investment Response to Digital Transformation Mechanisms in Arab Countries: An Econometric Study(2024–2004)

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Abstract :

This study aimed to investigate the responsiveness of Foreign Direct Investment (FDI) to digital transformation mechanisms in a panel of Arab countries, including Kuwait, Algeria, Morocco, Tunisia, Jordan, Saudi Arabia, the United Arab Emirates, Qatar, and Egypt, spanning the period 2004 - 2024. To analyze both short- and long-run dynamics, the econometric model was estimated using the Panel Autoregressive Distributed Lag - Pooled Mean Group (Panel ARDL-PMG) approach.

The empirical findings revealed a long-run relationship between digital transformation - proxied by e-government and mobile cellular subscriptions - and FDI. Specifically, the econometric results indicated that the e-government index (EGI) exerts a positive and statistically significant long-run impact on FDI, with an estimated coefficient of 0.0358 at the 5% significance level; however, its short-run effect was found to be statistically insignificant. Conversely, mobile cellular subscriptions (MOB) displayed a negative and statistically significant long-run impact, with an estimated coefficient of -0.0132 at the 5% significance level, while its short-run effect remained statistically insignificant.

Keywords : Digital Transformation, Foreign Direct Investment (FDI), E-government, Mobile.

JEL Classification Codes: O30 , F21, L96.

Introduction

The determinants of Foreign Direct Investment (FDI) represent a dynamic variable within macroeconomic literature. While classical approaches concentrated on traditional market forces - such as growth rates, domestic demand size, and currency stability - the accumulation of knowledge and technological advancements since the turn of the third millennium has propelled digital transformation into a sovereign benchmark that reshapes the competitive advantages of host countries. Within this context, a research paradigm has crystallized to explore this linkage through the lens of 'Spillover Effects and Absorptive Capacity' theory, alongside international strategy theories of Multinational Corporations (MNCs).

The theoretical underpinning of this relationship rests on the premise that digitalization reconfigures the strategies of transnational corporations toward investing in intangible assets, thereby reducing reliance on traditional physical presence**(Mai & T, 2020, pp. 34–42)** and forging new capital inflow channels anchored in the agility of digital supply chains. Within this conceptual framework, structural and political factors intertwine to determine the efficiency of this effect; it manifests linearly and directly in specific investment environments where digitalization is linked to easing financing constraints and expanding corporate scaling capacity**(Zhu, 2025, p. 72) .**

However, a review of the empirical literature unveils fundamental contradictions and complex interactions regarding the nature of this impact. On one hand, several studies hypothesize non-linear relationships governed by exceptional circumstances, wherein digital public services emerge as a buffer that ensures the sustainability of capital flows during economic and health crises, as evidenced by the European experience**(Ha & Nguyen, 2022, pp. 177–191)**. On the other hand, these digital benefits intersect with non-technological dimensions; the positive impact of digitalization is directly proportional to the robustness of diplomatic relations between countries, whereas it may turn negative or face severe challenges due to fierce competition in host markets with saturated and highly advanced digital infrastructures**(Wu, 2025, p. 779)**. Regionally and within oil-producing countries, however, studies have demonstrated a linear positive effect, where infrastructure and supportive government policies act as the core drivers for investments**(Bardesi, 2024, pp. 18–40)**, reflecting the disparate response mechanisms between advanced and developing economies.

Despite this rich body of knowledge, a critical review of the literature reveals a three-dimensional research gap:

- ✓ Theoretical Underpinning Deficiencies in Developing Environments: Most prior studies**(e.g.,Zhu, 2025)** have focused on major economies - such as China and Europe - that possess saturated digital markets. Consequently, extrapolating their findings to Arab countries lacks scientific precision due to structural differences in the investment climate.
- ✓ Omission of the Inter-Regional Digital Divide: The Arab region is characterized by severe network disparities, contrasting the high-readiness Gulf Cooperation Council (GCC) states with other Arab nations possessing developing infrastructures. This

represents a dynamic dimension overlooked by previous regional literature, which has predominantly relied on individual case studies**(e.g.,Bardesi, 2024)**

Building upon this gap and capturing these structural variances, the core research problem is defined by the following primary question:

- **How do Foreign Direct Investment (FDI) inflows respond to digital transformation mechanisms and indicators in Arab countries during the period 2004–2024?**

The study is based on the hypothesis that digital readiness (measured by mobile cellular subscriptions and E-government) in Arab countries will have a statistically significant positive impact on FDI flows in both the long and short run. Consequently, this study aims to achieve several objectives, most importantly: estimating the quantitative impact of digitalization variables on FDI attractiveness in both the short and long run. To this end, the study is divided into three main sections: the first covers the theoretical framework; the second outlines the research methodology and econometric model; the third presents and discusses the empirical findings; followed by the conclusion and policy recommendations**.**

I: The Theoretical Framework of the Relationship between Digital Transformation and Foreign Direct Investment

This section provides a theoretical grounding for the concept of digital transformation and the nature of Foreign Direct Investment (FDI). It further explores the theoretical link between digitalization - as an efficiency-enhancing mechanism - and market attractiveness, which serves as a strategic objective for host countries.

1. The Concept of Digital Transformation

Digital transformation is perceived as a set of strategic actions undertaken by organizations or states to integrate and leverage new digital technologies to achieve a qualitative leap in institutional performance. This approach focuses on deploying innovative solutions such as the Internet of Things (IoT), Cloud Computing, mobile applications, social media, Virtual Reality (VR), Data Analytics, and Artificial Intelligence (AI)**(Sadigh et al., 2022, pp. 1212–1242).**

In a related context, digital transformation is defined as the systematic employment of digital technology to fundamentally alter traditional workflows. It represents a core transition

toward an operational model that relies essentially on technical solutions to enhance Value Added**(Westerman, 2015, p. 39)**.

From a structural impact perspective, the researcher Vial defines this process as aimed at improving an entity by triggering significant changes in its properties and fundamental functions, which is achieved through the functional integration of information technology, computing, and modern communication technologies**(Vial, 2019, pp. 118–144)**.

2. Definition of Foreign Direct Investment (FDI)

Foreign Direct Investment (FDI) is defined as a vital instrument for transferring capital flows and real resources across national borders, particularly during the foundational stages of enterprises. Operationally, it manifests as an equity participation by one firm in the ownership structure of another cross-border entity, either through the establishment of a foreign branch, capital expansion, or a joint venture with foreign partners**(Bertrand, 1997, p. 91).**

In a related context, FDI possesses a cumulative nature aimed at deepening the capital stock of the host country. This occurs either through Greenfield Investments, which add new productive assets such as machinery and equipment, or through Acquisition Strategies, whereby a foreign investor acquires a substantial stake in local firms. Academic convention typically sets this threshold at 10% or more of total assets to ensure the exercise of management and voting rights**(Hess & Ross, 1997, p. 490)**.

The United Nations Conference on Trade and Development (UNCTAD) provides the institutional framework for this activity, defining it as a long-term economic relationship reflecting a lasting interest and control by a resident entity in one economy (the foreign investor or parent company) over an enterprise resident in another economy (the direct investment enterprise, affiliate, or foreign branch) **(UNCTAD, 2009, p. 243)**.

3. The Relationship Between Digital Transformation and FDI

Theoretical frameworks converge in explaining the dynamics between digitalization and investment attraction. From the perspective of the Eclectic Paradigm (OLI), digital transformation has generated modern Locational (L) advantages that transcend physical resources. Technological readiness and connectivity have become strategic assets that diminish "economic distances"**(Dunning, 1988, pp. 1–31)**, a notion corroborated by**(UNCTAD 2017)** reports, which emphasize that digital infrastructure facilitates the management of Global Value Chains (GVCs).

This argument aligns with Transaction Cost Theory, where digital tools function as a mechanism to reduce search and coordination expenses**(Williamson, 1985)** According to **(Chen, 2026)** digitalization mitigates the dilemma of "Information Asymmetry" between parent companies and their foreign affiliates, thereby enhancing the flexibility of cross-border operations.

From an institutional standpoint, Signaling Theory elucidates the role of digital governance as a reassuring signal reflecting the quality of the regulatory environment**(Spence, 1973**). This is supported by **(Ndou, 2004, pp. 1–24),** who argues that E-government elevates transparency levels and attracts investors. Finally, Endogenous Growth Theory views digitalization as a driving force that boosts Total Factor Productivity (TFP)**(Romer, 1990, pp. 71–102)** . Empirical evidence from**(Mensah & Traore, 2024, pp. 1–23)** confirms that high-quality information infrastructure fosters an innovative climate that attracts efficiency-seeking investments.

II: Methodology and Model Specification

To achieve the primary objective of this study - namely, measuring the impact of digital transformation on the attractiveness of Foreign Direct Investment (FDI) - a sample comprising nine (09) Arab countries was selected: Algeria, Tunisia, Morocco, Egypt, Jordan, Saudi Arabia, the United Arab Emirates, Qatar, and Kuwait. The criteria for selecting this specific sample are anchored in objective methodological and economic considerations. First, the structural variance in digital infrastructure levels and technological readiness between countries that have made advanced strides in digitalization (such as the GCC states) and others still in the process of transition and growth allows the econometric model to capture the impact across heterogeneous digital environments. Second, the disparity in the volume of FDI inflows directed toward these economies facilitates an empirical examination of how foreign capital responds to digital indicators. Third, the sample exhibits sufficient regional, geographical, and institutional homogeneity to justify its integration into a panel data framework, while ensuring the full availability and systematic regularity of uninterrupted statistical data. The study utilizes annual data spanning the period 2004–2024.

1 .Model Specification and Variables

The model adopted in this study specifies Foreign Direct Investment (FDI), measured as a percentage of Gross Domestic Product (% of GDP), as the dependent variable, sourced from the World Bank database. This variable is expressed as a function of a set of independent variables reflecting digital and institutional transformation dimensions, derived from reliable sources. These include the E-Government Index (EGI), measured as a score, which reflects the level of digitalization in public administration and transactional government services based on the United Nations (UN) reports, and mobile cellular subscriptions per 100 people (MOP), obtained from the World Bank database. Despite reservations in recent literature regarding the comprehensiveness of the latter indicator, its adoption in this study is justified as it captures the cornerstone and the baseline level of network and connectivity readiness available during the initial cross-sections of the study period within the targeted Arab economies.

In addition to the aforementioned indicators, the requirements of the enabling environment are incorporated via the economic growth variable augmented by political stability (GDPPS). This composite indicator was constructed in this study as an interaction variable, computed as the product of the annual GDP growth rate and the score of the Political Stability and Absence of Violence index (both sourced from the World Bank database). This econometric procedure finds its justification in modern institutional theory; high economic performance alone does not constitute a sufficient pull factor for foreign investment unless it is fortified by a stable political environment that mitigates uncertainty and sovereign risks. Consequently, integrating these two variables mathematically allows for measuring the joint and reciprocal effect of stability as an accelerating and anchoring factor for growth

2 .Econometric Approach: Panel ARDL

To estimate the relationship, the study employs the Panel Autoregressive Distributed Lag (Panel ARDL) approach. This methodology is particularly suitable for analyzing the dynamics between variables in both the short-run and long-run. The general form of the ARDL model is represented in Equation (1):**(Stephen, 2002, pp. 141–162).**

$$Y_{it} = \sum_{j=1}^{p} \lambda_{ij} Y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{jt} \dots\dots (01)$$

- p Represents the lag length for the dependent variableY_{it}.
- q Represents the lag length for the independent variables $X_{i,t}$.
- $i = 1,2, \dots . N$ **:** Denotes the number of cross-sectional units.
- $t = 1,2, \dots . T$: Denotes the number of time periods.
- $X_{i,t}$: Represents a $k * 1$ vector of independent variables.
- δ_{ij}: Represents the coefficients (parameters) of the independent variables.
- μ_i: Represents the fixed effects specific to each cross-sectional unit.
- λ_{ij}: Represents the coefficient of the lagged dependent variableY_{it}

The model can be reformulated into a Vector Error Correction (VEC) system as follows:**(Blackbume & Frank, 2007, pp. 198–199).**

$$\Delta Y_{it} = \Phi_i (Y_{i,t-1} - \theta_t' X_{i,t}) \sum_{j=1}^{p-1} \lambda_{ij} \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \delta'_{ij} \Delta X_{i,t-j} + \mu_i + \varepsilon_{jt} \dots\dots (02)$$

Where:

$\Phi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij})$: Represents the Error Correction Term (ECT). It is required that its value be negative and statistically significant, which implies the existence of a long-run cointegration relationship.

$\Delta Y_{i,t-1}$ ، $\Delta X_{i,t-1}$: Represent the short-run dynamics (changes), which are affected by any deviation from the long-run equilibrium.

θ_i: Represents the vector of independent variable coefficients that illustrate the long-run cointegration relationships between the variables.

Based on the above, the estimation model is represented in Equation (03) as follows:

$$FDI_{it} = \beta_0 + \beta_1 \text{Egi}_{it} + \beta_2 MOB_{it} + \beta_3 Rx_{it} + \varepsilon_{it} \dots\dots . (03)$$

It is pertinent to note that prior to the estimation process, a series of rigorous preliminary diagnostic tests were conducted to ensure the reliability of the results. These assessments included: Multicollinearity Tests, Cross-Sectional Dependence (CD) Tests, Panel Unit Root Tests. Panel Cointegration Tests, Slope Homogeneity Tests.

III: Presentation and Discussion of Empirical Results

1 .Preliminary Tests

Prior to the main estimation, a series of diagnostic tests were conducted to ensure the validity and reliability of the econometric model.

1.1. Descriptive Statistics of the Study Variables

The following table 01 the descriptive statistics for the study variables, including the mean, standard deviation, minimum, and maximum values for each variable:

Table 01: Descriptive statistics

Variable	Obs	Mean	Std.dev	Min	Max
FDI	189	2.544303	3.141653	-1.685507	23.53729
EGI	189	0.6237743	0.2964048	0.2641	2.17
Mob	189	118.1913	46.4789	9.61664	220.412
GDPPS	189	246.1773	342.1027	- 695.648	2184.692

Source: Stata Outputs

The descriptive statistics for the study data - comprising 189 observations spanning the period 2004–2024 across 09 Arab countries - revealed notable variance in the statistical characteristics of the model variables. The values of Foreign Direct Investment (FDI) ranged from a minimum of -1.68% to a maximum of 23.53%, registering an overall period mean of 2.54% and a standard deviation of 3.141653.

Regarding the digital transformation indicators, the scores of the e-government index (EGI) were bounded between a minimum of 0.2641 and a maximum of 2.17, with a reported mean of 0.6237743 and a low standard deviation of 0.2964048, reflecting relative homogeneity among its observations. Conversely, the mobile cellular subscriptions (MOB) variable displayed wide variation and substantial dispersion, with a standard deviation of 46.4789 around an overall mean estimated at 118.1913, where its values fluctuated between a minimum of 9.61664 and a high maximum approaching 220.412.

Finally, the economic growth variable augmented by political stability (GDPPS), incorporated as a control/interaction framework, exhibited wide divergence in its data, as expressed by a high standard deviation of 342.1027; its values ranged from a minimum negative value of -695.648 to a maximum of 2184.692, recording an overall period mean of 246.1773.

1.2. Multicollinearity Test

To ensure the model is free from Multicollinearity, which can lead to biased estimates and weaken the explanatory power of the independent variables, the Variance Inflation Factor (VIF) test was employed. Multicollinearity arises when independent variables are highly correlated, making it difficult to isolate the individual effect of each variable on FDI.

The following table presents the VIF results used to verify the independence of the explanatory variables:

Table 02: Variance Inflation Factor (VIF) Test Results

Variable	VIF	1/ VIF
MOB	1.03	0.969531
GDPPS	1.02	0.980332
EGI	1.01	0.988815
Mean VIF	**1.02**	

Source: Stata Outputs.

Analysis of VIF ResultsAs illustrated by the results in Table 02, the estimated model is free from Multicollinearity issues. The Mean Variance Inflation Factor (Centered VIF) is significantly lower than the conventional threshold of 5, recorded at 1.02 (1.02 < 5). This empirical evidence confirms the statistical independence of the explanatory variables, ensuring that the estimated coefficients are reliable and that the model's explanatory power remains robust.

1.3 .Cross-Sectional Dependence Test

Testing for cross-sectional dependence (CSD) constitutes a pivotal econometric procedure, serving as the fundamental decision rule for determining the technical specifications of the employed estimators and their alignment with the inherent properties of panel data. The primary objective of this diagnostic is to adjudicate between the application of first-generation tests - which are predicated on the assumption of cross-sectional independence - and the requisite transition toward second-generation tests capable of accounting for unobserved common factors and interdependencies.

In light of these considerations, the empirical evidence of significant cross-sectional dependence necessitates a methodological shift from conventional unit root and cointegration

frameworks (such as Pedroni or Kao) to more robust second-generation approaches, most notably the Westerlund (2007) technique. The superiority of this generation lies in its capacity to mitigate the "nuisance" or noise arising from cross-unit correlations, thereby ensuring the attainment of consistent and unbiased estimates of the long-run equilibrium relationship. This transition effectively circumvents the "spurious regression" pitfall that often invalidates first-generation tests in the presence of cross-sectional dependence.

Table 03: Cross-Sectional Dependence (CSD) Test Results

Variables	Test		
	Breuch – Pagan LM	**Pesaran scaled LM**	**Bais-corrected scaled LM**
FDI	111.9589***	8.95184***	8.726847***
EGI	640.7688***	71.27269***	71.04769***
MOB	491.5735***	53.68985***	53.46485***
GDPPS	187.3304***	17.83445***	17.60945***

Source: Stata Outputs.

Note: ***denotes significance at 1% level.

The statistical results presented in Table 03 indicate a categorical rejection of the null hypothesis (H0) of cross-sectional independence at the 1% significance level. Consequently, the alternative hypothesis (H1), which confirms the presence of significant cross-sectional dependence, is statistically accepted. From an economic perspective, these findings denote profound interdependencies and cross-border linkages among the sampled countries; thus, any economic shock or structural shift occurring in one nation is expected to propagate automatically and reciprocally across the other countries within the panel. In light of these econometric diagnostics, and given the violation of the cross-sectional independence assumption, this study necessitates a methodological departure from conventional frameworks toward second-generation techniques. Accordingly, advanced panel unit root tests (e.g., the CIPS test) and cointegration procedures that account for cross-unit correlations (e.g., the Westerlund test) will be employed. This approach ensures the attainment of efficient and statistically consistent estimators, mitigating any potential bias in the empirical results.

1.4. Panel Unit Root Test Results

To investigate the stationarity properties of the variables and detect the presence of unit roots within the panel framework, this study employs the Cross-sectionally Augmented IPS (CIPS) test developed by (Pesaran 2007). This second-generation test is specifically selected

for its robustness and reliability in the presence of cross-sectional dependence, as established in the previous diagnostic stage, ensuring that the stationarity inferences are not biased by unobserved common factors.

Table 04: Results of Second-Generation Panel Unit Root Tests (CIPS)

Pesarane- CIPS (2007) Test				
	FDI	**EGI**	**MOB**	**GDPPS**
At Level	-2.29087 (> 0.10)	-1.40114 (> 0.10)	-1.69599 (> 0.10)	-3.36693 (< 0.01)
At First Difference	-4.09869 (< 0.01)	-3.97275 (< 0.01)	-4.18769 (< 0.01)	-3.77646 (< 0.01)

Source: Stata Outputs.

The empirical results of the Pesaran (2007) CIPS test, as detailed in Table 04, indicate that economic growth moderated by political stability (GDPPS) is the only variable found to be stationary at level [I(0)]. This result facilitates the rejection of the null hypothesis (H0) regarding the presence of a unit root for this specific series at the 5% significance level. Conversely, the remaining variables - namely Government Expenditure (EGI), Foreign Direct Investment (FDI), and Mobile Penetration (MOB) - attained stationarity only after being transformed into their first differences [Δ]. This implies the rejection of the null hypothesis in favor of the alternative hypothesis (H1), confirming that these series are integrated of order one [I(1)]. In conclusion, the integration properties of the study's variables exhibit a mixed order of integration, specifically a combination of I(0) and I(1). This specific data structure provides the econometric justification for adopting the Autoregressive Distributed Lag (ARDL) dynamic model, as it is uniquely suited to handle variables with different integration orders, provided that no variable is integrated of order two [I(2)].

1.5. Panel Cointegration Test Results

The Westerlund (2007) panel cointegration test emerges as the most rigorous and appropriate analytical framework for this study. Its superiority over conventional alternatives lies in its robust capacity to yield highly reliable results, even in the presence of cross-sectional dependence and significant heterogeneity in the dynamic properties across the panel units. Unlike first-generation tests, the Westerlund approach is specifically designed to account for these complexities, ensuring that the detected long-run equilibrium relationships are not spurious.

Table 05: Results of Second-Generation Panel Cointegration Test (Westerlund, 2007)

Westerlund (2007) test			
Statistic	**Value**	**Z-value**	**P-value**
Gt	-3.026	-2.533	0.006
Ga	-8.147	1.202	0.885
Pt	-8.743	-2.821	0.002
Pa	-11.571	-1.881	0.030

Source: Stata Outputs.

The statistical outputs of the Westerlund (2007) test indicate the rejection of the null hypothesis of no cointegration, thereby confirming the existence of a stable long-run equilibrium relationship between Foreign Direct Investment (FDI) and its determinants .A detailed examination of the results reveals that the panel statistics (Pt and Pa) are statistically significant at the 5% level, demonstrating the presence of cointegration for the panel as a whole. Regarding the group statistics, the results exhibit some variation; while the Gt statistic is highly significant at the 1% level - supporting the existence of an equilibrium relationship for at least one section of the sampled units - the Ga statistic did not reach the required significance threshold. Nevertheless, based on the superior explanatory power and robustness of the panel statistics (Pt and Pa), it can be concluded that a comprehensive cointegration relationship is established. This provides the methodological justification to proceed with the estimation of the long-run coefficients.

1.6 .Results of Slope Homogeneity (SH) Tests

The slope homogeneity test represents the methodological cornerstone for determining the degree of symmetry in the response of cross-sectional units to the explanatory variables; this, in turn, dictates the appropriate choice of estimators. Given its robustness in handling longitudinal data, the Blomquist and Westerlund**(Blomquist et al., 2013, p. 375)** test was adopted to adjudicate between the hypotheses of slope homogeneity and structural heterogeneity in the parameters. This procedure ensures the accuracy of the model's mathematical specification and mitigates the potential biases arising from the assumption of uniform slopes across disparate economic environments.

Table 06: Results of the Blomquist and Westerlund (2013) Slope Homogeneity Test

	Blomquist and Westerlund	
	Delta	**P-value**
	-0.292	0.770

Adj,	-0.337	0.736

Source: Stata Outputs.

The results of the Blomquist and Westerlund (2013) test indicate the presence of slope homogeneity across the sampled countries. This is evidenced by the Delta (Delta) and Adjusted Delta (Delta adj) statistics, both of which yielded p-values exceeding the 5% significance level. Consequently, the null hypothesis of slope homogeneity cannot be rejected. This result reflects the absence of fundamental structural disparities among the economies in the sample, implying that the responsiveness of Foreign Direct Investment (FDI) to the explanatory variables is uniform across countries and follows a consistent, synchronized pattern.

2 .Estimation Results of the Panel ARDL Model

To evaluate the responsiveness of Foreign Direct Investment (FDI) to changes in digital transformation mechanisms across the sampled Arab countries, the study utilizes the Panel Autoregressive Distributed Lag (Panel ARDL) framework. The estimation is conducted for both the long-run and short-run horizons using two distinct estimators: the Pooled Mean Group (PMG) and the Mean Group (MG). This dual-estimation approach facilitates a comparative analysis of the results, accounting for varying degrees of parameter heterogeneity and ensuring the robustness of the empirical findings.

Table 07: Estimation of the Panel ARDL Model using PMG and MG Estimators

Long run estimation				
Variables	**PMG-ARDL estimation**		**MG-ARDL estimation**	
	Coefficient	Probability	Coefficient	Probability
EGI	0.035848	0.032	0.2394164	0.888
MOB	-0.0132134	0.005	-0.194447	0.271
GDPPS	0.0022042	0.001	0.0043551	0.061
Short run estimation				
Variables	**Coefficient**	**Probability**	**Coefficient**	**Probability**
-ec	-0.5347189	0.0000	-0.4490014	0.157
D(EGI)	-1.60944	0.1070	-2.550297	0.079
D(MOB)	0.0069142	0.5970	0.0095583	0.401
D(GDPPS)	-0.0001237	0.7930	0.0011513	0.607
-cons	1.711923	0.0000	-1.827411	0.671
Hausman specification test:		0.47χ2(3) = Prob>chi2 = 0.9254		

Source: Stata Outputs.

The Hausman test results indicate that the Pooled Mean Group (PMG) estimates outperform the Mean Group (MG) estimator. This is evidenced by the p-value associated with the Chi-square (χ^2) statistic, which exceeds the 5% significance level. Consequently, the null hypothesis (H0) of the efficiency and consistency of the PMG estimator is accepted, rendering the PMG results more reliable for subsequent inference.

This result aligns seamlessly and with methodological complementarity with the outcomes of the Blomquist and Westerlund (2013) test, which pre-emptively indicate and confirm the homogeneity of the long-run regression coefficients. This statistical alignment finds its scientific justification in the structural foundation of the PMG estimator, which is inherently built upon imposing homogeneity restrictions on the long-run parameters while permitting them to vary in the short run. This econometric consistency reflects the existence of homogenous tendencies and structural symmetry in the long-term economic frameworks of the investigated Arab countries in response to shocks from digital transformation mechanisms and political stability, despite the structural and circumstantial variances that may govern their dynamic relationships in the short run

The long-run results from the PMG estimation reveal that E-government (EGI) exerts a positive and statistically significant impact on FDI at the 5% level, with a coefficient of 0.035848. This reflects the reality that adopting digital technologies in service delivery mitigates bureaucracy and enhances transparency, thereby improving the business environment and attracting foreign investors seeking institutional efficiency and digital agility. Conversely, Mobile Phone Subscriptions (MOB) per 100 inhabitants recorded a negative and statistically significant impact at the 5% level, with a coefficient of -0.0132134. Economically, this suggests that in the Arab context, a mere increase in subscription volume - without high-quality digital infrastructure or production-oriented applications - may not provide sufficient incentives for high-quality investment. Regarding economic growth augmented by political stability (GDPPS), the empirical results revealed a positive and statistically significant impact at the 1% significance level, with a coefficient of 0.0022042. This finding conforms perfectly with macroeconomic rationale, which asserts that sustained economic growth fortified by political stability significantly enhances the influx of foreign direct investment.

Furthermore, the empirical findings confirm the presence of a corrective mechanism following any system shock to restore the long-run equilibrium. Specifically, the Error Correction Term (ECT) indicates that the system adjusts by 53.47% annually toward the equilibrium state, implying that a full restoration of balance is achieved within approximately 1.87 years.

In the short run, however, the digital transformation variables exhibited no statistically significant impact on Foreign Direct Investment (FDI). From an econometric and economic standpoint, this result is highly plausible; FDI inflows typically require a gestation period to respond to structural shifts in digital infrastructure, rendering the impact more pronounced in the long run. This discrepancy between short-run and long-run horizons underscores that digitalization and e-government policies are strategic investments that do not yield immediate results in attracting international capital. Rather, they necessitate institutional sustainability to effectively function as a fundamental pull factor for foreign investors.

Conclusion

This study investigated the impact of digital transformation - proxied by e-government development and mobile phone subscriptions - on Foreign Direct Investment (FDI) inflows in Arab countries from 2004 to 2024. Utilizing the Panel ARDL-PMG framework, the research analyzed both short-run dynamics and long-run equilibrium relationships.

The empirical findings from the cointegration analysis confirm a stable long-run equilibrium among the variables. Specifically, E-government (EGI) was found to exert a positive and statistically significant impact on FDI. This result underscores that digitalization serves as a catalyst for transparency and a deterrent to bureaucracy, thereby attracting investors seeking an efficient and streamlined business environment.

Conversely, Mobile Phone Subscriptions (MOB) exhibited a negative and statistically significant effect on FDI. This suggests that a mere quantitative expansion in mobile penetration, in the absence of specialized productive applications or high-quality digital infrastructure, fails to incentivize high-value investments in emerging economies.

Regarding the short-run dynamics, the Error Correction Term (ECT) was estimated at -0.5347, being both negative and statistically significant at the 1% level. This validates the

existence of a short-run corrective mechanism toward the long-run equilibrium, whereby 53.47% of short-term deviations are corrected annually, achieving full restoration of balance within approximately 1.87 years.

Based on these findings, the study offers the following policy recommendations for Arab authorities:

- Institutional Digital Transformation: Efforts should be intensified to evolve e-government systems into integrated, seamless platforms. This is essential to further mitigate bureaucratic hurdles and enhance transparency, which are the primary drivers of long-term investment attraction.
- Qualitative Infrastructure Upgrading: There is an urgent need to shift from "quantitative diffusion" of mobile technology to "qualitative utilization." This involves prioritizing support for digital applications tailored to productive and service sectors that directly serve investor needs.
- Sustainable Digital Policy: Given that the impact of digitalization is more pronounced in the long run, policymakers must ensure the sustainability and continuity of digital reforms to build long-term institutional credibility.

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