

E-GOVERNMENT, INSTITUTIONAL QUALITY AND ECONOMIC GROWTH IN THE MENA REGION: THEORETICAL ANALYSIS AND EMPIRICAL EVIDENCE

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Abstract

How to cite this paper: Labkir, S.-E., El Loumani, L., & El Harmouzi, N. (2026). E-government, institutional quality and economic growth in the MENA region: Theoretical analysis and empirical evidence. *Journal of Governance and Regulation*, 15(1), 117–125.
<https://doi.org/10.22495/jgrv15i1art11>

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ISSN Print: 2220-9352
ISSN Online: 2306-6784

Received: 26.05.2025
Revised: 31.08.2025; 12.12.2025
Accepted: 13.01.2026

JEL Classification: O43, H11, C33
DOI: 10.22495/jgrv15i1art11

This study investigates whether institutional quality and digital governance can effectively promote economic growth in the Middle East and North Africa (MENA) region, where structural inefficiencies and governance weaknesses have long constrained development. While institutions are widely recognized as long-term growth drivers (Acemoglu & Robinson, 2012), the role of e-government remains underexplored, particularly in emerging economies. To address this gap, we employ the system generalized method of moments (GMM) on a dynamic panel dataset of 11 MENA countries from 2002 to 2021. Our findings reveal that government effectiveness has a significant and positive influence on economic growth. In contrast, control of corruption and political stability show negative associations, potentially due to transitional reform costs. Other governance dimensions, such as regulatory quality, rule of law, and voice and accountability, are not statistically significant. Notably, the e-government development index (EGDI) displays the strongest and most robust positive effect on growth, emphasizing the strategic importance of digital transformation (Mohammed & Yacine, 2025). The study concludes that while institutional reforms are necessary, they must be complemented by coherent digital strategies. These results offer valuable policy insights for enhancing state capacity, improving governance, and accelerating inclusive development in MENA economies.

Keywords: Economic Growth, Institutional Quality, E-Government, MENA Region, Dynamic Panel Data, System GMM

Authors' individual contribution: Conceptualization — S.-E.L. and L.E.L.; Methodology — S.-E.L. and L.E.L.; Software — S.-E.L.; Writing — Original Draft — S.-E.L.; Writing — Review & Editing — S.-E.L. and L.E.L.; Supervision — N.E.H.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

Institutional quality has long been recognized as a cornerstone of economic growth, ensuring macroeconomic stability, fostering investor confidence, and guaranteeing the predictability of public policy. While this relationship is well

documented in the literature (Acemoglu et al., 2001, 2005), the complementary role of digital transformation, particularly digital governance, remains relatively underexplored, especially in the context of developing and emerging economies. Yet, in a period marked by accelerated technological change, digital tools can help compensate for institutional weaknesses by improving access

to information, enhancing procedural transparency, and streamlining administrative efficiency (World Bank, n.d.; United Nations Development Programme [UNDP], 2020; Zheng & Walsham, 2008).

This link between institutions and digital development is particularly relevant in the Middle East and North Africa (MENA) region, which faces a double structural deficit. On the one hand, existing institutional fragility, characterized by corruption, inefficient bureaucratic systems, and political instability, continues to hamper sustainable development (Kaufmann & Kraay, 2024). On the other hand, underinvestment in digital infrastructure and fragmented information and communications technology (ICT) strategies impeded the region's ability to fully exploit the potential of the digital economy (Zheng & Walsham, 2008). While several Gulf countries have adopted ambitious digital transformation programs (e.g., Saudi Arabia's Vision 2030), most non-oil economies in the MENA region remain constrained by weak institutional foundations and limited e-government penetration. While previous research has established that institutions transform long-term development pathways (North, 1990; Knack & Keefer, 1995; Mauro, 1995), recent literature has begun to examine how digital governance, measured using tools such as the e-government development index (EGDI), can complement or partially replace institutional reforms (Zheng & Walsham, 2008).

However, empirical evidence remains sparse for the MENA context, where the joint dynamics of institutions and digitalization have rarely been studied using robust econometric tools. This paper contributes to filling this gap by empirically examining how institutional quality and digital governance jointly influence economic growth in MENA countries. Building on a theoretical framework that considers institutions as the bedrock of inclusive development (Acemoglu & Robinson, 2012) and digital transformation as a potential enabler of state capacity, we propose that the EGDI may act as a complementary or even substitutive lever to institutional strength. To this end, we use a dynamic panel estimation method — system generalized method of moments (GMM) (Arellano & Bover, 1995; Blundell & Bond, 1998), on a dataset of 11 MENA countries over the 2002–2021 period, combining six institutional dimensions (from the Worldwide Governance Indicators, WGI) with the EGDI. Our results reveal that government effectiveness is positively and significantly associated with economic growth, while the impacts of corruption control and political stability are more ambiguous, possibly reflecting reform-induced adjustment costs.

Notably, the EGDI emerges as a robust and consistent driver of growth, suggesting that digitalization can enhance institutional frameworks and stimulate performance, especially in fragile governance contexts. By integrating both governance and digitalization indicators into a unified empirical model, this study contributes to the literature in several ways. It updates and refines previous theoretical claims (Knack & Keefer, 1995) through region-specific evidence, highlights the role of e-government as a development tool, and provides actionable insights for policymakers aiming

to promote inclusive and innovation-led growth in the MENA region.

The rest of the article is structured as follows: Section 2 summarizes theoretical and empirical contributions on institutions, digital governance, and growth. Section 3 describes the empirical framework (data sources, variables, and methodology). Section 4 presents and analyzes the results. Section 5 examines the scope and implications for economic policy. Finally, Section 6 summarizes the main contributions and opens up avenues for future research.

2. LITERATURE REVIEW

2.1. Institutions and economic growth

Contemporary economic literature pays increasing attention to the role of institutions in growth dynamics. North (1990) was one of the first to formalize this approach, defining institutions as the set of formal rules (laws, regulations) and informal rules (norms, traditions) that frame social, economic, and political interactions. He postulated that strong institutions reduce transaction costs, improve transparency, and foster a favorable investment climate.

With this in mind, Knack and Keefer (1995) analyze a sample of 71 developing countries over the period 1980–1992. Their results indicate that effective institutional structures, in particular the rule of law and the protection of property rights, are associated with higher growth, outweighing the effect of other traditional variables such as the level of education or the rate of investment. Mauro (1995) examines the impact of corruption in 67 countries between 1960 and 1990. He shows that corruption hampers growth, particularly in middle- and high-income countries, by weakening institutions and reducing their effectiveness.

A new generation of studies, most notably those by Acemoglu et al. (2001; 2005), are taking this link further. These authors demonstrate that inclusive institutions enable a better allocation of resources, promoting sustainable growth. Although their analyses are global, they raise the question of their applicability to specific regional contexts, such as the MENA region. Other studies also emphasize the role of political stability, regulation, and legal certainty in supporting sustainable development. Gradstein (2008) enriches the theoretical framework by incorporating political participation and public policy choices as endogenous variables. He argues that when democratization moderates inequality, it promotes investment, strengthens the protection of property rights, reduces disparities, and supports growth. Conversely, if these conditions are not met, power remains concentrated in the hands of the elite, rent-seeking behavior increases, and economic momentum is weakened. More recent research confirms this conclusion in the post-pandemic context, showing that robust institutions help absorb macroeconomic shocks and foster inclusive recovery (Kaufmann & Kraay, 2024; Andrews & Shah, 2005).

Several studies have focused more specifically on countries in the region. Lahouij (2016), using a sample of six non-oil-exporting states between 2002 and 2013, mobilizes a random-effects panel

model. His results reveal a significant correlation between the governance index and economic growth, as well as a positive effect of public spending and domestic and foreign investment. However, in this model, economic freedom does not seem to play an important role.

Moreover, recent research (Otman, 2019) has underscored persistent governance deficiencies across MENA countries, such as opaque corporate practices and limited regulatory enforcement, which justify renewed empirical attention to the region's institutional development. These structural challenges reinforce the importance of assessing the quality of governance — particularly as captured by the WGI — as a critical foundation for understanding long-term growth performance in the region.

2.2. Digitalization and e-government

Beyond research on institutional quality, a growing body of recent work underscores the sizable impact of digital development on economic performance. Aghion et al. (2019) show that the digital transition can act as a lever for development when public services lift their efficiency, foster innovation, and ease information flows.

The EGDI rests on three pillars: online services, telecommunications infrastructure, and technological human capital. Higher scores typically signal modernized administrative systems, more accessible services, and greater transparency.

Focusing on MENA, Mohammed and Yacine (2025) use a panel-data approach to show that digital governance significantly supports economic growth, highlighting how ICT readiness and e-government complement institutional reform. In the same spirit, the World Bank (n.d.), United Nations Public Administration Network (2022), and International Telecommunication Union (2023) emphasize the role of digital governance in promoting transparency, curbing corruption, and expanding institutional capacity.

Building on these insights, Sulila et al. (2024) propose a framework for integrating e-government strategies into online taxation systems. Their analysis indicates that digitizing tax services — especially through the EGDI's "online services" component — can strengthen the operational effectiveness of public administration and contribute positively to economic outcomes. This mechanism is particularly salient in low- and middle-income settings, where reliable digital tax platforms help broaden the revenue base, advance institutional reforms, and sustain development.

Despite the spread of digital technologies, relatively few studies probe in depth how digital

development interacts with institutional quality, especially in MENA. This gap motivates an inquiry into whether digitalization enhances institutional effectiveness and operates as a complement to, or even a partial substitute for, traditional governance reforms in fostering growth.

3. MATERIALS AND METHODS

3.1. Data

This study relies on a dataset covering 11 MENA countries over 20 years (2002–2021), drawing on data from internationally recognized and reliable sources such as the World Bank, the WGI, and the United Nations database. Key macroeconomic variables, including GDP per capita, inflation, trade openness, public expenditure, and population growth, are sourced from World Bank repositories, ensuring both the consistency of the data and their comparability across the countries in the sample.

Institutional performance is proxied by the six dimensions of governance identified in the World Bank's WGI, which reflect various aspects such as accountability, regulatory capacity, and the rule of law. This multidimensional framework allows us to examine how institutional structures condition economic performance and political stability. In parallel, the United Nations' EGDI is incorporated as an independent measure of digital transformation in the public sector, providing an external benchmark for assessing its effect on governance effectiveness.

3.2. Methodology

3.2.1. Research methodology

This study employs a dynamic panel model to explore the relationships between governance dimensions, digital transformation, and economic growth across eleven MENA countries over the period 2002–2021. Given the potential issues of endogeneity between institutional variables and growth, unobserved country-specific heterogeneity, and error autocorrelation, we apply the two-step system GMM estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This method is particularly appropriate for panels with a small number of cross-sectional units (small N) and a dynamic structure. It uses internal instruments derived from lagged variables to correct for potential biases.

The baseline equation to be estimated is specified as follows:

$$\log(GDP_{i,t}) = \alpha \log(GDP_{i,t-1}) + \beta_1 Instit_{i,t} + \beta_2 EGDI_{i,t} + \beta_3 X_{i,t} + \mu_{i,t} + \varepsilon_{i,t} \quad (1)$$

where,

- $\log(GDP_{i,t})$ — real gross domestic product (GDP) per capita of country i in the year t , taken as a logarithm;
- $\log(GDP_{i,t-1})$ — persistence term representing lagged GDP;
- $Instit_{i,t}$ — institutional variable introduced independently in each model (government efficiency,

corruption control, political stability, regulatory quality, rule of law, and voice and accountability);

- $EGDI_{i,t}$ — digital development index, added in Model 7 (see Table 5) to examine its potential role;
- $X_{i,t}$ — vector of economic control variables including: government spending, trade openness, inflation, and demographics;
- $\mu_{i,t}$ — country-specific effects;
- $\varepsilon_{i,t}$ — error term.

3.2.2. Model justification and collinearity test

Before estimation, a collinearity test was conducted using the variance inflation factor (VIF) for the six institutional indicators. The results show that only the “rule of law” variable exceeds the conventional threshold of 10, with a VIF of 13.89, suggesting a high degree of collinearity with other governance dimensions. However, the average VIF (7.03) remains below the critical value of 10 commonly accepted in the literature (Gujarati, 2003), indicating no severe multicollinearity in the overall model. To mitigate potential distortions and enhance coefficient interpretability, each institutional indicator is introduced separately in a distinct regression (Models 1–6 in Table 5).

Model 7 (see Table 5) incorporates the EGDI index to capture the potential impact of administrative digitalization on economic growth, either as a complementary or substitutive lever to institutional quality. All estimations are performed using the two-step system GMM method with robust standard errors to correct for heteroskedasticity. The validity of the instruments is tested using the Hansen test (for over-identifying restrictions) and the Arellano-Bond test (for second-order autocorrelation in the residuals).

Table 1. Collinearity test

Variable	VIF	Tolerance 1/VIF
<i>GovernmentEffectiveness</i>	7.93	0.126122
<i>ControlCorruption</i>	9.85	0.101475
<i>PoliticalStability</i>	2.76	0.362360
<i>RegulatoryQuality</i>	6.01	0.166479
<i>RuleLaw</i>	13.89	0.071980
<i>VoiceAccountability</i>	1.75	0.572685
Mean VIF	7.03	

Source: Authors' elaboration.

3.2.3. Alternative estimation strategy

As an alternative to the system GMM approach, the model could have been estimated by decomposing the governance variables into separate components across different specifications, which is precisely the strategy we adopted. This method addresses the multicollinearity concern by avoiding the simultaneous inclusion of highly correlated institutional indicators in a single regression. While this approach could also be implemented within a fixed-effects or ordinary least squares (OLS) framework, these estimators would not adequately correct for endogeneity and dynamic panel bias. Therefore, the system GMM remains the most suitable and robust method for our panel structure and research objectives, while the component-wise specification enhances clarity and coefficient interpretability.

3.3. Variables

The indicators of institutional quality used in this study are taken from the WGI database developed by the World Bank, which provides a comprehensive analytical framework for assessing the quality of governance along several dimensions. In addition, the analysis incorporates the EGDI, provided by the United Nations, to measure the impact of the digital transformation of public administrations.

- **Government effectiveness (*GovernmentEffectiveness*):** Government effectiveness reflects the capacity of the state to design and implement policies, manage resources, and deliver services efficiently.

- **Control of corruption (*ControlCorruption*):** Captures the prevalence of rent seeking and the robustness of integrity systems across public interfaces.

- **Political stability (*PoliticalStability*):** Exposure to violence/instability and the resilience of the political order.

- **Regulatory quality (*RegulatoryQuality*):** Gauges whether rules enable private-sector activity while keeping administrative frictions low.

- **Rule of law (*RuleLaw*):** Reflects credible legal enforcement of property rights, contracts, and independent adjudication.

- **Voice and accountability (*VoiceAccountability*):** Tracks the openness of political choice, civic voice, and institutional accountability.

- **E-government development index (*EGDI*):** The EGDI captures the degree of digitization of public administrations and its influence on the quality of governance. It assesses the ability of states to integrate digital technologies to optimize the efficiency, transparency, and accessibility of public services.

- **Inflation (*Inf*):** An indicator of macroeconomic stability, inflation can affect growth independently of institutional quality. It is, therefore, introduced as a control variable, based on the annual rate measured by the consumer price index for each country in the sample. A negative effect is anticipated due to its impact on economic uncertainty, price volatility, and investment profitability.

- **Openness to trade (*OpsTrad*):** Economic literature emphasizes the importance of trade openness in growth dynamics, by facilitating trade, technology transfer and the strengthening of productive capacities. It is measured by the ratio of exports and imports to GDP for each country in the sample.

- **Public expenditure (*PubExp*):** A determining variable in development, public spending influences investment, infrastructure, education, and social protection. Its effectiveness depends on the institutional framework in which it is implemented. The indicator selected corresponds to their share of GDP, according to World Bank data, to assess their economic weight and their interaction with the quality of institutions in MENA countries.

- **Total population (*Pop*):** Demographic dynamics are an important determinant of growth, through their effects on labor supply, domestic demand, and human capital. The annual population growth rate, used as a control variable, enables us to analyze its interaction with institutional quality in MENA countries.

- **Control variables** include the main economic, social, and demographic factors likely to influence the relationship between institutional quality and growth. They include the inflation rate, trade openness, public spending, and total population. Their inclusion in the model makes it possible to isolate the specific effect of institutions and reinforce the robustness of the empirical results.

4. RESULTS

Tables 2–4 respectively present descriptive statistics and correlation matrices between, on the one hand, the economic growth rate and the set of explanatory

variables related to institutional quality, and on the other hand, the EGDI and institutional indicators.

Table 2. Descriptive statistic

Variable	Obs.	Mean	Std. dev.	Min	Max
GDP per capita (log)	220	9.054	1.147	6.697	11.493
GovernmentEffectiveness	220	-0.034	0.698	-1.963	1.386
ControlCorruption	220	-0.129	0.684	-1.489	1.559
PoliticalStability	220	-0.632	0.945	-3.18	1.224
RegulatoryQuality	220	-0.148	0.82	-1.995	1.311
RuleLaw	220	-0.112	0.758	-1.838	1.132
VoiceAccountability	220	-0.911	0.654	-2.05	0.787
PubExp	220	17.402	4.313	7.286	29.322
OpsTrad	220	0.401	0.151	0.149	0.959
Infl	220	5.637	8.361	-10.067	53.231
Pop	220	2.544	2.681	-2.649	19.36

Source: Calculations by the Authors using Stata software.

Descriptive analysis reveals significant heterogeneity in GDP per capita (*log GDP*) across MENA countries. The values range from 6.697 (Iraq, per capita income of USD 809.85) to 11.493 (Qatar, per capita income of USD 98,041.36), with an average of 9.054, illustrating significant differences between national economic structures.

In terms of governance indicators, government effectiveness has an average value of -0.034, with extreme values ranging from -1.963 to 1.386. Control corruption oscillates between -1.489 and 1.559, whereas political stability shows an average of -0.632, with particularly critical levels reaching -3.18. Regulatory quality and rule of law also reveal notable disparities, with scores ranging from -1.995 to 1.311, and from -1.838 to 1.132, respectively. Voice and accountability remain weak overall, with an average of -0.911 and a minimum value of -2.05.

In economic terms, public spending represents an average of 17.402% of GDP, with variations ranging from 7.286% to 29.322%, reflecting differing budgetary choices from country to country. Trade openness, measured by the ratio of exports and imports to GDP, varies between 0.149 and 0.959, reflecting more or less outward-looking economic strategies. Inflation is characterized by marked volatility, with an average of 5.637%, but extremes from -10.067% to 53.231%. Population growth, meanwhile, varies considerably between countries, with a regional average of 2.544%, ranging from a decline of -2.649% to a rapid expansion of 19.36%. These results highlight profound disparities, both institutional and economic, within the MENA region, underscoring the relevance of an in-depth analysis of the link between institutional quality and economic performance.

Table 3. Correlation between economic growth rate and institutional quality indicators

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) GDP per capita (log)	1.000						
(2) GovernmentEffectiveness	0.748	1.000					
(3) ControlCorruption	0.777	0.940	1.000				
(4) PoliticalStability	0.495	0.582	0.694	1.000			
(5) RegulatoryQuality	0.726	0.888	0.874	0.569	1.000		
(6) RuleLaw	0.713	0.935	0.938	0.690	0.921	1.000	
(7) VoiceAccountability	0.160	0.498	0.427	-0.055	0.447	0.403	1.000

Source: Calculations by the Authors using Stata software.

The results of the correlation matrix reveal a strong association between GDP per capita and several institutional dimensions, notably control of corruption (0.777), government efficiency (0.748), regulatory quality (0.726), and the rule of law (0.713), suggesting that a robust institutional framework promotes economic growth. Strong interdependence is also observed between these indicators, particularly between government effectiveness and corruption control (0.940), as well as between the rule of law and regulatory quality (0.921), reflecting a structural coherence of

institutions. Conversely, political stability shows more moderate correlations (between 0.495 and 0.694), whereas voice and accountability display weaker, even slightly negative associations (-0.055), indicating that democratic participation is not necessarily accompanied by more stable governance in the MENA context. These results underline both the central role of institutions in economic development and the need for refined econometric approaches to assess the potentially redundant or distinct effects of certain indicators.

Table 4. Correlation between e-government development index and institutional indicators

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) EGDI	1.000						
(2) GovernmentEffectiveness	0.630	1.000					
(3) ControlCorruption	0.570	0.940	1.000				
(4) PoliticalStability	0.144	0.582	0.694	1.000			
(5) RegulatoryQuality	0.606	0.888	0.874	0.569	1.000		
(6) RuleLaw	0.637	0.935	0.938	0.690	0.921	1.000	
(7) VoiceAccountability	0.276	0.498	0.427	-0.055	0.447	0.403	1.000

Source: Calculations by the Authors using Stata software.

Analysis of the correlations between EGDI and institutional variables reveals a marked association with government effectiveness (0.630), regulatory quality (0.606), and respect for the rule of law (0.637), highlighting the central role of institutions in digital development. In contrast, political stability (0.144) and voice and accountability (0.276) show weaker relationships, suggesting that digital transition can progress even in less open institutional environments. In the MENA context, these results indicate that digital transformation depends above all on institutional robustness, making improved governance a strategic lever for accelerating technological innovation and sustaining growth.

Table 5 shows the results of estimation via the GMM in a system proposed by Blundell and Bond (1998). This approach makes it possible to simultaneously integrate instruments into differences and levels for the explanatory variables, thus reinforcing the robustness of the estimates. The validity of the instruments was verified via the Hansen test, whereas the AR(2) test confirmed the absence of second-order autocorrelation in the majority of the models, indicating an appropriate specification. The results of these tests validate the appropriateness of the instruments selected and support the reliability of the estimates.

Table 5. Estimation results

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
<i>logGDP_1</i>	0.354 (0.258)	0.416*** (0.106)	-0.110 (0.346)	0.409*** (0.128)	0.377** (0.153)	0.347** (0.167)	0.078 (0.199)
<i>PubExp</i>	-0.000 (0.025)	-0.008 (0.031)	-0.093 (0.057)	0.001 (0.020)	0.001 (0.043)	0.002 (0.025)	-0.050 (0.041)
<i>OpsTrad</i>	-1.203 (1.615)	-1.237 (2.156)	-1.627 (3.023)	-1.267 (1.695)	-1.676 (2.894)	0.024 (1.869)	-0.199 (1.801)
<i>Infl</i>	-0.000 (0.007)	-0.006 (0.007)	-0.005 (0.006)	-0.005 (0.007)	-0.002 (0.009)	-0.006 (0.007)	-0.008** (0.003)
<i>Pop</i>	-0.003 (0.037)	0.011 (0.028)	-0.000 (0.037)	0.001 (0.025)	-0.019 (0.035)	-0.011 (0.014)	0.027 (0.024)
<i>GovernmentEffectiveness</i>	1.189** (0.593)						
<i>ControlCorruption</i>		-0.403* (0.216)					
<i>PoliticalStability</i>			-1.793** (0.835)				
<i>RegulatoryQuality</i>				0.190 (0.263)			
<i>RuleLaw</i>					-2.056 (1.801)		
<i>VoiceAccountability</i>						-0.811 (0.627)	
<i>EGDI</i>							1.761*** (0.623)
Observations	209	209	209	209	209	209	209
Instruments	21	21	21	21	21	21	21
Hansen	0.78	0.83	0.93	0.78	0.90	0.85	0.87
AR(2) p-value	-2.18 (0.030)	-1.82 (0.068)	0.35 (0.726)	-2.07 (0.039)	-0.52 (0.604)	-0.52 (0.604)	-0.06 (0.949)

Note: Standard errors in parentheses. ***, **, * significant at the 1%, 5% and 10% respectively.

Source: Calculations by the Authors using Stata software.

5. DISCUSSION

This section reinterprets the empirical findings through the analytical lenses of institutional economics and digital governance, with a particular focus on the challenges and structural characteristics of MENA countries. It sheds light on the interactions between institutional quality, digital transformation, and economic performance, while incorporating current concerns such as implementation capacity, institutional fragmentation, and heterogeneous reform trajectories.

5.1. Institutional variables: Asymmetric effects on growth

Among the three governance dimensions tested (government effectiveness, control of corruption, and political stability), there are statistically significant results in line with classical institutional theories (Acemoglu & Robinson, 2012). These findings confirm that sound governance enhances

resource allocation, macroeconomic coordination, and the quality of public service delivery. However, the effects are not uniform: while government effectiveness exerts a positive influence on growth, the negative coefficients of control of corruption and political stability may reflect transitional costs associated with reform, such as political resistance or institutional blockages (Rodrik, 2020). These findings are consistent with Otman (2019), who emphasizes persistent governance deficits in MENA economies.

In contrast, regulatory quality, rule of law, and voice and accountability show no significant effect in the estimated models. This aligns with a growing body of literature suggesting that such dimensions may have indirect, conditional, or even weakly negative effects depending on the context (Beschel et al., 2025). In resource-rich authoritarian states, especially oil exporters, democratic accountability and legal safeguards are often decoupled from economic performance, as stability tends to be prioritized over citizen participation. These findings caution against generalizing the effectiveness of

governance indicators, especially in politically constrained or institutionally fragile environments.

5.2. Digital transformation and growth dynamics

When adding EGDI (Model 7 in Table 5), digital governance displays the largest, most robust growth association, outperforming the WGI dimensions. This confirms that digital transformation serves as an independent and powerful lever for economic growth in the MENA region, particularly in settings where formal institutions are weak or fragmented. As shown by Mohammed and Yacine (2025), e-government reforms, such as digital taxation, public service portals, and digital identity systems, improve administrative efficiency, reduce transaction costs, and enhance transparency. These dynamics are fully embedded in national digital strategies (e.g., Saudi Arabia's Vision 2030, Morocco's digital strategy).

The inclusion of EGDI in the model also alters the dynamics of growth: the coefficient on lagged GDP declines, suggesting that digitalization reduces dependence on past economic performance. This shift points toward more proactive, technology-driven development trajectories, where digital tools not only strengthen governance but also boost productivity and civic engagement. Nevertheless, such a transition requires adequate absorptive capacities, robust digital infrastructure, and regulatory coherence (UNDP, 2023; Organisation for Economic Co-operation and Development, 2023).

5.3. Control variables and structural constraints

Among the control variables, only inflation has a significant and negative effect on growth, highlighting the macroeconomic vulnerability of many MENA countries to price instability. The lack of significance for public expenditure, trade openness, and population growth may reflect the limitations of traditional policy tools in structurally rigid contexts characterized by low policy effectiveness (Otman, 2019; Mohammed & Yacine, 2025).

5.4. Toward a hybrid development strategy

Overall, the results suggest that while institutional reforms are necessary, they are not sufficient to sustainably drive growth. The EGDI emerges as a strategic complement, enabling MENA countries to bypass certain persistent institutional bottlenecks. A dual strategy combining institutional strengthening with targeted digital modernization thus appears essential to unlock inclusive and sustainable development potential in the region. This role of digitalization is particularly relevant as it aligns with ambitious national agendas such as Saudi Arabia's Vision 2030 or Morocco's Horizon Numérique, which explicitly position digital transformation as a central development lever. However, the actual growth-enhancing impact of digital tools remains highly dependent on implementation capacity, effective digital inclusion, and the quality of supporting infrastructure. This underscores the need for coherent, cross-cutting public policies that are simultaneously focused on technical performance, institutional governance, and universal accessibility.

In summary, while institutional reforms, particularly in government effectiveness, corruption control, and political stability, are crucial, they are not sufficient on their own. The EGDI emerges as a transformative complement, offering MENA countries a pragmatic avenue to accelerate development despite persistent institutional limitations. A dual strategy that combines institutional strengthening with targeted digital modernization appears essential for unlocking inclusive and sustainable economic growth in the region.

6. CONCLUSION

This article examines the joint impact of institutional quality and digital development on economic growth in the MENA region. The analysis is based on panel data covering the period 2002–2021, and uses the GMM to estimate separately the effects of governance indicators and the EGDI index. The results highlight the decisive role of institutions in the development process. However, they also suggest that improving governance alone is not enough to guarantee sustainable economic growth. Digital transformation thus appears to be a necessary complement to reinforce the effectiveness of institutional reforms.

The findings confirm the critical role of institutions in economic development but highlight that institutional improvements alone are insufficient for sustainable growth. In this context, the digital development of institutions appears as a complementary lever, reinforcing the effectiveness of institutional reforms. Empirical analysis highlights the significant impact of government efficiency and corruption control on growth. Political stability, on the other hand, has a negative effect, suggesting that a rigid or unstable institutional framework can hinder economic development. In addition, the index of EGDI is a very pertinent indicator whose impact on growth is likely to be greater than that of conventional institutional indicators. As far as control variables are concerned, such as public spending, trade openness, inflation, and population growth, only inflation shows a significant but negative effect, underlining the risks associated with price instability. The absence of any substantial effect from other variables calls into question conventional macroeconomic approaches, which are often insufficient to generate sustainable growth.

These results underline that development strategies in the MENA region should henceforth focus on structural improvements in governance, combined with ambitious digital modernization, while taking into account the specific institutional characteristics of each country. In particular, countries with fragile or stagnant institutions may benefit from leveraging digital tools as accelerators of public service delivery, transparency, and citizen engagement — especially when governance reforms are politically or administratively constrained. This hybrid strategy can be aligned with national programs such as Saudi Arabia's Vision 2030 or Morocco's Horizon Numérique. While the EGDI constitutes a relevant proxy for assessing a country's e-government maturity, its focus remains primarily institutional and service-oriented, thus offering a partial lens on the broader digital transformation landscape. As such, it fails to fully

encompass key dimensions of the digital economy — such as broadband penetration, mobile connectivity, digital literacy, or cybersecurity infrastructure — that are increasingly critical to understanding the developmental implications of digitalization. This limitation underscores the need to develop more comprehensive and multidimensional composite indicators capable of capturing the heterogeneity of digital capacities across sectors, regions, and population groups, and their differentiated effects on inclusive growth dynamics.

Finally, with the rise of emerging technologies such as artificial intelligence, big data, and

blockchain, future research could delve deeper into their influence on productivity, economic management, and institutional quality. These technologies offer new pathways to enhance public administration and citizen trust, but their effective deployment depends on digital literacy, regulatory clarity, and infrastructure readiness. Future studies should expand these analyses, test for interaction effects across governance types, and guide decision-makers toward integrated, evidence-based strategies tailored to the institutional and economic realities of the MENA region.

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