



The digital edge and institutional quality: A pathway to effective public debt management in developing MENA economies

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Abstract

This research examines the role of digitization in improving the impact of the quality of institutions on public debt. It studies a panel dataset for 12 Middle East and North Africa countries over 20 years. It aims to assess the function of digital governance in enhancing the ability of institutional frameworks to efficiently manage public debt. Specifically, it tests the effect of digitized quality of institutions on public debt by introducing government digitization into a consolidated quality of institutions metric, which is based on the worldwide governance indicators. We construct this metric using Principal Component Analysis, which sharply highlights the critical role of a holistic quality of institutions approach in public debt management. The research suggests utilizing a single-step Generalized Method of Moments estimation model, which is known for its robustness in studying dynamic panel datasets and includes associated diagnostic tests to properly validate estimation results. The findings demonstrate a positive and significant correlation between the digitized quality of institutions and public debt. The research provides a distinct understanding of institutional capacity enhancement for effective public debt management by integrating government digitization into the framework of governance itself. It provides invaluable insights for decision-makers, particularly in developing countries suffering from weak governance structures. By integrating digitization into the governance structures, countries enhance the quality and capacity of their institutions, which proves to be a critical factor in effective public debt management.

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1. Introduction

The sustainability of public debt in economies of the Middle East and North Africa (MENA) region is challenging, as multiple factors come into play. Despite efforts to curb the accelerating debt dynamics post-pandemic years, a recent report by the World Bank shows that during the year 2023, only 8 MENA economies were able to return their debt-to-GDP to pre-pandemic levels. The debt-to-GDP ratio has been on an ascending trend even prior to the pandemic of the year 2020, with the region's median ratio increasing by more than 23% over the period 2013-2019 (Gatti et al., 2024). Public debt conduct is a bi-product of prudent fiscal policies controlling for macroeconomic factors, human capital, and technological progress, as per the endogenous growth theory (Romer, 1986). Recent studies explore governance-related factors affecting public debt (Kocha, Iwedi, & Sarakiri, 2021; Kongo, 2023; Tang, 2022). These include the institutional framework for investment attraction, the geo-political system, donor ideology, among others (Acemoglu & Robinson, 2019; Reinhart,

Reinhart, & Trebesch, 2016). Novel studies by Aurangzaib and Farooq (2022) and Zhou, Yu, Xu, and Sun (2022) argue that robust institutional setups have a strong impact on debt-to-GDP in countries. Stawiarska (2023) affirms the definitive role of strong institutions in ensuring the fiscal direction needed to maintain robust public debt management. The interplay between quality of institutions and macroeconomic stability is also explored by Acemoglu, Johnson, and Robinson (2005) underscoring political and historical roots of institutional progression. His work emphasizes challenges faced by countries of weak governance and extractive institutions, thus straining fiscal discipline (Abaidoo & Agyapong, 2021; Halyska & Donkohlova, 2023).

This paper examines the critical role of the quality of institutions in public debt management in Middle Eastern and North African countries. It identifies a gap in the World Bank's matrix of worldwide governance indicators (Kaufmann & Kraay, 2023). It suggests modifying the way we measure the quality of institutions by including government digitization as a factor that interacts with government effectiveness. Recent research on the effectiveness of institutional quality is increasingly recognizing digitization as a manifestation of technological advancement (Alemu, Choramo, & Jeldu, 2023; Kongo, 2023; Nguyen, 2022). It has become a core factor for economic growth and solutions to development challenges. Studies by Mislawaty, Harahap, and Anisyah (2022) and Mynenko and Lyulyov (2022) argue in favour of digitizing government operations to improve public service efficiency and transparency. The use of digital tools has a strong effect on public debt conduct in resource-limited developing economies (Wanjiru, 2022). This paper aims to highlight the critical role of digitized quality of institutions on public debt. The paper comprises the following sections: Introduction, Literature Review, Data and Methodology, Findings, Discussion of Results, and Conclusion.

2. Literature Review

Economic literature is rich with theories that try to explain the dynamics of public debt. Classical economic theories, such as the Keynesian theory (Palley, 2013) champion public debt as financial inflow to increase aggregate demand in times of economic decline (Blanchard, 2019). The Ricardian Equivalence theory (Barro, 1974) contests this logic and hypothesizes that economic agents are rational and will adjust their savings today to meet tax increases in the future deemed necessary to repay debt. Economic agents will save more today, thus neutralizing the stimulative outcomes of incurring public debt. Scholars such as Divino, Santana Filho, and Orrillo (2023) and Sardoní (2021) challenge the Ricardian Equivalence theory when studying developing economies, arguing that not all economic agents in underprivileged communities have access to institutional fundamentals, thereby undermining the theory's assumptions. This phenomenon is also captured in the Debt Overhang theory which hypothesizes that developing countries with weak institutional frameworks are incapable of creating a favorable environment for investment inflows and strong economic growth (Azolibe, 2022; Joy & Panda, 2020; Shah, Younas, Junaid, & Iqbal, 2023) as economic agents believe that returns on investments will eventually be used to pay increasing debt servicing (Krugman, 1988).

North defined the notion of institutions as "the rules of the game in a society", reflecting systems that people create to regulate interactions on the economic, social, and political fronts (North, 1990). Along with contextual economic constraints, institutions maneuver economic activity by governing transactions and costs, thus directing the economy towards growth, depression, or stagnation. [North 1991, 1993, 1994, 1997, as cited in Dugger (1995)]. According to North, neo-classical and other mainstream economists have considered the role of the government (or state) as rent-seeking only. They discount the influence of transaction costs on institutional systems and do not value the role of political structures as determinants of policies (North, 1986). Institutional quality or governance indicators are important factors in proper public budget management (Barişik & Baris, 2017; Saeed & Abdulla, 2020; Taouab & Ameer, 2018). The quality of governance affects the impact of public spending on expected outcome improvements (Rajkumar & Swaroop, 2008). Research conducted by Katoka (2018); Moss, Pettersson Gelandar, and Van de Walle (2006) and Ricciuti, Savoia, and Sen (2019) demonstrates that if governance modalities are not utilized, the reliance of state revenue on donor aid will diminish the impact of aid on outcomes. Within this framework, Acemoglu, Johnson, and Robinson (2001) show that strengthening institutions is crucial to create a conducive environment for the private sector to invest, stimulating economic growth and consequently reducing the burden of public debt.

Additionally, studies by Fagbemi and Olatunde (2019) and Liu, Moldogaziev, and Mikesell (2017) demonstrate that weak institutions, characterized by a lack of fiscal discipline, rent-seeking practices, a lack of transparency, and corruption, contribute to fiscal behaviors that escalate public debt. Tarek and Ahmed (2017) study the impact of quality of institutions on public debt in the MENA region and conclude that weak governance fuels an increase in public debt as a bi-product of the contraction of GDP, while strong institutions facilitate the implementation of robust fiscal policies, which in turn support reducing the level of public debt. This phenomenon holds true even in resource-rich countries in the MENA region, where the abundance of resources often masks inefficiencies and increased rent-seeking practices, ultimately leading to the accumulation of public debt (Bhattacharyya & Hodler, 2010). The World Bank issued metrics to measure good governance, also referred to as the quality of institutions. Six aggregate governance indicators comprise it: (1) voice and accountability, (2) government effectiveness, (3) political stability and no violence, (4) control of corruption, (5) rule of law, and (6) regulatory quality (Kaufmann & Kraay, 2023).

Digitization is the use of digital products and tools to enhance the efficiency of service delivery while reducing per unit cost (Wanjiru, 2022). Introducing digitization into governance actions has a positive impact on institutional dimensions of economic governance (OECD, 2020). In particular, introducing electronic government operations enhances the delivery of public services and improves the efficiency of state administrations by streamlining procedures (Wanjiru, 2022). Government digitization fosters economic growth by enhancing revenue collection and providing conditions for innovation and business development indirectly impacting public debt (Lindgren, Madsen, Hofmann, & Melin, 2019).

The integration of government digitization into institutional frameworks and practices is susceptible to conditionalities that challenge its efficiency. Incorporating government digitization alone won't solve fundamental institutional weaknesses like lack of political will, resistance to reform, and deep-rooted corruption; instead, it may exacerbate inequality by unevenly distributing the positive spillover of government digitization (Gil-Garcia, Helbig, & Ojo, 2014). The effectiveness of government digitization is contingent upon other dimensions of institutional quality, as shown in recent studies by Güler and Büyükožkan (2023); Maragno, Gastaldi, and Corso (2021) and Mergel, Edelmann, and Haug (2019).

Figure 1 demonstrates the hypothesis of this research:

Hypothesis H: Digitized Quality of Institutions has a positive influence on debt to GDP.

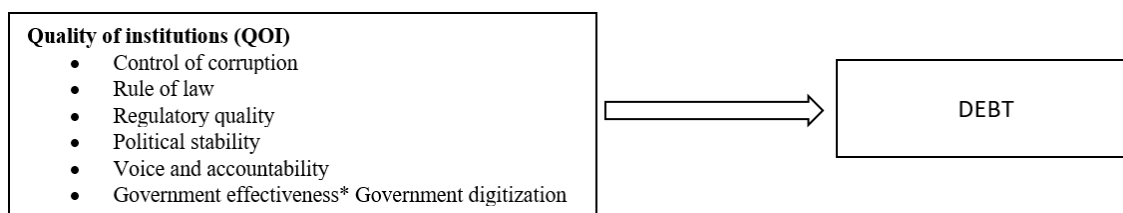


Figure 1. Conceptual model.

Note: The (*) sign indicates multiplication of two factors to show the interaction between these two factors.

There are also macroeconomic factors affecting public debt dynamics, such as gross domestic product per capita, inflation, and military expenditure. According to Onofrei, Bostan, Firtescu, Roman, and Rusu (2022) increasing GDP per capita in developing countries not only improves economic performance but also enhances the government's ability to manage and maintain a sustainable level of public debt. In turn, positive inflation shocks in a small open economy result in lower consumption and real output and ultimately a lower value of the real debt denominated in local currency (Assibey-Yeboah, Mallick, & Mohsin, 2016). This perspective, however, is rather simplistic, as it does not account for other effects of inflation on fiscal strain due to a reduction in the real value of economic output Ndou, Mokoena, Ndou, and Mokoena (2019) and Bukhari and Yusof (2014). In general, the relationship between public debt and inflation can be either positive or negative, depending on various economic contexts. However, the majority of literature suggests a positive relationship, particularly in highly indebted countries with underdeveloped financial systems (Aimola & Odhiambo, 2020). Recent research on the opportunity cost of military expenditure supports this, as it diverts limited resources from crucial areas for long-term economic growth and sustainable public debt management (Solarin, 2017).

3. Data and Methodology

To study the effect of the quality of institutions on public debt management in the MENA region, this research uses a panel analysis with data extracted from secondary sources such as the World Bank, IMF, and other UN bodies. It covers 12 countries, namely Algeria, Djibouti, Egypt, Iran, Iraq, Jordan, Lebanon, Mauritania, Morocco, Sudan, Tunisia, and Turkey. It studies them over a time span of 2000 to 2022. Therefore, (N) refers to the number of countries (hence N=12) and (T) refers to the number of years (hence T=22).

The dependent variable is the ratio of a country's total public debt to its gross domestic product (DEBT). The independent explanatory variables include the quality of institutions (QOI), GDP per capita, lagged DEBT, and a set of other control variables. These include the percentage of military expenditure to the gross domestic product (ME) and the inflation rate (INF), which is the annual percentage of consumer prices. The QOI is calculated using the principal component analysis (PCA) and is composed of six dimensions as per the WGI, whereby government effectiveness dimension is multiplied by the Government Digitization as an interaction term.

This research uses a panel data analysis to explain the unobserved unit-specific heterogeneity in both static and dynamic estimations. We use the Generalized Method of Moments (GMM) for dynamic estimations, unlike previous research that utilized Ordinary Least Squares (OLS) or ARDL. The GMM provides a superior solution for capturing the relationship between the dependent and independent variables while also resolving the issue of endogeneity. More specifically, the use of one-step GMM is preferable for small-sized datasets (opposed to using two-step GMM in large panel datasets), as it is simple in structure and is able to correct for the structural biases of dynamic panel samples. The GMM is characterized by a lagged dependent variable and cross-section-specific unobserved heterogeneity (Arellano & Bond, 1991). According to Lu and Wooldridge (2020) this estimator, which accounts for endogeneity and heteroskedasticity, outperforms other estimation modalities.

Nguyen and Luong (2021) used the same econometric model in their study. They utilized the Ordinary Least Squares (OLS) model, the random effects model, and the two-step GMM as their estimation technique to examine the influence of fiscal policy on public debt while separately estimating governance indicators. This research employs an integrated approach to examine the lump sum of governance indicators while also incorporating government digitization as an additional variable. Previous research Sani, Said, Ismail, and Mazlan (2019) used the Generalized Method of Moments (GMM) to investigate the impact of institutional quality and public debt on economic growth in sub-Saharan African countries but did not explore the role of government digitization in enhancing institutional quality. Other research Ashogbon, Onakoya, Obiakor, and Lawal (2023) and Munir (2023) used the autoregressive distributed lag (ARDL) model to study the impact of institutional quality on public debt management using macroeconomic data.

The literature lacks sufficient studies that shed light on the critical role of the quality of institutions on public debt management in the MENA region, let alone the need to modernize the measurement of the quality of institutions and make it more inclusive of contemporary factors contributing to economic prosperity. In this context, this paper uses principal component analysis (PCA) to measure the governance pillars in a new way and adds digitization of the government to the measurement of the effectiveness of the government as part of the quality of institutions framework.

The model's equation, based on Nguyen and Luong (2021) becomes as follows:

$$LNDEBT_{it} = \beta_0 + \beta_1 QOI_{it} + \beta_2 LDEBT_{it} + \beta_3 LNGDP_{it} + \beta_4 LNME_{it} + \beta_5 LNINF_{it} + \varepsilon_{it} \quad (1)$$

LNDEBT is the natural logarithm of the ratio of debt to GNI, which is considered the dependent variable; LDEBT is the lagged variable of the dependent variable DEBT; LNGDP is the natural logarithm of gross domestic product per capita, which is an explanatory variable; LNME is the natural logarithm of military expenses; and QOI is the quality of institutions.

β_0 is the intercept, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the coefficients of each independent variable, ε_{it} is the error term, t is the time period, and i is the country.

According to Mishra et al. (2019) descriptive statistics show the reliability of the data in terms of mean, standard deviation, median, maximum value, minimum value, skewness, and kurtosis.

Table 1. Descriptive statistics.

Variable	Mean	Standard deviation	Minimum	Maximum
LNDEBT	4.019	0.687	1.959	5.842
LNGDP	4.168	0.593	0.993	5.852
LNINF	4.225	1.342	0.685	10.566
QOI	0.045	1.077	-2.187	1.916

Table 1 indicates that the majority of variables have a mean value greater than the standard deviation. This suggests a clustering of the data around the mean. The dependent variable, the natural logarithm of debt (LNDEBT), has a mean value of 4.0194, surpassing its standard deviation of 0.6869. Similarly, the natural logarithm of gross domestic product (LNGDP) and the natural logarithm of inflation (LNINF) both have mean values of 4.1680 and 4.2248, respectively, and both exceed the standard deviation values of 0.5926 and 1.3420, respectively. In contrast, the mean value of the quality of institutions is 0.0449, which is less than the standard deviation value of 1.0770. This indicates that the data is distributed across a broad range, indicating a high level of variability. The lowest value of debt-to-GDP is 1.9591, and its highest value is 5.8415, which is close to the highest value of GDP (5.8521).

Correlation matrix: It studies the association between the dependent variable, the independent variables, and between the independent variables themselves. Correlation, indicated by the coefficient of correlation r , denotes the weakness or strength of the relationship between variables (Wang, Xie, Chen, & Chen, 2013).

Table 2. Correlation matrix.

Variables	1	2	3	4	5
1 LNDEBT	1				
2 LNGDP	-0.049	1			
3 LNME	0.120*	0.190*	1		
4 LNINF	0.108	-0.099	0.038	1	
5 QOI	0.642*	-0.003	0.149*	0.032	1

Note: * is the significance level at 5% ($p \leq 0.05$).

Table 2 indicates the following:

- A significant, positive, and strong relationship between the QOI and debt-to-GDP, where the coefficient of correlation $r=0.6424$. In addition, the correlation between QOI and military expenditure (LNME) is weak, positive, and significant, where the coefficient of correlation $r = 0.1485$.
- A positive, weak, and significant relationship between military expenditure and debt to GDP, where the coefficient of correlation $r=0.1199$, as well as the relationship between the military expenditure and the

gross domestic product (LNGDP), where the coefficient of correlation $r=0.1902$. This indicates that an increase in military expenditure (LNME) will lead to an increase in public debt as a share of GDP. This finding aligns with the literature on military expenditure that was discussed in the previous section.

- A significant, positive, and weak relationship between inflation (LNIF) and debt-to-GDP, where the coefficient of correlation $r=0.1077$. In addition, the correlation between inflation (LNINF) and GDP per capita is negative, which indicates that as inflation increases, economic growth per capita will decrease.

The previous section's discussion of military expenditure literature aligns with this finding.

Multicollinearity test: it is used to detect the variance inflation factor (VIF). If the mean of the VIF of the independent variable is more than 10, this means the presence of multicollinearity, while if the VIF value is less than 10, this means the absence of multicollinearity (Daoud, 2017).

Table 3. Multicollinearity.

Variables	VIF
LLNDEBT	1.22
QOI	1.21
LNME	1.00
LNGDP	1.07
LNINF	1.07
Mean VIF	1.04

Table 3 presents the results of the multicollinearity test, indicating a mean VIF value of 1.04, which is less than 10. This indicates the absence of multicollinearity.

Table 4. Heteroskedasticity.

Breusch-Pagan test	
Chi2(1)	188
Prob>chi2	0.0000

Table 4 presents the heteroskedasticity test, which is used to test if the data has the same variance or a different variance. Where, if the p-value has a value greater than $\alpha=0.05$, this means that the data is homoscedastic, while the contrary means that the data is heteroskedastic. The result of the heteroskedasticity test denotes a probability value of 0.000, which is less than $\alpha = 0.05$, indicating that we fail to reject the alternative hypothesis, which means that the data is heteroskedastic.

Table 5. Serial correlation.

Wooldridge	
F (1,11)	16.669
Prob>F	0.0007

Table 5 presents the Wooldridge test, which is the serial correlation test. Baltagi and Li (1995) and Wooldridge (2002) use the Wooldridge test, also known as the serial correlation test, to determine if the error terms exhibit a correlation over time for each unit. Because the probability value for the Wooldridge test is 0.0007, which is less than $\alpha = 0.05$, it means that the error terms are correlated. This means that we cannot reject the alternative hypothesis because of the presence of serial correlation and heteroskedasticity.

Table 6. Generalized method of moments.

Variables	Coefficient	Standard error	Probability
LLNDEBT	0.730***	0.035	0.000
LNGDP	0.071**	0.245	0.004
LNME	0.144***	0.028	0.000
LNINF	0.024	0.023	0.293
QOI	0.255**	0.077	0.001

Note: **, *** denote the significance level at 5%, and 1%, ($p \leq 0.05$, $p \leq 0.01$, $p \leq 0.001$) respectively.

The result of the estimation of Generalized Method of Moments (GMM) one-step (Roodman, 2009) as shown in Table 6, indicates:

- A significant and positive relationship between debt from the previous year and debt of the current year.
- A positive and significant relationship between GDP and debt.
- Military expenses positively influence debt.
- The quality of institutions (QOI) has a positive and significant impact on debt.

Sargan test for Instruments validity: It tests the exogeneity, which is the test of over-identification restrictions (Sargan, 1958). When the p-value is greater than 0.10, this means that the instruments are well-

identified, and the over-identification of restrictions is valid (Soto, 2009). The Sargan test yields a p-value of 0.0912, greater than 0.05, indicating the validity of the instruments and the failure to reject the alternative hypothesis. Estimation of Generalized Method of Moments one-step robustness: Dynamic panel data is used to estimate the dynamic effect between variables. It accounts for unobservable explanatory variables that are endogenous in a time-invariant country effect. Furthermore, Arellano and Bond (1991) used the difference generalized method of moments (difference GMM) in order to solve the problem of endogeneity with explanatory variables. In the GMM model, instrumental variables are used in the model that has a lagged dependent variable. Moreover, the GMM test-one, step-robust is used to overcome the endogeneity problem and correct serial correlation and heteroskedasticity.

Table 7. GMM one step robust-dependent variable natural logarithm of debt (LNDEBT).

Variables	Coefficient	Robust standard error	Probability
LLNDEBT	0.546	0.121	0.000***
LNGDP	0.060	0.641	0.346
LNME	0.124	0.911	0.173
LNINF	0.383	0.015	0.012*
QOI	0.385	0.124	0.002**
Constant	0.989	0.872	0.257

Note: *, **, *** denote the significance level at 5%, 1% and 0.1%, ($p \leq 0.05$, $p \leq 0.01$, $p \leq 0.001$) respectively.

4. Findings

Table 7 displays the outcome of the estimation:

- A positive and significant effect between the previous year’s debt and the current year’s debt.
- A positive and insignificant relationship between gross domestic product and debt
- A positive and insignificant relationship between military expenses and debt.
- A positive and significant relationship between the natural logarithm of inflation and DEBT, where an increase of inflation by 1 unit leads to an increase of 0.3832 units in DEBT.
- A positive and significant relationship between the quality of institutions and debt, where an increase in the quality of institutions by 1 unit leads to an increase in debt of 0.3850 units.
- The value of the standard error is less than the coefficient for the majority of variables. In contrast, the standard error of the natural logarithm of GDP is 0.6414, which is greater than its coefficient of 0.0604, indicating the variability of GDP. In addition, the standard error of the natural logarithm of military expenses is 0.9108, which is greater than its coefficient of 0.1240, indicating the variability of data.

5. Discussion of Results

The study's findings demonstrate an inverse relationship between the quality of institutions and public debt, suggesting that weaker institutions correspond to higher levels of public debt. This conclusion is consistent with the literature that showcases that poorly governed institutions strive to maintain debt sustainability. This is confirmed by Nguyen and Luong (2021); Cooray and Özmen (2024) and Zaib, Rafique, Jahanzaib, and Scholar (2023). This research provides insight into the mediating role of institutions in public debt management, as poor quality of institutions curbs their ability for effective public finance management, leading to unsustainable public debt accumulation. The universality of this narrative has been increasingly challenged by recent studies which proclaim that having robust institutional quality may paradoxically lead to increases in debt levels. This scenario is contingent on economic and political context, as governments over-rely on debt by undergoing extra borrowing to finance large-scale infrastructure and social development investments (Kongo, 2023). Relying on the robustness of their institutions to repay the loans and mitigate reputational risks, debtor countries may engage in large-scale borrowing to support economic boosts, recognizing debt accumulation as sustainable. While Morelli and Moretti (2023) demonstrate the margin by which governments can build on their reputation to secure more borrowing from foreign entities, Mamone (2020) defies this narrative, highlighting that the nature of political systems shapes their ability to sustain sound debt management.

The results of this research also align with studies that demonstrate a positive correlation between current and initial levels of public debt, as a large stock of debt imposes further borrowing to meet financial needs for debt servicing (Butkus, Cibulskiene, Garsviene, & Seputiene, 2021; Hilton, 2021). This endless self-generating growth in public debt stock is yet challenged by further studies arguing that there are other factors playing a role in the need for further borrowing. These factors include global economic conditions, fiscal strictness, etc. (Checherita-Westphal & Rother, 2012; Saungweme & Odhiambo, 2018). Likewise, the results show that public debt grows as GDP per capita increases. This finding aligns with studies claiming that increasing aggregate demand through borrowing supports economic growth (Kamiguchi & Tamai, 2019; Onafowora & Owoye, 2019). However, this positive correlation isn't always true because other studies warn that it's only true up to a certain point. After that, an adverse correlation happens because more public debt makes it harder to invest in activities that will lead to growth (Penzin, Salisu, & Akanegbu, 2022; Serin & Demir, 2023). The findings also reveal that

while engaging in military expenditure boosts public debt accumulation, it is not a significant factor contributing to substantial increases in public debt stock. This finding draws an analogy with studies considering different parts of the developing world, where military expenditure has significant implications for public debt accumulation as it snaps out a considerable share of the public budget (Kharas & Dooley, 2021; Serin & Demir, 2023; Tian et al., 2023). These discrepancies propose that the relationship between military expenditure and public debt is context-driven and subject to external factors related to geopolitics and modalities of financing. The findings of this study align with mainstream literature that emphasizes countries with high indebtedness and poor financial frameworks, demonstrating a positive correlation between inflation and public debt levels (Aimola & Odhiambo, 2020). Studies reveal a complex relationship between inflation and debt levels, challenging this narrative. Incurring higher levels of inflation may boost nominal economic growth, which eventually reduces the stock of public debt—a scenario that is context-specific and dependent on different factors contributing to economic growth potential (Saungweme, Maluleke, & Odhiambo, 2023).

This research contributes significantly to the literature and ongoing debate by presenting evidence from the MENA region, which is broadly a substantial recipient of foreign aid. It highlights the fundamental role of improved and strong institutions as a pathway to robust fiscal discipline and public finance management, leading the way to reduce the crowding out of public debt servicing in return for proper investments in growth-prone economic activity. Bridging this gap in evidence-based policy making provides clear entry points in institutional reform when addressing public debt management.

6. Conclusion

Key Findings and Messages: This research asserts the pivotal role of solid institutions in effective public debt management. The PCA technique, which compiles the indicators of institutional quality into a single comprehensive metric, highlights the crucial role of a holistic approach to institutional quality in public debt management. This inclusive approach provides a better understanding of governance modalities. Its approach overcomes limitations of the traditional role of individual governance indicators, providing practitioners with a robust tool to comprehensively assess the effectiveness of institutions. This research also provides a distinct understanding of institutional capacity enhancement through integrating government digitization into the framework of governance itself. The interaction between government digitization and government effectiveness strengthens the latter's contribution to the efficiency of public administrations within a comprehensive measure of the quality of institutions. It provides a forward-looking tactic in addressing fiscal discipline challenges, particularly in developing countries with limited resources. It presents a pragmatic approach for policymakers to ensure the sustainability of debt. The interplay between the quality of institutions and public debt suggests that focusing reforms on strengthening the quality of institutions and improving their capacities by digitization is important in aid management and public debt sustainability. This is particularly valid for economies suffering from governance challenges and a vicious circle of dependency on external aid flows, such as the MENA countries studied in this research.

6.1. Implications

The findings stress prioritizing institutional reform in resource-deficient MENA countries and suggest implementing modern digitization solutions to strengthen institutions' governance frameworks. Boosting the effectiveness of government institutions allows for streamlining processes, improved service delivery, and enhanced resource allocation. Digitized quality of institutions facilitates fiscal discipline and public debt management, thereby shifting the dynamics away from prolonged aid dependency. The findings underscore the urgency to strengthen the institutional absorptive capacity for donor aid in the MENA countries by adopting comprehensive, inclusive, and interdisciplinary approaches in policy design.

6.2. Limitations

The research faced some limitations, particularly pertaining to the availability and quality of data covering more MENA countries with similar conditions. This restricts the ability to generalize the findings globally. This also prohibits the ability to delve more into quantifiable measurements of resistance to change within institutions, as well as logistical and political challenges of reform in the region studied.

6.3. Future Research

This study facilitates a deeper examination of the relationship between the digital quality of institutions and long-term aid-dependent public debt in various developing regions. It also allows for comparative studies between countries with or without digitized institutions and public policy frameworks, and it further provides opportunities to study the impact of digitized institutions' quality on the sustainability of sector-specific public spending.

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