

Islamic finance, digitalization and economic growth among leading IFDI Countries: an application of Driscoll–Kraay standard error approach

Mega Ayu Widayanti

*Department of Research, Publications and Thought Leadership,
KMMB Consulting, South Jakarta, Indonesia*

Muhamad Nafik Hadi Ryandono

Department of Islamic Economics, Universitas Airlangga, Surabaya, Indonesia, and

Mochamad Badowi

*Department of Research, Publications and Thought Leadership,
KMMB Consulting, South Jakarta, Indonesia*

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Abstract

Purpose – This study aims to examine the impact of Islamic finance and digitalization on economic growth, measured by real GDP growth, focusing on Islamic banking development, sukuk issuance and digital investment while controlling for governance effectiveness and inflation.

Design/methodology/approach – The study uses a balanced macropanel of six leading Islamic Finance Development Indicator (IFDI) countries over 2015–2024. A fixed-effects model with Driscoll–Kraay standard errors is used to address heteroskedasticity, serial correlation, cross-sectional dependence and common global shocks. A robustness test excluding the COVID-19 year (2020) is conducted to verify result stability.

Findings – Islamic banking development and sukuk issuance do not show statistically significant short-run effects on economic growth after controlling for country and time effects. In contrast, digitalization shows a positive and highly significant association with economic growth, indicating that technological investment may function as an important structural factor related to growth. Governance effectiveness and inflation are not significant, suggesting they function primarily as enabling conditions rather than immediate growth drivers.

Practical implications – Policymakers should prioritize digital transformation through ICT infrastructure, digital public services and innovation ecosystems. Islamic finance development should focus not only on expanding financial assets but also on strengthening productive financing, risk-sharing instruments and linkages with the real economy.

Originality/value – This study integrates Islamic finance, digitalization and institutional quality within a unified macropanel framework for leading IFDI countries, highlighting the central role of technological transformation in supporting economic growth.

Keywords Islamic finance, Islamic banking, Sukuk, Digitalization, Governance effectiveness, Economic growth

Paper type Research paper



1. Introduction

Sustainable economic growth remains a strategic priority among leading Islamic Finance Development Indicator (IFDI) economies, particularly as they expand Islamic financial systems alongside rapid digital transformation (ICD PS, 2025). Islamic finance is expected to strengthen real-sector linkages and promote productive investment (Beck *et al.*, 2013).

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Concurrently, digitalization is widely recognized as a productivity-enhancing force that reduces transaction costs, facilitates innovation and improves resource allocation (Niebel, 2018). Together, financial deepening and technological advancement are viewed as key engines of structural transformation in emerging Islamic economies. Islamic banking and sukuk constitute the core pillars of modern Islamic financial systems (Obaidullah, 2005). Over the past decade, both segments have expanded substantially across leading IFDI countries. Figure 1 shows that Islamic banking assets have grown steadily, while sukuk issuance has accelerated more sharply after 2019, particularly in Gulf economies.

Figure 1 illustrates the sustained expansion of Islamic financial intermediation during the period under review. Despite this substantial growth, whether such financial deepening translates into sustained macroeconomic acceleration remains an open empirical question. The growth implications of Islamic finance are not automatic. Empirical studies indicate that its impact depends critically on structural characteristics and institutional quality. The predominance of debt-like contracts, limited implementation of genuine risk-sharing mechanisms, operational inefficiencies and uneven regulatory environments may weaken transmission to the real sector (Boukhatem and Ben Moussa, 2018; Daly and Frikha, 2016). Consequently, expansion in Islamic financial assets does not necessarily guarantee higher economic growth. A similar conditional dynamic characterizes digital transformation. Several leading IFDI economies particularly in the Gulf region have achieved very high ICT development levels, with Saudi Arabia ranking first globally in the 2025 ICT Development Index, followed by Qatar, the United Arab Emirates and Bahrain, while Malaysia ranks 15th. These achievements reflect significant progress in digital infrastructure and connectivity. Nevertheless, empirical evidence suggests that ICT investment may yield delayed or statistically weak growth effects in environments constrained by limited absorptive capacity, institutional weaknesses or regulatory rigidities (Bahrini and Qaffas, 2019; Czernich et al., 2011). These mixed findings point to a broader institutional puzzle: whether financial development and digital transformation generate growth independently, or whether their

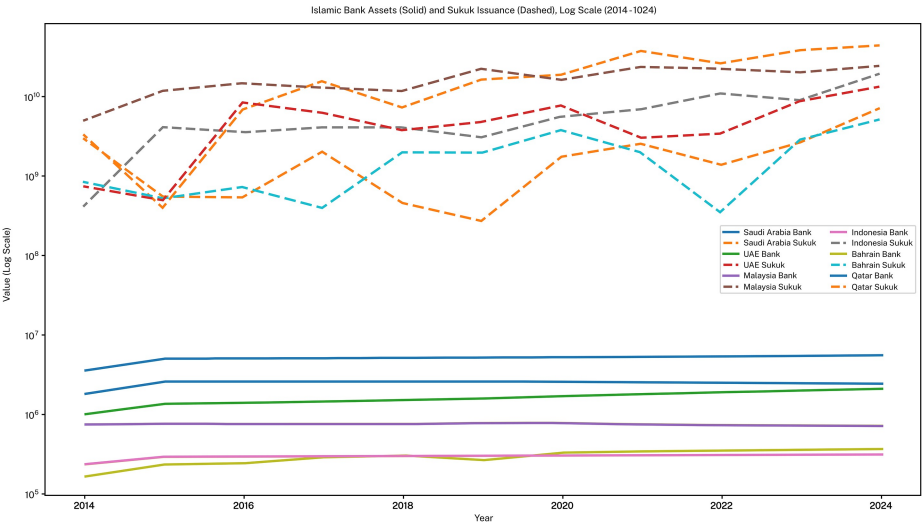


Figure 1. Trend of Islamic bank and sukuk in IFDI countries (2015–2024)
Source: Authors’ compilation based on Bloomberg Data Terminal

effects depend critically on governance quality and macroeconomic stability. Institutional economics emphasizes that effective governance reduces uncertainty, improves regulatory enforcement and strengthens investment incentives (North, 1990; Rodrik *et al.*, 2004). Yet empirical evidence on whether governance directly accelerates growth or conditions the impact of financial and technological development remains unsettled.

Despite expanding scholarship, several gaps remain. First, most studies examine Islamic banking and sukuk separately, providing limited comparative evidence within a unified macropanel framework. Second, the combined role of Islamic financial development and digital transformation remains underexplored, particularly in leading IFDI countries undergoing structural reform. Third, many existing studies rely on conventional panel estimators without addressing cross-sectional dependence, a common feature in macroeconomic data subject to synchronized global shocks. Finally, the role of governance effectiveness and inflation as macroeconomic and institutional determinants in the Islamic finance–growth nexus remains insufficiently examined.

To address these gaps, this study investigates the relationship between Islamic banking development, sukuk issuance, digitalization, governance effectiveness and economic growth across six leading IFDI countries over the period 2015–2024. The analysis uses a fixed-effects model (FEM) with Driscoll–Kraay standard errors to account for heteroskedasticity, serial correlation and cross-sectional dependence, providing more reliable inference than conventional panel techniques frequently used in earlier literature.

This study makes three main contributions. First, it provides integrated empirical evidence on Islamic banking, sukuk issuance and digitalization within a single macropanel framework. Second, it advances the literature by applying a robust estimation strategy that accounts for cross-sectional dependence across economies exposed to common shocks. Third, it clarifies the direct role of governance effectiveness and inflation in shaping economic growth in Islamic finance–oriented economies.

Accordingly, the study addresses the following research questions:

- RQ1. How does Islamic banking development affect economic growth in leading IFDI countries?
- RQ2. What is the impact of sukuk issuance on economic growth in leading IFDI countries?
- RQ3. Does digitalization contribute to economic growth in leading IFDI countries?
- RQ4. Does governance effectiveness directly influence economic growth in leading IFDI countries?
- RQ5. How does inflation affect economic growth as a macroeconomic control variable?

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature. Section 3 describes the data and methodology. Section 4 presents the empirical results. Section 5 discusses the findings. Section 6 concludes with policy implications.

2. Literature review and hypothesis development

2.1 Endogenous growth theory

Endogenous Growth Theory explains long-run growth as the result of internally generated forces, including financial development, technological progress, institutional quality and macroeconomic stability (Barro, 1989; Romer, 1990). Financial development enhances growth through efficient intermediation and capital allocation, while technological advancement increases productivity via innovation and knowledge spillovers. Governance effectiveness conditions these mechanisms by strengthening regulatory quality, policy credibility and

institutional enforcement, thereby improving the efficiency with which financial and technological resources are transformed into productive capital. Macroeconomic stability, reflected in inflation dynamics, further shapes intertemporal investment decisions and resource allocation. Within this framework, sustained growth emerges from the interaction between finance, technology, governance quality and price stability. This framework provides the theoretical foundation for examining how Islamic financial development, digitalization, governance effectiveness and macroeconomic stability jointly influence economic growth.

2.2 *The nexus between economic growth and Islamic banks' development*

The finance–growth nexus is well established in conventional literature, where financial deepening promotes capital accumulation and productivity gains (Beck *et al.*, 2000; Levine, 2005). Islamic banking represents a distinct institutional form of financial intermediation characterized by risk-sharing principles, asset-backing and Shariah compliance (Iqbal and Mirakhor, 2011). In theory, these features align financial flows more closely with real-sector activity and reduce speculative distortions, potentially strengthening growth transmission. Empirical evidence on Islamic banking and growth, however, remains inconclusive. While some studies document positive long-run effects (Imam and Kpodar, 2016), others argue that outcomes depend on institutional quality and the effective implementation of genuine profit-and-loss sharing contracts (Boukhatem and Ben Moussa, 2018; Daly and Frikha, 2016). In practice, the dominance of debt-like instruments may limit the distinct growth advantages of Islamic finance. Extending the conventional finance–growth framework into a Shariah-compliant context, this study tests whether Islamic banking development contributes to growth in leading Islamic Financial Development Index (IFDI) countries. Based on this theoretical and empirical foundation, the following hypothesis is proposed:

- H1.* Islamic banking development is positively related to the economic growth in leading IFDI countries.

2.3 *The relationship between economic growth and sukuk issuance*

Capital market development enhances growth by facilitating long-term financing, risk diversification and investment expansion (Beck *et al.*, 2000). Sukuk markets extend these functions within a Shariah-compliant structure, mobilizing funds for infrastructure and strategic sectors (Ledhem and Mekidiche, 2022). By broadening investor participation and deepening domestic capital markets, sukuk issuance may alleviate financing constraints and stimulate capital formation (Naifar and Hammoudeh, 2016; Smaoui and Khawaja, 2017). However, sovereign sukuk oriented toward fiscal refinancing rather than productive investment may generate limited real-sector multipliers (Yildirim *et al.*, 2020). Grounded in endogenous growth logic, where capital formation sustains expansion, this study evaluates the macroeconomic contribution of sukuk development:

- H2.* Sukuk issuance is positively related to the economic growth in leading IFDI countries.

2.4 *The relationship between economic growth and digitalization*

Technological progress constitutes a central engine of endogenous growth. ICT investment reduces transaction costs, enhances coordination efficiency and accelerates innovation diffusion (Czemich *et al.*, 2011; Niebel, 2018). Digital infrastructure enhances firm competitiveness and supports productivity improvements across sectors (Vu, 2011). Nevertheless, macroeconomic

returns to digitalization are context-dependent. Recent cross-country evidence suggests that ICT investment yields stronger growth effects in environments characterized by high institutional capacity and effective governance (Erum *et al.*, 2024). Weak regulatory frameworks and implementation gaps may constrain productivity spillovers. Accordingly, digitalization is conceptualized not merely as a technological input but as a structural driver whose impact depends on institutional conditions. Therefore:

H3. Digitalization is positively related to the economic growth in leading IFDI countries.

2.5 *The role of governance effectiveness on economic growth*

Institutional quality shapes the effectiveness of financial and technological development by influencing incentives, contract enforcement and policy coordination (Law and Azman-Saini, 2012). Strong governance reduces uncertainty, improves regulatory enforcement and enhances resource allocation efficiency. In Islamic finance, governance holds particular importance due to its ethical and stakeholder-oriented foundation (Iqbal and Mirakhor, 2004). Effective governance strengthens transparency, accountability and risk management, thereby improving financial intermediation quality. Empirical studies indicate that governance effectiveness enhances financial stability and market confidence, reinforcing long-term growth prospects (Saha and Dutta, 2021). Beyond finance, governance also determines whether ICT investments generate productivity spillovers. Strong institutional environments facilitate coherent digital implementation and sectoral diffusion (Ding *et al.*, 2024; Erum *et al.*, 2024). Accordingly:

H4. Governance effectiveness is positively related to the economic growth in leading IFDI countries.

2.6 *The role of inflation on economic growth*

Inflation influences growth through its impact on price stability, investment incentives and financial contract valuation. High and volatile inflation increases uncertainty, distorts price signals and discourages long-term capital formation (Fischer, 2023). Empirical studies suggest nonlinear effects, where moderate inflation may coexist with growth, but high inflation becomes detrimental (Khan and Ssnhadji, 2001). Stable inflation supports financial intermediation by preserving real returns and reducing informational frictions (Boyd *et al.*, 2001; Huybens and Smith, 1999). Given the importance of macroeconomic stability in endogenous growth processes, inflation is incorporated as a structural control variable:

H5. Inflation is negatively related to economic growth in leading IFDI countries.

3. Data and methodology

3.1 *Data*

This study uses a balanced macropanel data set of six leading IFDI countries (Malaysia, Saudi Arabia, Indonesia, Bahrain, the United Arab Emirates and Qatar) over the period 2015–2024. These economies represent major Islamic finance jurisdictions with relatively advanced institutional frameworks and consistent data availability. Real GDP growth and inflation data are obtained from the World Bank. Islamic banking development and sukuk issuance data are sourced from Bloomberg. Digitalization data are obtained from Statista and cross-validated with national statistical reports, while governance effectiveness is measured

using the Government Effectiveness index from the Worldwide Governance Indicators (WGI) compiled by the World Bank. Monetary variables (Islamic banking assets, sukuk issuance and ICT expenditure) are transformed into natural logarithms to reduce skewness and facilitate semielasticity interpretation of coefficients.

3.2 Variable definitions

Table 1 summarizes the variables used in the empirical analysis. Economic growth serves as the dependent variable. Islamic financial development and digitalization constitute the main explanatory variables, while governance effectiveness and inflation are included as control variables reflecting institutional quality and macroeconomic stability.

3.3 Model constructions

This study uses a two-way FE model to control for unobserved, time-invariant country characteristics and common time shocks that may jointly influence economic performance and financial development. The FE estimator exploits within-country variation over time, thereby mitigating omitted variable bias arising from structural heterogeneity across countries. Model (1) estimates the direct effects of Islamic banking development, sukuk issuance and digitalization on real GDP growth (baseline):

$$GDP_{it} = \alpha + \beta_1 \ln IB_{it} + \beta_2 \ln SUKUK_{it} + \beta_3 \ln ICT_{it} + \beta_4 QoG_{it} + \beta_5 INF_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where μ_i captures country-specific fixed effects, λ_t denotes time fixed effects, and ε_{it} represents the idiosyncratic error term. Country fixed effects account for time-invariant structural characteristics such as institutional frameworks and economic structures, while time fixed effects capture global shocks affecting all countries during the sample period.

3.4 Estimation methodology

We follow a structured macropanel econometric framework to ensure reliable inference in a multicountry setting. The analysis begins with descriptive statistics, followed by a Pearson

Table 1. Variables’ names and details

Variable name	Acronyms	Definitions and measures	Sources
Real GDP growth	GDP	Annual real GDP growth rate (%)	Beck <i>et al.</i> (2000); Levine (1997)
Islamic banking development	lnIB	Total Islamic banking assets (USD billion, ln); proxy for investment, deposit and financing	Abduh and Azmi Omar (2012); Imam and Kpodar (2016)
Sukuk development	lnSUKUK	Total outstanding and matured sukuk (USD billion, ln)	Smaoui <i>et al.</i> (2020); Smaoui and Nechi (2017)
Digitalization	lnICT	Total government and business ICT expenditure (USD billion, ln)	Niebel (2018); Wang <i>et al.</i> (2025)
Governance effectiveness	QoG	Government Effectiveness index (WGI); captures public service quality and policy implementation effectiveness (−2.5 to + 2.5, higher values indicate stronger governance)	Erum <i>et al.</i> (2024)
Inflation	INF	Annual inflation rate (%)	Khan and Ssnhadji (2001)
Source(s): Authors’ compilation			

correlation matrix and variance inflation factor (VIF) diagnostics to assess linear dependence among regressors (Gujarati, 2002). Cross-sectional dependence is examined using Pesaran's CD test and the Breusch–Pagan LM. The second-generation Cross-sectionally Augmented Dickey–Fuller (CADF) and Cross-sectionally Augmented IPS (CIPS) tests are used to examine unit root properties while accounting for unobserved common factors and cross-country spillovers (Pesaran, 2007). The CADF specification is given by:

$$\Delta y_{it} = \alpha_i + \beta_i y_{it-1} + \gamma_i \bar{y}_{t-1} + \sum_{j=1}^p \delta_{ij} \Delta y_{it-j} + \sum_{j=0}^p \phi_{ij} \Delta \bar{y}_{t-j} + \varepsilon_{it} \quad (2)$$

where $y_{i,t}$ denotes the variable of interest for country i at time t , $\bar{y}_t = \frac{1}{N} \sum_{i=1}^N y_{it}$ is the cross-sectional average, and p is the lag length. The inclusion of cross-sectional averages accounts for unobserved common factors and cross-sectional dependence across panel units (Pesaran, 2007). The null hypothesis of the CADF/CIPS test is that all series contain a unit root, while rejection of the null implies stationarity after controlling for cross-sectional dependence. Model selection proceeds by comparing pooled ordinary least square (OLS), FE and random effects (RE) specifications using the Chow, Breusch–Pagan LM and Hausman tests (Baltagi, 2018).

3.5 Driscoll–Kraay standard error approach

The final estimations apply fixed effects with Driscoll–Kraay standard errors to address heteroskedasticity, serial correlation, and cross-sectional dependence common in macropanel data (Driscoll and Kraay, 1998). This estimator provides robust inference while maintaining coefficient consistency in panels with small N and moderate T . Robustness checks include country-clustered standard errors and exclusion of the 2020 COVID-19 shock year, ensuring that results are not driven by variance specification or global disturbances.

4. Empirical result

4.1 Descriptive analysis

Table 2 reports that GDP growth shows substantial variability (mean = 2.93; min = −5.9; max = 8.9), reflecting cyclical fluctuations. Digitalization (lnICT) displays asymmetry and nonnormal distributional characteristics, while inflation also shows departures from normality. These distributional features support the logarithmic transformation of monetary variables to stabilize variance and improve comparability, as well as the use of robust estimation techniques to mitigate potential nonnormality and heteroskedasticity in the panel framework.

Table 2. Descriptive analysis

Variable	Obs	Mean	SD	Min.	Max.	Skewness	Kurtosis
GDP	60	2.931	3.154	−5.9	8.9	0.001	0.089
lnIB	60	13.871	1.031	12.413	15.448	0.768	0.000
lnSUKUK	60	22.239	1.37	19.427	24.52	0.186	0.093
lnICT	60	23.517	0.937	19.496	24.633	0.000	0.000
QoG	60	0.701	0.409	−0.06	1.41	0.832	0.001
INF	60	0.017	0.0196	−0.025	0.08	0.776	0.077

Source(s): Authors' own work

4.2 Correlation analysis

Table 3 presents the Pearson correlation matrix. GDP is positively correlated with inflation and governance quality, while its correlations with Islamic banking, sukuk and digitalization are weak and statistically insignificant. Digitalization is positively associated with sukuk issuance and governance quality. Although some correlations are moderate, none exceed conventional multicollinearity thresholds. This is further examined using VIF diagnostics.

The multicollinearity diagnostics are presented in Table 4. The VIF diagnostics based on the pooled OLS specification with year dummies indicate no serious multicollinearity concerns. The mean VIF is 2.08, well below the conventional threshold of 10 and even below the more conservative threshold of 5. Year dummies also show moderate VIF values (all

Table 3. Pearson correlation matrix results

Variable	GDP	lnIB	lnSUKUK	lnICT	INF	QoG
GDP	1					
lnIB	-0.207	1				
	-0.114					
lnSUKUK	-0.054	0.158	1			
	-0.68	-0.229				
lnICT	0.106	-0.219	0.471***	1		
	-0.423	-0.093	0			
INF	0.371***	0.054	-0.143	-0.197	1	
	-0.004	-0.682	-0.275	-0.131		
QoG	0.335***	-0.437***	0.430***	0.499***	-0.029	1
	-0.009	-0.001	-0.001	0	-0.827	

Note(s): * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source(s): Authors' own work

Table 4. VIF results

Variable	VIF	Tolerance (1/VIF)
lnIB	1.26	0.795
lnSUKUK	1.69	0.592
lnICT	2.00	0.500
QoG	1.43	0.698
INF	1.94	0.514
Year 2016	1.98	0.504
Year 2017	2.04	0.490
Year 2018	1.94	0.514
Year 2019	2.25	0.445
Year 2020	2.34	0.427
Year 2021	2.31	0.432
Year 2022	2.79	0.358
Year 2023	2.56	0.390
Year 2024	2.64	0.379
Mean VIF	2.08	

Note(s): Following Gujarati and Porter (2009), VIF values below 10 indicate the absence of serious multicollinearity

Source(s): Authors' own work

below 3). These results confirm that multicollinearity does not distort the estimation results and that coefficient estimates are statistically reliable.

4.3 Model selection tests

The Breusch–Pagan LM test indicates that RE are not statistically significant ($\text{Prob} > \chi^2_{\text{bar}} = 1.000$), suggesting no strong evidence over pooled OLS. The Chow test provides borderline evidence of country-specific heterogeneity ($F = 3.76$; $p = 0.059$), indicating the potential relevance of FE at the 5% level. Furthermore, the Hausman specification test yields a chi-square statistic of 23.76 ($p = 0.0002$), implying weak evidence against the RE estimator at the 5% level. Given the macropanel structure and the likelihood of correlation between unobserved country-specific effects and the regressors, the FE model is retained as the baseline specification.

4.4 Panel unit root test

The CADF–CIPS results indicate mixed integration properties across variables. GDP and sukuk issuance are weakly stationary at the 10% level, while inflation is stationary at the 5% level. In contrast, Islamic banking development, digitalization, and governance quality exhibit unit root behavior in levels. The coexistence of $I(0)$ and $I(1)$ variables suggests heterogeneous stochastic properties, implying that a conventional long-run cointegration framework may not be suitable for this relatively short macropanel data set.

The results of the CADF–CIPS panel unit root tests are reported in Table 5. Overall, the diagnostic tests support the FEM as the appropriate baseline specification. The Chow and Hausman tests provide strong statistical evidence of country-specific heterogeneity and inconsistency of the RE estimator, supporting the adoption of the FE framework. Moreover, the mixed order of integration does not justify a long-run cointegration approach. Therefore, the final estimation applies FEM with Driscoll–Kraay standard errors to ensure consistent and robust inference.

4.5 Regression results and robustness analysis

4.5.1 Baseline model. Table A1 (see Appendix 1) reports the FE baseline results. The model is jointly significant [$F(5,49) = 5.62$; $p = 0.0004$] with a within R^2 of 0.3643. The high intra-class correlation ($\rho = 0.6378$) justifies the use of FE estimation. Sukuk issuance ($\ln\text{SUKUK}$) is negative and significant at the 5% level, suggesting a short-run inverse association with GDP, possibly reflecting fiscal financing motives rather than productivity-enhancing investment. Islamic banking ($\ln\text{IB}$) is statistically insignificant, indicating limited contemporaneous growth effects from Islamic banking expansion. Digitalization ($\ln\text{ICT}$) and Governance Effectiveness (QoG) are also insignificant in this specification. The significance

Table 5. The CADF–CIPS results

Variable	CIPS statistic	10% CV	5% CV	1% CV	Order of integration
GDP	-2.364	-2.31	-2.52	-2.97	$I(0)$ at 10%
$\ln\text{IB}$	-1.478	-2.31	-2.52	-2.97	$I(1)$
$\ln\text{SUKUK}$	-2.358	-2.31	-2.52	-2.97	$I(0)$ at 10%
$\ln\text{ICT}$	-1.252	-2.31	-2.52	-2.97	$I(1)$
QoG	-1.026	-2.31	-2.52	-2.97	$I(1)$
INF	-2.820	-2.31	-2.52	-2.97	$I(0)$ at 5%

Source(s): Authors' own work

of inflation (INF) in the baseline model likely captures common macroeconomic shocks, as the effect disappears once time FE are introduced.

4.5.2 *Extended model (main specification).* Table 6 reports the preferred specification estimated using fixed effects with Driscoll–Kraay standard errors and time fixed effects. The model is strongly significant [$F(14,9) = 24.10$; $p < 0.001$] with a within R^2 of 0.8448, indicating substantial explanatory power after controlling for common time shocks. After incorporating time effects, sukuk issuance (lnSUKUK) becomes statistically insignificant ($\beta = -0.595$; $p = 0.137$), indicating no robust short-run growth impact. Islamic banking development (lnIB) likewise remains insignificant. In contrast, digitalization (lnICT) retains a positive and highly significant effect ($\beta = 0.0061$; $p < 0.000$), confirming ICT investment as the most consistent driver of economic growth. Governance effectiveness (QoG) and inflation (INF) are statistically insignificant, suggesting limited direct short-run macroeconomic and institutional effects once common shocks are controlled for. The inclusion of year fixed effects highlights the importance of global macroeconomic conditions in explaining growth fluctuations. Negative and significant coefficients during 2016–2019 indicate moderated growth relative to the base year (2015). The largest contraction occurs in 2020 ($\beta = -9.11$; $p < 0.001$), reflecting the COVID-19 shock, followed by a strong rebound in 2022 ($\beta = 2.05$; $p < 0.001$). Growth weakens again in 2023 amid persistent global uncertainty, while 2021 and 2024 remain statistically insignificant. Collectively, the results indicate that short-run growth dynamics during the sample period are primarily shaped by common global shocks rather than country-specific structural factors.

4.6 Robustness test

The robustness checks confirm the stability of the baseline results (see Appendix 2; Table A2). When the model is reestimated using cluster-robust standard errors, the direction

Table 6. FE Estimation with Driscoll–Kraay standard errors (lag 2)

Variables	Coefficient	SE	<i>t</i>	<i>p</i> -value
lnSUKUK	−0.595	0.365	−1.63	0.137
lnIB	−0.019	1.133	−0.02	0.987
lnICT	0.610***	0.070	8.69	0.000
QoG	−0.806	1.849	−0.44	0.673
INF	−8.751	11.711	−0.75	0.474
<i>F</i> (14,9)	24.10			
Within <i>R</i> ²	0.8448			
Lag maximum	2			
<i>Year Dummies (Base = 2015)</i>				
2016	−0.933***	0.189	−4.92	0.001
2017	−2.005***	0.501	−4.00	0.003
2018	−1.297***	0.360	−3.60	0.006
2019	−2.583***	0.61	−4.18	0.002
2020	−9.115***	0.930	−9.79	0
2021	−0.649	0.600	−1.08	0.307
2022	2.047***	0.28	7.24	0
2023	−1.699**	0.563	−3.01	0.015
2024	−0.635	0.803	−0.79	0.45
Constant	4.4873	16.4969	0.27	0.792

Note(s): Robust standard errors are estimated using the Driscoll–Kraay method with lag length 2. ***, ** and *denote statistical significance at the 1, 5 and 10% levels, respectively

Source(s): Authors’ own work

and statistical significance of the main variables remain consistent with the primary specification. Digitalization (lnICT) continues to show a positive and statistically significant effect on economic growth, while sukuk issuance (lnSUKUK) and Islamic banking (lnIB) remain statistically insignificant, with no substantial change in the control variables. Similarly, excluding the year 2020 from the sample does not materially alter the sign or inference of the estimated coefficients. The positive contribution of digitalization persists, and Islamic finance indicators continue to exhibit no significant short-run effect. These results indicate that the main conclusions are neither sensitive to the choice of variance–covariance estimator nor driven by the COVID-19 shock.

5. Discussion

5.1 Islamic banking development

Islamic banking development (lnIB) exhibits a negative coefficient ($\beta = -0.0194$), but the effect is statistically insignificant ($p = 0.987$). Therefore, *H1* is not supported in the main specification. The negative sign should not be overinterpreted, as the large standard error suggests considerable uncertainty around the estimate. The absence of statistical significance suggests that, in leading IFDI countries during the sample period, the expansion of IB assets has not translated into measurable short-run productivity-enhancing outcomes. Rather than reflecting shortcomings of Shariah principles *per se*, the negative sign may indicate structural and operational characteristics of implementation. Prior studies argue that the predominance of debt-like instruments, limited engagement in high-value productive sectors, elevated intermediation costs and weak integration with the real economy may constrain the growth impact of Islamic banks (Boukhatem and Ben Moussa, 2018; Daly and Frikha, 2016; Mollah and Zaman, 2015). From an endogenous growth perspective, financial deepening promotes growth only when capital is efficiently allocated toward innovation and productive investment (Romer, 1990). The results therefore imply that Islamic banks in the sampled countries remains concentrated in short-term, low-risk financing, limiting its capacity to foster sustained economic growth an interpretation consistent with (Boukhatem, 2022; Hasan and Dridi, 2010).

5.2 Sukuk issuance

The variable sukuk issuance (lnSUKUK) carries a negative coefficient of -0.5951 with a standard error of 0.3648 ($t = -1.63$; $p = 0.137$). Although the sign indicates an inverse relationship, the effect is statistically insignificant at conventional levels. Therefore, *H2* is not supported in the preferred specification. The finding suggests that sukuk markets may be predominantly oriented toward sovereign financing and debt refinancing rather than toward productivity-enhancing investment in the real sector. In particular, the growing reliance on sovereign sukuk to finance fiscal deficits or roll over existing obligations may weaken the growth transmission mechanism in the short run. From a macrofinancial perspective, the growth impact of sukuk critically depends on their allocation efficiency and project composition. When sukuk issuance is not sufficiently linked to infrastructure development, innovation or private-sector capital formation, its contribution to economic growth may be limited or even contractionary. Similar outcomes have been documented by (Boukhatem, 2022; Ledhem, 2022), who emphasize that the growth effects of sukuk markets are conditional on institutional quality, fiscal discipline, and the extent to which proceeds are channeled into productive investment.

5.3 Digitalization

Digitalization (lnICT) exhibits a positive and highly statistically significant effect on economic growth in the main specification. The estimated coefficient of 0.6104 (SE = 0.0702 ; $p = 0.01$) indicates that a 1% increase in ICT expenditure is associated with approximately a

0.0061 increase in real GDP growth, supporting *H3*. This result is consistent with endogenous growth theory, which emphasizes technological progress and knowledge diffusion as key engines of long-run economic expansion (Barro, 1989; Romer, 1990). ICT investment enhances productivity through efficiency gains, lower transaction costs and improved information flows, thereby strengthening aggregate output (Jorgenson and Vu, 2016; Niebel, 2018; Vu, 2011). Beyond direct productivity effects, digitalization facilitates structural transformation by accelerating innovation adoption, strengthening market connectivity and improving firm competitiveness. Expanded digital infrastructure reduces coordination frictions and enables faster technology diffusion across sectors, particularly in emerging economies, supporting transitions toward higher value-added and knowledge-intensive activities (Bahrini and Qaffas, 2019; Czernich *et al.*, 2011; Papaioannou and Dimelis, 2007; Salahuddin and Gow, 2016).

Within Islamic finance economies, digitalization functions as an enabling infrastructure that strengthens the broader financial ecosystem. Although ICT expenditure reflects economy-wide investment, improved digital systems promote fintech development, financial inclusion and more efficient Sharia-compliant intermediation. Digital platforms reduce information asymmetry, enhance risk assessment, and expand access to financing, thereby supporting deposit mobilization, investment activities and financing distribution consistent with risk-sharing principles (Andrianaivo and Kpodar, 2012; Ozili, 2018). Furthermore, digitalization contributes to institutional effectiveness by improving transparency, administrative efficiency and regulatory monitoring capacity. Empirical evidence shows that economies with stronger institutional quality are better able to transform digital investment into sustained productivity gains and economic growth (Kaufmann *et al.*, 2010; Niebel, 2018). Overall, the results confirm digitalization as a foundational growth driver operating simultaneously through productivity enhancement, structural transformation, financial deepening and institutional modernization in leading Islamic finance economies.

5.4 Governance effectiveness

Governance effectiveness (QoG) exhibits a negative but statistically insignificant relationship with economic growth ($\beta = -0.8057$; $SE = 1.849$; $p = 0.673$), indicating that institutional quality does not exert a direct short-run growth effect in the preferred specification. Hence, the *H4* is not supported. This finding aligns with contemporary institutional-growth literature suggesting that governance influences economic performance primarily through indirect and long-term channels rather than immediate output expansion. Institutional quality reduces uncertainty, strengthens policy credibility, and improves resource allocation efficiency (Acemoglu and Robinson, 2013; North, 1990; Rodrik *et al.*, 2004), yet its marginal growth impact may diminish in relatively stable economies with limited institutional variation (Law and Azman-Saini, 2012). Within leading Islamic finance economies, governance appears to operate as an enabling framework that conditions the effectiveness of financial development and digital transformation. Its growth contribution therefore materializes through enhanced financial intermediation, technological adoption and productivity accumulation over time rather than through contemporaneous growth effects (Demetriades and Hook Law, 2006).

5.5 Inflation

Inflation (INF) shows a negative but statistically insignificant association with economic growth in the baseline model ($\beta = -8.7511$; $SE = 11.7112$; $p = 0.474$). While the sign is consistent with macroeconomic theory, the absence of statistical significance suggests that inflation did not exert a systematic growth effect in the sampled IFDI countries during the

study period. Theoretically, inflation may impede growth by distorting price signals, increasing uncertainty and reducing investment efficiency (Fischer, 2023). In endogenous growth frameworks, persistent inflation can weaken financial intermediation and productivity-enhancing investment (Romer, 1990). However, empirical evidence also indicates threshold effects, where only high or volatile inflation becomes growth-reducing (Khan and Ssnhadji, 2001; Kremer *et al.*, 2013). The insignificant result likely reflects relatively moderate and well-managed inflation environments in leading IFDI economies, where credible monetary frameworks mitigate adverse macroeconomic distortions. From an Islamic economic perspective, price stability aligns with principles of justice (*‘adl*) and wealth protection (*hifz al-māl*), reinforcing the normative importance of monetary stability even when short-run growth effects appear limited.

5.6 Robustness check

To verify that the baseline results are not driven by the COVID-19 shock, the model is reestimated excluding the year 2020. The findings remain consistent with the preferred specification. Islamic banking and sukuk issuance continue to exhibit statistically insignificant effects on economic growth, indicating that their limited short-run contribution is not pandemic-specific. Governance effectiveness and inflation also remain insignificant, supporting the interpretation that their roles operate primarily through longer-term structural channels rather than immediate growth effects. Digitalization retains a positive and statistically significant coefficient ($\beta = 0.5985$; $p = 0.021$) under clustered standard errors, confirming the stability of its growth impact across alternative variance estimators. This consistency suggests that ICT investment represents a structural growth driver rather than a temporary response to pandemic-induced digital acceleration. Year fixed effects remain relevant, indicating that common global conditions continue to shape growth fluctuations across countries. Their inclusion ensures that estimated coefficients reflect structural relationships after accounting for shared macroeconomic shocks.

6. Conclusion

This study examines the relationship between Islamic finance, digitalization, governance effectiveness and economic growth in six leading IFDI countries during 2015–2024 using a FEM with Driscoll–Kraay standard errors. The results indicate that neither Islamic banking development nor sukuk issuance exerts a statistically significant short-run impact on economic growth. Although both variables display negative coefficients, they remain statistically insignificant once country heterogeneity and time shocks are controlled for, indicating that Islamic financial expansion alone does not guarantee growth. Its contribution depends on effective risk-sharing, productive investment, and real-sector integration; otherwise, expansion may remain balance-sheet driven rather than developmental. In contrast, digitalization emerges as a robust and consistently significant driver of economic growth. The positive effect of ICT investment remains stable across robustness checks, confirming digital transformation as a structural growth engine consistent with endogenous growth theory emphasizing technological progress and productivity enhancement. Governance effectiveness and inflation show no significant direct effects, suggesting that institutional quality and macroeconomic stability function primarily as enabling conditions for long-term development rather than short-run growth acceleration.

Implications. Policy efforts should move beyond expanding Islamic financial assets toward improving financing quality, strengthening profit-and-loss sharing mechanisms and directing funds toward innovation-driven and high-value sectors. Continued investment in digital infrastructure should remain a strategic priority, as digitalization constitutes the

clearest and most robust growth channel identified in this study. Future research may extend the analysis to broader country samples and compare Islamic and conventional financial systems to evaluate structural differences in growth transmission mechanisms.

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Further reading

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Appendix 1. Baseline model

Table A1. Baseline results (FE estimation)

Variables	Coefficient	SE	<i>t</i> -statistic	<i>p</i> -value
lnSUKUK	−1.180**	0.431	−2.74	0.009
lnIB	−0.868	4.962	−0.17	0.862
lnICT	0.148	0.585	0.25	0.801
QoG	4.908*	2.561	1.92	0.061
INF	75.744***	19.065	3.97	0.000
Constant	32.945	61.546	0.54	0.595
Observations		60		
Number of countries		6		
<i>F</i> (5,49)		5.62		
Within <i>R</i> ²		0.3643		
Between <i>R</i> ²		0.0626		
Overall <i>R</i> ²		0.0593		
Prob > <i>F</i>		0.0593		

Note(s): ***, **, and *denote statistical significance at the 1, 5, and 10% levels, respectively

Source(s): Authors' own work

Table A2. Fixed effects with clustered standard errors

Variables	Coefficient	Std. Error (clustered)	t-statistic	p-value
lnSUKUK	-0.5887	0.4393	-1.34	0.238
lnIB	0.684	1.0848	0.63	0.556
lnICT	0.5985**	0.1804	3.32	0.021
QoG	-0.4518	1.429	-0.32	0.765
INF	-7.6361	10.0696	-0.76	0.482
Year effects				
2016	-0.9581	0.5388	-1.78	0.135
2017	-2.0342	1.5056	-1.35	0.235
2018	-1.3582	0.9431	-1.44	0.209
2019	-2.6184*	1.2503	-2.09	0.090
2021	-0.7523	0.8016	-0.94	0.391
2022	1.889	1.0281	1.84	0.126
2023	-1.8683	1.1736	-1.59	0.172
2024	-0.8	1.1646	-0.69	0.523
Statistic	Value			
Observations	54			
Groups	6			
Within R ²	0.6016			
Estimator	Fixed effects			
Variance estimator	Clustered (id)			
Year fixed effects	Yes			

Note(s): ***, ** and *denote statistical significance at the 1, 5 and 10% levels, respectively
Source(s): Authors’ own work

Corresponding author

Muhamad Nafik Hadi Ryandono can be contacted at: muhammadnafik@feb.unair.ac.id