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Technology money supply and economic growth simultaneously in islamic banks in Indonesia

Mila Naeruz
Universitas Islam Sumatera Utara,
MEDAN

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Abstract

Background: The expansion of digital financial technologies has fundamentally reshaped monetary systems in emerging economies, yet the structural interaction between e-money, money supply, Islamic banking, and economic growth remains theoretically fragmented. Existing studies predominantly adopt partial or linear approaches, overlooking the endogenous and simultaneous nature of these relationships.
Aims: This study aims to develop a structural simultaneous equation model to capture the dynamic and reciprocal interactions among digital financial adoption, monetary expansion, Islamic banking performance, and economic growth. It contributes to mathematical and quantitative economic modeling by addressing endogeneity within a multi-equation financial system.
Methods: Using quarterly time-series data from 2004 to 2024, this study employs a Two-Stage Least Squares (2SLS) estimation framework to identify causal relationships within an endogenous system. The model explicitly accounts for structural interdependence among variables, ensuring consistent parameter estimation under simultaneity conditions.
Results: The results reveal that technological adoption and labor productivity significantly strengthen Islamic banking performance, while e-money exerts a dual structural effect by expanding money supply but weakening direct banking productivity. Furthermore, money supply and digital financial expansion positively influence economic growth, whereas Islamic banking shows a non-significant or negative direct effect, indicating a structural inefficiency in financial intermediation.
Conclusion: This study uncovers a critical structural paradox in which the expansion of Islamic banking does not proportionally translate into economic growth, despite increased digital financial activity. The findings suggest that digital finance operates primarily through indirect monetary transmission channels rather than direct institutional performance. By modeling the financial system as an endogenous and simultaneous structure, this research advances the theoretical understanding of financial intermediation inefficiencies and provides a more rigorous quantitative framework for analyzing the complex interplay between digital finance and macroeconomic outcomes.

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INTRODUCTION

The rapid expansion of digital financial technologies has fundamentally transformed monetary systems and financial intermediation processes in emerging economies. In Indonesia, the integration of e-money platforms, fintech ecosystems, and digital banking services has accelerated transaction efficiency and broadened financial inclusion within both conventional and Islamic financial sectors. Islamic banking, as a key component of the financial system, plays a strategic role in linking technological innovation with Sharia-compliant financial mechanisms to support economic development (Firdaus, 2025 and Taufik Syamlan et al., 2025). The increasing adoption of e-money has altered the structure of money circulation, influencing liquidity dynamics and consumption patterns within the economy (Gurgur & Kahveci, 2025 and Nizam, 2022). At the same time, the

* **Corresponding author:**
Mila Naeruz, Universitas Islam Sumatera Utara, Jalan Sisingamangaraja, Medan, Indonesia
gmail.com

expansion of money supply continues to act as a primary driver of macroeconomic activity, particularly through its impact on investment and aggregate demand. However, the interaction between digital finance, monetary variables, and banking performance remains complex and often non-linear. Several studies indicate that Islamic banking contributes positively to economic growth, yet the magnitude and direction of this contribution vary depending on structural conditions and financial efficiency (Ahsan & Qureshi, 2021 and Kazak et al., 2023). These dynamics highlight the urgency of developing a comprehensive analytical framework that captures the simultaneous relationships among technology, money supply, Islamic banking, and economic growth.

The rationale of this study is grounded in the need to move beyond fragmented analytical approaches that treat financial variables as independent rather than structurally interconnected. Existing research on Islamic finance and fintech has largely focused on partial relationships, such as the effect of Islamic banking on growth or the role of fintech in financial inclusion (Alshater et al., 2022 and Azmeh & Al-Raeei, 2024). However, these approaches fail to capture the endogenous interactions that exist within a dynamic financial system. The increasing complexity of digital financial ecosystems requires a modeling approach that can account for reciprocal causality and structural dependence among variables. Furthermore, empirical evidence suggests that technological innovation does not always translate directly into improved banking performance or economic outcomes (Akdeniz et al., 2024 and Baffour Gyau et al., 2024). This inconsistency indicates the presence of underlying structural mechanisms that are not adequately addressed in conventional models. The use of simultaneous equation modeling provides a more appropriate analytical framework to address these challenges by incorporating endogeneity and feedback effects. In addition, the integration of digital finance into Islamic banking systems introduces new transmission channels that require rigorous quantitative examination. Therefore, this study is designed to provide a more robust and mathematically grounded understanding of financial system dynamics in the context of digital transformation.

Recent studies have increasingly explored the relationship between Islamic banking, fintech, and economic growth, yet their findings remain fragmented and context-dependent. Moldakmatov et al., (2025) emphasize the potential of Islamic finance to support economic development through ethical and inclusive financial mechanisms. Farah et al., (2025), in a systematic review, demonstrate that Islamic banking generally has a positive impact on economic growth, although the strength of this relationship varies across regions and methodologies. Suleman et al., (2025) highlight the resilience of Islamic financial institutions during economic disruptions, suggesting that structural adaptability is a key determinant of performance. Yakubu et al., (2025) examine Islamic fintech as a driver of financial inclusion, emphasizing its role in expanding access to financial services. Suhartini, (2025) identifies macroeconomic instability and political turbulence as factors influencing Islamic banking performance in Indonesia and Malaysia. Ahamed et al., (2025) argue that innovation in Islamic banking is essential for achieving long-term sustainability and competitiveness. Fodol & Aslan, (2025) provide a bibliometric analysis showing the growing integration of sustainability and Islamic finance research. Raval & Desai, (2024) highlight the evolution of fintech research, emphasizing the importance of technological innovation in financial systems. Kadir & Musataklima, (2024) discusses regulatory challenges in Islamic banking within the digital financial era, particularly in relation to institutional adaptation. Jabeen et al., (2016) analyze consumer behavior in Islamic banking adoption, indicating that decision-making is influenced by both economic and non-economic factors. Despite these contributions, the literature lacks a unified framework that simultaneously examines the structural interaction among digital finance, money supply, Islamic banking, and economic growth.

Despite the growing body of literature on Islamic banking and digital finance, existing studies predominantly rely on partial or linear analytical frameworks that fail to capture the simultaneous

and endogenous nature of financial system interactions. Most research isolates variables such as fintech adoption, money supply, or banking performance without considering their reciprocal relationships within a unified structural system. This fragmented approach limits the ability to explain inconsistencies in empirical findings, particularly regarding the role of Islamic banking in economic growth. Furthermore, previous studies have not adequately addressed the paradox in which financial expansion does not necessarily lead to proportional economic outcomes. The absence of a mathematically rigorous simultaneous modeling framework results in an incomplete understanding of financial transmission mechanisms. In addition, the role of e-money as both a liquidity driver and a potential source of inefficiency remains underexplored. The lack of integration between technological variables and macroeconomic modeling further weakens theoretical development in this field. Therefore, there is a critical need for a structural modeling approach that captures the dynamic and interconnected nature of financial systems.

This study aims to develop and estimate a simultaneous structural equation model to analyze the dynamic interactions among digital financial technology, money supply, Islamic banking performance, and economic growth. The research is designed to identify causal relationships within an endogenous system, addressing the limitations of conventional linear approaches. It seeks to examine whether technological adoption and labor productivity significantly influence Islamic banking performance within a structural framework. In addition, the study investigates the role of e-money in shaping money supply and its indirect impact on economic growth. The model also evaluates whether Islamic banking acts as an effective transmission channel between financial innovation and macroeconomic outcomes. Furthermore, this research aims to uncover potential structural inefficiencies that may explain the weak or negative contribution of Islamic banking to economic growth. By applying a Two-Stage Least Squares estimation, the study ensures consistent parameter estimation under simultaneity conditions. Ultimately, the research contributes to the development of a more rigorous mathematical and quantitative framework for analyzing financial system dynamics in the digital era.

METHOD

Research Design

This study adopts a quantitative research design based on a structural simultaneous equation modeling framework to investigate the dynamic interdependence among digital finance, money supply, Islamic banking, and economic growth. The selection of this design is motivated by the presence of endogenous relationships among variables, where causality occurs in multiple directions rather than in a single linear form, as emphasized in financial system modeling studies (Fabozzi et al., 2024 and Yilmaz et al., 2026). Conventional regression approaches are insufficient in this context because they assume exogeneity of explanatory variables, which may lead to biased and inconsistent estimates when simultaneity exists. Therefore, a system of equations is specified to capture the reciprocal interactions among key variables within the financial system. The model consists of three structural equations representing Islamic banking performance, money supply, and economic growth as endogenous variables. Each equation includes both endogenous and exogenous variables to reflect the complexity of financial intermediation in the digital era. The Two-Stage Least Squares (2SLS) method is employed as an appropriate estimation technique to address endogeneity issues, as it provides consistent estimators under simultaneity conditions (Iheonu et al., 2023 and Sheikhi et al., 2022). Furthermore, the model satisfies identification requirements, including order and rank conditions, ensuring that each equation can be uniquely estimated.

Figure 1. Structural Relationship among Variables in the Simultaneous Model

Figure 1 illustrates the structural relationships among variables within the simultaneous equation system. The diagram highlights the bidirectional interactions between Islamic banking, money supply, and economic growth, as well as the influence of exogenous variables such as e-money and labor productivity.

Participants

This study utilizes secondary time-series data collected on a quarterly basis covering the period from 2004 to 2024, allowing for a comprehensive analysis of structural changes in Indonesia's financial system. The data are obtained from reliable and authoritative sources, including Bank Indonesia and the Central Bureau of Statistics, ensuring consistency and accuracy of measurement. The variables include e-money transactions as a proxy for digital financial adoption, money supply (M1/M2), Islamic banking performance, labor productivity, and economic growth measured by GDP. These variables are selected based on their theoretical relevance and empirical significance in studies examining the interaction between fintech and Islamic finance (Faizulayev, 2025 and Maryam & Ahmad, 2022). The use of quarterly data enables the capture of both short-term fluctuations and long-term structural trends within the economy. Additionally, the dataset reflects critical periods of digital transformation and macroeconomic adjustment. All variables are transformed into logarithmic form to improve interpretability and stabilize variance. Prior to estimation, stationarity tests are conducted to ensure the validity of time-series analysis.

Instrument

The analytical instrument in this study is a system of simultaneous structural equations that represents the endogenous relationships among financial variables. The first equation models Islamic banking performance as a function of digital finance (e-money) and labor productivity, reflecting the role of technological and human capital factors in financial development. The second equation models money supply as a function of e-money, capturing the monetary implications of digital payment systems as highlighted in fintech literature (Gurgur & Kahveci, 2025; Nizam, 2022). The third equation models economic growth as a function of Islamic banking, money supply, and digital finance, representing macroeconomic transmission channels. All variables are operationalized using macroeconomic indicators obtained from official national statistics to ensure measurement validity. The model is specified in linear structural form to facilitate estimation using econometric techniques. In addition, variable selection is aligned with established theoretical frameworks in financial economics and Islamic finance. Each variable is tested for stationarity to avoid spurious regression problems. This specification enables a systematic representation of causal relationships within a multi-equation system.

Table 1. Definition and Measurement of Variables

Variable	Definition	Measurement	Type
E-Money	Digital financial transactions	Transaction value (log)	Exogenous
Islamic Banking	Performance of Islamic banking sector	Total assets/financing	Endogenous
Money Supply	Monetary aggregate	M1/M2	Endogenous
Economic Growth	National output	GDP (log)	Endogenous
Labor Productivity	Workforce efficiency	Productivity index	Exogenous

Table 1 presents the operational definition and measurement of all variables included in the simultaneous equation model, providing a clear foundation for empirical estimation. Each variable is defined based on its theoretical role within the financial system, distinguishing between endogenous and exogenous components to ensure proper model specification. E-money is treated as an exogenous variable representing digital financial adoption, as it originates from technological innovation and influences other variables without being directly determined within the system. Islamic banking is modeled as an endogenous variable, reflecting its responsiveness to technological and labor-related factors within the financial intermediation process. Money supply is also categorized as endogenous due to its dynamic interaction with digital transactions and broader monetary conditions. Economic growth, measured by GDP, serves as the ultimate outcome variable that captures the macroeconomic impact of financial system dynamics. Labor productivity is included as an exogenous variable, representing human capital capacity that supports technological adoption and institutional performance. The use of logarithmic transformation for selected variables enhances interpretability and reduces heteroscedasticity, ensuring more reliable estimation results. Overall, this table ensures clarity in variable construction and strengthens the validity of the econometric modeling framework.

Data Analysis Plan

The data analysis is conducted using a Two-Stage Least Squares (2SLS) estimation procedure to address endogeneity within the simultaneous equation system. In the first stage, endogenous variables are regressed on all exogenous variables in the system to obtain predicted values that are not correlated with the error term. In the second stage, these predicted values are used to estimate the structural equations, ensuring consistent parameter estimation under simultaneity conditions (Pérez-Sánchez et al., 2025). Prior to estimation, unit root tests are performed to ensure stationarity of the data and prevent spurious relationships. Identification tests are conducted to verify that each equation satisfies order and rank conditions. The validity of instrumental variables is evaluated using overidentification tests such as the Sargan test to ensure that instruments are exogenous. Endogeneity is further tested using the Hausman test to confirm the appropriateness of 2SLS over OLS estimation. Model fit is evaluated using the coefficient of determination (R^2), which is presented in the results section. The interpretation of results is based on both statistical significance and theoretical consistency.

Model Validation and Robustness

To enhance the reliability of the estimation results, this study incorporates robustness and validation procedures within the modeling framework. Sensitivity analysis is conducted by comparing alternative model specifications to evaluate the stability of parameter estimates. Multicollinearity tests are performed to ensure that explanatory variables do not exhibit strong linear relationships that could bias the estimation results. The predictive accuracy of the model is assessed by comparing observed values with estimated values generated from the system. Robustness testing is essential in simultaneous equation modeling to ensure that results are not driven by model specification errors, as emphasized in recent financial modeling studies (Khatib, 2024 and Sarstedt et al., 2024). In addition, the direction and magnitude of coefficients are evaluated based on theoretical expectations to ensure economic interpretability. These validation procedures

strengthen the credibility of the empirical findings. Consequently, the model provides a reliable framework for analyzing complex financial system interactions.

RESULTS AND DISCUSSION

Results

The results of this study are presented to examine the structural relationships among digital finance, Islamic banking, money supply, and economic growth within a simultaneous equation framework. Given the endogenous nature of these variables, the interpretation of results is conducted at both the individual equation level and the system level to capture the complexity of financial interactions. This approach allows for the identification of both direct and indirect transmission mechanisms within the financial system. The findings are organized into three main parts corresponding to each structural equation, followed by a system-wide interpretation. In addition, the results are evaluated not only based on statistical significance but also on their economic relevance and structural implications. Particular attention is given to identifying dominant effects and potential inconsistencies within the system. This is important to uncover underlying inefficiencies that may not be visible in conventional linear models. Therefore, the results provide a comprehensive understanding of how financial variables interact within an endogenous system.

Estimation Results of the Simultaneous Model

Table 2 presents the estimation results of the simultaneous equation system using the Two-Stage Least Squares (2SLS) method, capturing the structural relationships among digital finance, Islamic banking, money supply, and economic growth. The results confirm the presence of strong interdependence among variables, indicating that the financial system operates as an integrated and endogenous structure rather than a set of isolated relationships. The statistical significance of key coefficients across equations supports the validity of the simultaneous modeling framework. In contrast to conventional regression models, this approach reveals feedback mechanisms that shape financial and macroeconomic dynamics. The variation in coefficient magnitude across equations indicates that each variable plays a distinct role within the system. This suggests that financial transmission mechanisms are not uniform but depend on the structural position of each variable. The results are therefore interpreted at both the equation level and the system level to uncover deeper economic insights. Overall, the estimation confirms the robustness of the structural model in explaining financial system interactions.

Table 2. Estimation Results of the Simultaneous Equation Model

	Coefficient	Error	Std.	t-Statistic	Prob.
C(1)	-6.338793		1.091562	-5.807087	0.0000
C(2)	0.091683		0.027522	3.331254	0.0010
C(3)	4.918488		0.807009	6.094713	0.0000
C(4)	-0.096710		0.066283	1.459051	0.1463
C(5)	2.274849		0.102144	22.27098	0.0000
C(6)	0.187042		0.007913	23.63876	0.0000
C(7)	0.026470		0.019039	1.390310	0.1662
C(8)	0.088697		0.053833	1.647621	0.1012
C(9)	0.951157		2.608348	0.364659	0.7158
C(10)	0.135119		-2.473523	0.054265	0.0143

Table 2 presents the estimation results of the simultaneous equation model, highlighting the structural relationships among digital finance, Islamic banking, money supply, and economic growth. The coefficients indicate that the interactions among variables are not independent but form an interconnected system with varying directions and magnitudes of influence. Several variables exhibit statistically significant effects, confirming the presence of strong endogenous relationships within the model. In particular, the results reveal differences in the strength of influence across equations,

indicating that each variable plays a distinct role within the financial system. The variation in coefficient signs also suggests the existence of both reinforcing and weakening effects among variables. These findings support the use of a simultaneous modeling approach to capture complex financial dynamics. Overall, Table 2 provides empirical evidence of structural interdependence within the financial system.

Equation 1: Determinants of Islamic Banking Performance

The estimation results indicate that labor productivity has a strong and positive effect on Islamic banking performance, suggesting that human capital plays a critical role in enhancing institutional efficiency. In contrast, the effect of e-money reflects a more nuanced relationship, indicating that digital financial adoption does not automatically translate into improved banking productivity. This suggests that Islamic banking institutions are still in a transitional phase in adapting to digital transformation. The magnitude of the labor coefficient is relatively larger compared to digital finance, indicating that internal capacity remains more influential than external technological factors. This implies that technological innovation alone is insufficient without institutional readiness. Furthermore, the results highlight that Islamic banking is structurally dependent on both technological and labor inputs. This reinforces the view that financial institutions operate within a broader economic ecosystem. Therefore, improvements in Islamic banking performance require a combination of technological integration and human capital development.

Equation 2: The Effect of Digital Finance on Money Supply

The estimation results show that e-money has a significant and positive effect on money supply, indicating that digital financial transactions contribute directly to liquidity expansion. This suggests that the adoption of digital payment systems increases the velocity of money circulation, thereby enhancing the effective supply of money in the economy. The magnitude of this effect indicates that digital finance has become a dominant driver of monetary dynamics. Unlike traditional banking mechanisms, this effect operates through transaction efficiency rather than credit intermediation. This finding reflects a structural shift in the monetary system from institution-based to technology-driven processes. However, the expansion of liquidity does not necessarily imply productive allocation, as increased money circulation may be directed toward consumption activities. This highlights the dual role of digital finance as both an enabler of economic activity and a potential source of inefficiency. Therefore, the relationship between e-money and money supply represents a transformation in the structure of monetary transmission.

Equation 3: Structural Determinants of Economic Growth

The estimation results reveal that money supply and digital finance exert a positive influence on economic growth, while Islamic banking shows a non-significant or negative direct effect within the system. The magnitude of the money supply coefficient indicates that liquidity expansion is the most dominant factor driving economic growth. Similarly, the positive effect of digital finance suggests that increased transaction efficiency contributes to broader economic participation. However, the weak or negative coefficient of Islamic banking reveals a structural inefficiency in financial intermediation. This paradox indicates that the expansion of Islamic banking does not proportionally translate into productive economic output. One possible explanation is the misallocation of financial resources toward less productive sectors. Another explanation is the limited integration between Islamic banking and the real sector of the economy. This finding challenges the conventional assumption that financial development inherently leads to economic growth. Therefore, the role of Islamic banking must be interpreted within a broader structural context rather than as a standalone growth driver.

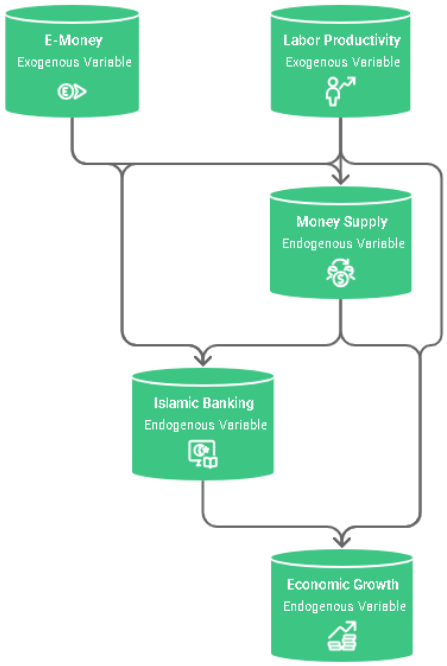

Figure 2. Structural Interpretation of the Estimation Results

Figure 2 illustrates the structural interpretation of the estimation results, highlighting the direction and strength of relationships among variables. Positive relationships are represented by directional arrows indicating reinforcing effects, while weaker or negative relationships reflect structural inefficiencies within the system.

Structural Insight and Dominant Effects

The simultaneous model reveals that economic growth is primarily driven by liquidity expansion rather than institutional banking performance. Among all explanatory variables, money supply emerges as the most dominant factor influencing economic growth, indicating that macroeconomic activity is highly sensitive to monetary conditions. Digital finance plays a secondary but significant role by facilitating liquidity expansion through increased transaction efficiency. In contrast, Islamic banking does not function as an effective transmission channel within the system. This indicates a structural disconnection between financial institutions and real economic outcomes. The model suggests that the financial system is undergoing a transition toward a technology-driven structure. This transition reduces the relative importance of traditional banking mechanisms. Therefore, economic growth is increasingly influenced by systemic interactions rather than individual institutional performance.

Model Fit and Explanatory Power

The coefficient of determination (R^2), as presented in Table 3, indicates that the model has a high explanatory power across all equations. This suggests that the simultaneous model effectively captures the variation in endogenous variables within the system. The high R^2 values confirm the relevance of selected variables in explaining financial system dynamics. However, model fit is interpreted in conjunction with structural consistency rather than as a standalone indicator of model quality. The consistency of coefficient signs across equations further strengthens the validity of the model. In addition, the results demonstrate that the model is capable of capturing both direct and indirect relationships among variables. This highlights the advantage of using a simultaneous equation framework. Therefore, the model provides a reliable basis for analyzing the interaction between digital finance and economic growth.

Table 3. Coefficient of Determination (R^2)

R^2 1	**95%**
R^2 2	93%
R^2 3	90.7%

Table 3 presents the coefficient of determination (R^2) for each equation in the simultaneous model, indicating the explanatory power of the model. The high R^2 values suggest that the selected variables are able to explain a substantial proportion of variation in the endogenous variables. This indicates that the model is well-specified in capturing the underlying financial system dynamics. However, the interpretation of R^2 is complemented by structural consistency rather than relying solely on statistical fit. The consistency of results across equations further supports the reliability of the model. In addition, the high explanatory power reflects the relevance of digital finance, monetary variables, and Islamic banking within the system. These results confirm that the model provides a robust representation of financial interactions. Therefore, Table 3 strengthens the validity of the empirical findings.

Discussion

The findings of this study reveal that the interaction between digital finance, Islamic banking, money supply, and economic growth is inherently structural rather than linear, indicating that financial variables operate within an interconnected system. The positive contribution of digital finance to both money supply and economic growth suggests that technological adoption enhances liquidity and transaction efficiency, which aligns with the evolving role of fintech in modern financial systems (Raval & Desai, 2024). This indicates that financial development is no longer solely driven by institutional expansion but increasingly shaped by technological infrastructure. In this context, digital finance functions as a catalyst that accelerates monetary circulation rather than as a direct substitute for traditional banking. The results further imply that financial innovation reshapes the transmission mechanism of monetary policy, making it more responsive to transaction-based dynamics. This perspective is supported by previous studies emphasizing the growing influence of fintech in transforming financial intermediation processes (Yakubu et al., 2025). Therefore, the relationship between digital finance and economic growth should be interpreted as part of a broader systemic transformation. These findings highlight the need to reconsider traditional financial models that rely heavily on banking institutions as the primary drivers of economic development.

The strong positive effect of e-money on money supply reflects a structural shift in monetary dynamics, where liquidity expansion is increasingly driven by digital transaction mechanisms rather than conventional banking channels. This finding suggests that the velocity of money has become a critical factor in determining effective money supply, reinforcing the importance of transaction efficiency in economic activity. Unlike traditional monetary frameworks, where banking institutions play a central role in money creation, digital finance introduces alternative pathways that bypass institutional constraints. This transformation supports the argument that financial systems are evolving toward technology-driven models, as highlighted in recent financial research (Suleman et al., 2025). However, this expansion of liquidity also raises concerns regarding the allocation of financial resources, as increased money circulation does not necessarily translate into productive investment. The dual nature of digital finance, as both an enabler of economic growth and a potential source of inefficiency, reflects the complexity of modern financial systems. These findings are consistent with studies that highlight the disruptive impact of fintech on traditional financial structures (Fodol & Aslan, 2025). Therefore, the role of digital finance must be understood within the context of both its benefits and its structural limitations.

One of the most critical findings of this study is the weak or non-significant effect of Islamic banking on economic growth, which reveals a structural paradox in financial intermediation. While

Islamic banking is theoretically expected to support economic development through ethical and risk-sharing mechanisms, the empirical results suggest that its expansion does not necessarily lead to proportional economic outcomes. This finding indicates the presence of inefficiencies in the allocation of financial resources, where institutional growth is not matched by productive investment. Previous studies have reported mixed evidence regarding the role of Islamic banking in economic growth, highlighting the importance of contextual and structural factors (Farah et al., 2025). The results of this study extend this perspective by suggesting that the effectiveness of Islamic banking depends on its integration with the real sector. Without strong linkages to productive economic activities, financial expansion may fail to generate meaningful macroeconomic impact. This interpretation is consistent with research emphasizing the importance of structural conditions in determining financial performance (Suhartini, 2025). Therefore, the role of Islamic banking should be evaluated not only in terms of its size but also in terms of its functional efficiency within the financial system.

From a system-wide perspective, the results indicate that economic growth is primarily driven by liquidity expansion rather than institutional banking performance, suggesting a shift from a bank-based to a technology-driven financial system. This transition reflects a fundamental change in the structure of financial intermediation, where digital platforms play an increasingly dominant role. The simultaneous equation model reveals that the interaction among variables is characterized by feedback mechanisms, highlighting the importance of considering endogenous relationships in financial analysis. The dominance of money supply as a driver of economic growth underscores the central role of monetary conditions in shaping macroeconomic outcomes. At the same time, the limited contribution of Islamic banking suggests that institutional factors alone are insufficient to drive growth in the absence of efficient transmission mechanisms. This finding aligns with broader literature emphasizing the importance of systemic interactions in financial development (Ahamed et al., 2025). The results also suggest that financial systems are becoming more complex and less dependent on traditional institutional structures. Therefore, economic growth should be understood as the outcome of dynamic interactions within a multi-layered financial system.

This study contributes to the theoretical development of financial economics by providing a structural perspective on the interaction between digital finance and economic growth. Unlike conventional approaches that treat financial variables as independent factors, this study demonstrates that financial dynamics are shaped by simultaneous and endogenous relationships. The identification of a structural paradox in Islamic banking adds to the existing literature by highlighting the limitations of institutional expansion as a driver of economic growth. This finding challenges traditional theories that assume a direct positive relationship between financial development and economic performance. Instead, it suggests that the quality of financial intermediation is more important than its scale. Furthermore, the study extends existing research on fintech by showing that digital finance influences economic growth primarily through indirect monetary channels rather than direct institutional mechanisms (Kadir, 2024). This insight provides a more nuanced understanding of the role of technology in financial systems. Overall, this study offers a more comprehensive framework for analyzing financial system dynamics in the digital era.

Implication

The findings of this study provide several important implications for both theory and practice, particularly in understanding the evolving structure of financial systems in the digital era. From a theoretical perspective, this study challenges the conventional view that financial development, particularly through banking expansion, directly contributes to economic growth. Instead, the results suggest that financial systems are increasingly driven by liquidity dynamics and technological adoption rather than institutional intermediation alone. This implies that existing financial development theories need to be re-evaluated to incorporate the role of digital finance as a central

component of economic systems. Furthermore, the identification of structural inefficiencies in Islamic banking highlights the importance of examining not only the scale but also the effectiveness of financial institutions in allocating resources. From a policy perspective, the findings suggest that regulators should focus on improving the integration between Islamic banking and the real sector to enhance its contribution to economic growth. In addition, policies that support the productive use of digital finance are essential to ensure that increased liquidity translates into sustainable economic development. The results also indicate that technological innovation should be accompanied by institutional readiness to maximize its impact. Therefore, the implications of this study extend beyond empirical findings to inform both theoretical development and policy formulation.

Limitations

Despite providing important insights, this study has several limitations that should be considered when interpreting the results. First, the analysis is based on aggregate macroeconomic data, which may not fully capture micro-level dynamics within financial institutions and individual economic agents. This limitation implies that the results reflect general trends rather than specific behavioral mechanisms. Second, the use of a linear simultaneous equation model may not fully capture potential nonlinear relationships within the financial system, particularly in the context of rapid technological change. Financial systems influenced by digital innovation may exhibit threshold effects or structural breaks that are not explicitly modeled in this study. Third, the measurement of digital finance using e-money transactions may not encompass the full spectrum of fintech activities, such as peer-to-peer lending and digital banking services. This may limit the ability to fully capture the impact of technological innovation on financial systems. In addition, the study focuses on a single country context, which may limit the generalizability of findings to other economies with different financial structures. Furthermore, the potential influence of external shocks, such as global economic crises, is not explicitly incorporated into the model. Therefore, the findings should be interpreted within the context of these methodological and empirical constraints.

Suggestions

Future research should extend this study by incorporating more comprehensive measures of digital finance to better capture the evolving nature of financial technology. In particular, the inclusion of variables such as digital lending, mobile banking, and fintech platform activity would provide a more complete understanding of financial system dynamics. Additionally, future studies should explore nonlinear modeling approaches to capture potential threshold effects and structural changes within the financial system. The use of advanced econometric techniques, such as dynamic panel models or nonlinear simultaneous equations, may provide deeper insights into complex financial interactions. Further research should also investigate the role of institutional quality and regulatory frameworks in shaping the effectiveness of Islamic banking and digital finance. This would help explain variations in financial system performance across different contexts. Moreover, cross-country comparative studies could provide valuable insights into how financial structures differ across economies. The integration of micro-level data could also enhance the understanding of behavioral mechanisms underlying financial interactions. Finally, future research should examine the long-term implications of digital financial transformation on economic stability and sustainability. These directions would contribute to a more comprehensive and nuanced understanding of financial system evolution.

CONCLUSION

This study demonstrates that the relationship between digital finance, Islamic banking, money supply, and economic growth is inherently structural and shaped by endogenous interactions rather than linear causality. The findings reveal that digital finance plays a central role in driving economic

dynamics through liquidity expansion and transaction efficiency, while Islamic banking does not exhibit a significant direct contribution to economic growth. This indicates a structural paradox in which institutional expansion does not necessarily translate into productive economic outcomes, highlighting inefficiencies in financial intermediation.

From a theoretical perspective, this study challenges the conventional assumption that financial development inherently promotes economic growth, emphasizing instead the importance of efficient resource allocation and structural integration within the financial system. The results further suggest a transition toward a technology-driven financial system, where monetary dynamics and digital platforms play a more dominant role than traditional banking mechanisms. Therefore, this study provides a more integrative and robust framework for understanding financial system dynamics in the digital era and calls for a reorientation of financial development strategies toward improving institutional effectiveness and technological integration.

AUTHOR CONTRIBUTIONS STATEMENT

Mila Naeruz was solely responsible for the entire research process, including conceptualization of the study, development of the research framework, data collection and curation, model specification, and formal analysis using econometric techniques. The author conducted the investigation, interpreted the results, and developed the theoretical and empirical discussions presented in the manuscript. Mila Naeruz also prepared the original draft, performed critical revisions, and finalized the manuscript for submission. All aspects of the study were carried out independently by the author, who has read and approved the final version of the manuscript.

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