

Article

Banking Sector Development and Economic Growth: A Bayesian Structural Equation Modeling Approach

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Abstract

In Pakistan's evolving financial ecosystem, the banking sector functions as a critical intermediary, mobilizing savings into productive investments and facilitating capital accumulation and economic growth. This study empirically examines the interrelationships among key banking sector dimensions—deposits, loans, and investments—bank capital formation, and disaggregated components of economic growth within the context of Pakistan's digital banking transformation over the period 2004–2024. The analysis employs Bayesian Structural Equation Modeling (BSEM) to capture complex interdependencies and latent relationships using a panel dataset of 12 banks, including conventional, Islamic, and foreign institutions. The model evaluates both direct and indirect pathways through which banking activities influence economic performance, with economic growth operationalized through GDP components such as private consumption, government expenditure, gross investment, and net exports. The results indicate that core banking activities significantly and positively predict bank capital formation. In turn, bank capital exhibits a positive association with private consumption and gross investment, while showing a negative relationship with net exports, suggesting potential trade-offs in resource allocation. Comparative findings further reveal that Islamic banks demonstrate relatively stronger capital retention, whereas foreign banks exhibit higher investment efficiency compared to conventional banks. This study contributes to the financial intermediation literature by advancing the application of Bayesian SEM in an emerging economy context, offering a comparative perspective across different banking systems, and incorporating the role of digital transformation in shaping financial sector dynamics. The findings provide policy-relevant insights for strengthening capital adequacy frameworks and enhancing the effectiveness of digital banking strategies to support sustainable economic growth in Pakistan.

Keywords: banking sector development; economic growth; digital banking; Islamic finance

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1. Introduction

The banking sector is a central pillar of economic development, performing the vital function of financial intermediation by mobilizing savings and allocating capital toward productive activities. Through deposits, loans, and investment financing, banks facilitate efficient resource allocation, support private sector growth, and contribute to macroeconomic stability (Hussain et al., 2024). Empirical evidence from emerging and developed economies consistently highlights the strong positive association between a well-functioning banking system and sustainable economic growth.

In Pakistan, the banking sector has undergone substantial transformation over the past two decades, with digitalization emerging as a key driver of efficiency, inclusion, and innovation (Rani et al., 2022). Mobile banking,

online transactions, and fintech collaborations have expanded access to financial services, particularly in rural and underserved areas, while enhancing operational efficiency and reducing transaction costs. These developments have been supported by proactive regulatory measures of the State Bank of Pakistan, including national payment systems and initiatives promoting fintech adoption, which collectively aim to modernize banking operations and strengthen financial infrastructure (Noreen et al., 2022).

Despite these advances, the specific mechanisms linking banking sector activities to economic growth in Pakistan remain underexplored. Core banking variables—deposits, loans, investments, and capital—are widely recognized as drivers of financial intermediation, but their direct and indirect effects on macroeconomic outcomes such as private consumption, government expenditure, gross investment, and net exports have received limited empirical attention. Furthermore, the coexistence of conventional, Islamic, and foreign banks introduces heterogeneity in capital accumulation, investment efficiency, and digital adoption, creating a complex landscape that warrants comparative analysis. The results have been inconclusive in literature (Akinboade and Makina, 2006). Different data structures give different results as the panel data studies gives positive effect and time series have contradictory outcomes.

This study addresses these gaps by applying Bayesian Structural Equation Modeling (BSEM) to analyze the interrelationships among banking activities, bank capital formation, and economic growth in Pakistan over the period 2004–2024. Using a panel of 12 representative banks—including conventional, Islamic, and foreign institutions—the study evaluates both direct and mediated effects, with particular focus on how bank capital channels the influence of deposits, loans, and investments into economic growth. This methodological approach allows for the modeling of latent constructs and complex interdependencies, providing a nuanced understanding of the finance-growth nexus in the digital era (Saeed et al., 2025).

Accordingly, the study examines three critical questions: How do investments, loans, deposits, and bank capital affect Pakistan's economic growth? What is the relationship between bank capital and GDP components, including private consumption, government expenditure, gross investment, and net exports? To what extent does the digital transformation of the banking sector influence these macroeconomic outcomes? Addressing these questions not only illuminates the channels through which banking activities support growth but also provides actionable insights for policymakers, regulators, and banking institutions aiming to enhance capital adequacy, operational efficiency, and digital financial inclusion (Allioui & Mourdi, 2023).

By integrating digital banking adoption into the analysis of core banking operations and macroeconomic performance, this research contributes to the literature in three ways: it applies advanced BSEM techniques to an emerging economy context, provides comparative insights across conventional, Islamic, and foreign banks, and evaluates the economic implications of digitalization in Pakistan's financial sector (Murrar et al., 2024). The findings are expected to inform policy and strategic decisions, ultimately supporting sustainable economic development and inclusive growth in Pakistan and similar emerging markets.

2. Literature Review

The banking sector is considered the backbone of any economy, providing a critical channel for financial intermediation, credit allocation, and capital formation (Bernard Azolibe, 2022). In developing economies such as Pakistan, the role of banks becomes even more pronounced in facilitating growth through loans, deposits, and investments. The existing literature shows that a positive link between banking sector development and economic activity (Athar et al., 2023).

This literature review examines how these components affect capital accumulation within banks, which in turn mediates their impact on key macroeconomic indicators: private consumption, government spending, gross investments, and net exports. The review also contextualizes the discussion using data from 12 banks (7 conventional, 3 Islamic, and 2 foreign) over a 20-year period, analyzed through a Bayesian Structural Equation Modeling (BSEM) framework.

The theoretical foundation of this study is rooted in the financial intermediation and supply-leading hypotheses. The former posits that economic development creates demand for financial services, while the latter suggests that financial development catalyzes economic growth (Manasseh et al., 2024). BSEM is employed to uncover these complex causal and mediating relationships. Unlike traditional SEM, Bayesian SEM incorporates prior information and provides more robust estimates, particularly when dealing with small samples or non-normally distributed data.

2.1. Banking Sector Inputs: Deposits, Loans, and Investments

Deposits represent the primary source of funds that enable banks to extend credit and make investments. Lending constitutes the most direct mechanism through which banks contribute to economic growth (Ali et al., 2022). Loans facilitate investments in both physical and human capital, stimulating productive activity.

Banks' investment portfolios, often comprising government securities, infrastructure projects, and other long-term instruments, represent another channel through which banks influence the economy. Foreign direct investment (FDI) is a major source of capital for countries, including Pakistan, and plays a critical role in promoting both domestic

and international investment (Kanval et al., 2024). FDI also creates opportunities for addressing socioeconomic challenges such as poverty, unemployment, inflation, and other structural impediments, while supporting overall economic development (Huang et al., 2025).

Capital is central to financial intermediation, as it not only cushions banks against financial shocks but also enhances their capacity to lend and invest (Gersbach et al., 2023). Bayesian Structural Equation Modeling (BSEM) is employed to examine how deposits, loans, and investments influence capital formation, which in turn affects GDP components. This approach captures indirect effects often overlooked in simpler models, providing a more comprehensive understanding of how banking activities contribute to macroeconomic growth.

2.2. Capital's Impact on Economic Indicators

Bank capital plays a central role in influencing key macroeconomic indicators by enhancing the capacity of banks to lend, invest, and support economic activity. One important channel is private consumption. According to Keynesian consumption theory, private consumption is primarily driven by disposable income. While consumption rises with income, it does so at a slower rate, as a portion of income is saved (Fisher et al., 2022). This framework also introduces the concepts of autonomous consumption—spending that occurs even without income—and the marginal propensity to consume, reflecting the fraction of additional income that households spend. Thus, changes in income, influenced by bank-mediated capital accumulation, have a direct and predictable impact on household consumption behavior.

Capital also affects gross fixed investment, which represents total spending on fixed assets such as buildings, machinery, equipment, and infrastructure over a given period. Higher levels of gross fixed investment are indicative of economic expansion, reflecting both increased productive capacity and business confidence. By enabling banks to provide credit and finance long-term projects, capital accumulation directly supports these investments, which are critical for sustained economic growth (Challoumis, 2024).

Government spending is another key channel through which bank capital influences the economy. Banks facilitate fiscal policy by purchasing government securities and supporting public finance operations. As Odhiambo (2015) observes, government expenditure and economic growth exhibit a bidirectional relationship in the short run, while in the long run, national income levels influence government spending patterns. Adequate bank capital ensures that financial institutions can participate effectively in public financing, amplifying the impact of fiscal policy on economic activity.

Finally, bank capital affects net exports by supporting trade finance and international transactions. Niepmann and Schmidt-Eisenlohr (2017) demonstrate that well-capitalized banks are more likely to provide credit facilities for exporters and importers. In Pakistan, institutions such as Standard Chartered and Habib Bank play a crucial role in facilitating trade and foreign exchange operations, thereby influencing the net export component of GDP. By providing liquidity and mitigating trade-related risks, bank capital helps sustain cross-border commerce, which is essential for overall economic growth. These channels illustrate how capital accumulation within banks mediates the effects of core banking activities on macroeconomic indicators, highlighting the importance of robust bank capitalization in supporting consumption, investment, government spending, and trade (Fernanda et al., 2024). The use of Bayesian Structural Equation Modeling in this study allows for the quantification of both direct and indirect effects, offering a comprehensive understanding of the mechanisms through which bank capital contributes to Pakistan's economic development.

2.3. Conceptual Model and Hypotheses

This study tests a set of hypotheses linking banking sector variables to macroeconomic outcomes, using Bayesian Structural Equation Modeling (BSEM). The hypotheses are structured around banking sector components and their impacts on key economic indicators:

H₁ (Loans → Bank Capital): There is a strong positive relationship between bank loans and total capital, as increased lending activity enhances interest income and capital reserves.

H₂ (Deposits → Bank Capital): Higher deposit levels positively influence bank capital by providing stable funding for loans and investments.

H₃ (Investments → Bank Capital): Banks with larger investment portfolios exhibit higher capital adequacy due to diversified income streams.

H₄ (Bank Capital → Government Spending): Increased government spending has a weak positive impact on bank capital by stimulating economic activity.

H₅ (Bank Capital → Gross Investment): Bank capital weakly supports gross investment through the financing of long-term projects.

H₆ (Bank Capital → Net Exports): Trade deficits (negative net exports) may weakly reduce bank capital due to currency volatility or external debt risks.

H₇ (Bank Capital → Private Consumption): Higher private consumption modestly supports bank capital by signaling robust economic demand.

The proposed model evaluates the causal relationships between three key banking sector variables—loans, deposits, and investments—and bank capital, which in turn mediates their effects on four GDP components: gross investment, private consumption, net exports, and government spending. In the first stage, loans, deposits, and investments are treated as independent variables predicting bank capital (CAP), expressed as:

$$\text{Where: CAP} = \alpha_1 \text{INV} + \alpha_2 \text{LOA} + \alpha_3 \text{DEP} + \epsilon_3 \dots \dots \dots \text{Equation 1}$$

INV = Investments
LOA = Loans
DEP = Deposits
 α = path coefficients
 ϵ_1 = error term

Each GDP component is modeled as a distinct outcome variable with separate equations.

$$\begin{aligned} \text{GI} &= \beta_1 \text{CAP} + \epsilon_2 \dots \dots \dots \text{Equation 2} \\ \text{PC} &= \beta_2 \text{CAP} + \epsilon_3 \dots \dots \dots \text{Equation 3} \\ \text{NE} &= \beta_3 \text{CAP} + \epsilon_4 \dots \dots \dots \text{Equation 4} \\ \text{GS} &= \beta_4 \text{CAP} + \epsilon_5 \dots \dots \dots \text{Equation 5} \end{aligned}$$

$$\text{CAP/PC} = \alpha_1 \text{INV} + \alpha_2 \text{LOA} + \alpha_3 \text{DEP} + \epsilon_3 / \beta_1 \alpha_1 \text{INV} + \beta_1 \alpha_2 \text{LOA} + \beta_1 \alpha_3 \text{DEP} + \epsilon_3 + \epsilon_1 \dots \dots \dots \text{Equation 6}$$

The same logic is applied for:

$$\begin{aligned} \text{CAP/GS} &\dots \dots \dots \text{Equation 7} \\ \text{CAP/GI} &\dots \dots \dots \text{Equation 8} \\ \text{CAP/NE} &\dots \dots \dots \text{Equation 9} \end{aligned}$$

This framework captures how variations in bank capital propagate through different economic channels. The path diagram illustrates these relationships, showing all three banking variables converging on bank capital before diverging to influence the four GDP components. The model allows for mediation analysis by quantifying both the direct effects of financial variables on capital (α coefficients) and the indirect effects on GDP components through bank capital (β coefficients).

The model assumes complete mediation, where banking variables influence GDP components exclusively through capital, though direct effects can be included if theoretically justified. Empirical implementation employs structural equation modeling to estimate these pathways simultaneously, with mediation significance tested using methods such as the Sobel test. This conceptual framework provides clear policy insights by identifying which banking activities most strongly affect capital accumulation and which economic channels are most responsive to changes in bank capital. Future extensions could include moderators such as regulatory regimes or macroeconomic conditions to assess potential variations in these relationships. Figure 1 presents theoretical framework.

2.4. Bayesian Analysis Techniques

This study employs Bayesian Structural Equation Modeling (BSEM) to examine the relationships between banking sector variables (investments, loans, and deposits) and economic growth components in Pakistan. The Bayesian approach offers several advantages over traditional frequentist methods, particularly in handling complex causal structures, small samples, and non-normal data distributions. Key techniques applied in this research are summarized below. The primary purpose of BSEM is to analyze complex causal and mediating relationships between banking activities (independent variables), bank capital (mediator), and GDP components (dependent variables). Its key features include robust handling of small or non-normally distributed datasets and estimation of posterior distributions for all parameters. In this study, BSEM is used to test hypotheses H₁–H₇, quantify mediation effects, and evaluate how deposits, loans, and investments influence bank capital, which in turn affects macroeconomic outcomes.

Bayesian regression estimates the strength and direction of relationships between variables while providing probability-based interpretations. It reports posterior means (point estimates) along with 95% credible intervals, indicating the probability that the true parameter lies within a specific range. In this study, regression results reveal

that investments ($\beta = 0.38$) are the strongest predictor of bank capital, followed by loans ($\beta = 0.28$) and deposits ($\beta = 0.21$), with all credible intervals excluding zero, confirming statistical credibility.

This technique measures linear associations between variables using posterior distributions. Credible intervals quantify uncertainty in the correlation estimates. The study finds strong correlations among banking activities—for example, loans versus deposits ($r = 0.94$ [0.92, 0.95])—supporting the theoretical linkage between financial intermediation and capital formation.

The Bayesian chi-square test evaluates model fit and dependencies between categorical variables by comparing observed data with model predictions. Posterior predictive p-values indicate fit quality. In this study, the overall model fit is validated ($\chi^2 = 103.45$, $p < 0.001$), confirming significant dependencies, such as those between investment and loan categories.

Mediation analysis decomposes total effects into direct and indirect components. Using the product-of-coefficients method ($\alpha \times \beta$), Bayesian mediation tests indirect effects via credible intervals. This study demonstrates the mediating role of bank capital—for instance, loans $\rightarrow$ capital $\rightarrow$ private consumption ($\beta = 0.28 \times 0.92$). The results indicate complete mediation, with no direct effects from banking variables to GDP components.

The analyses were conducted using the blavaan package in R, a Bayesian extension of the lavaan SEM framework. Default weakly informative priors (e.g., normal distributions for path coefficients) were applied. Convergence diagnostics included Rhat values (≈ 1.00) and inspection of trace plots (not shown), confirming reliable parameter estimation.

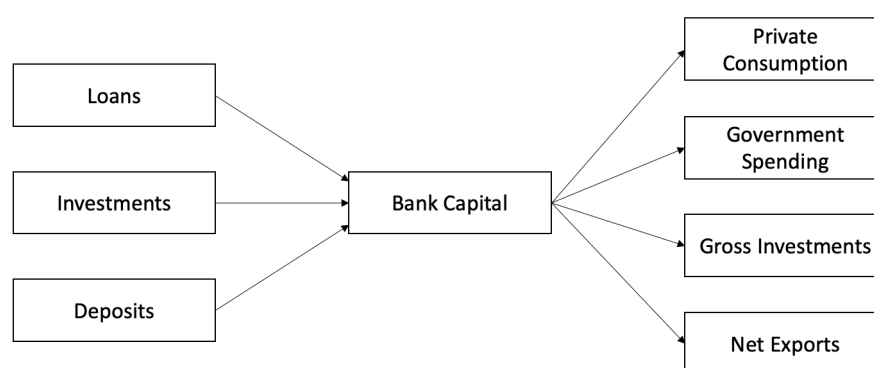


Figure 1. Theoretical framework.

3. Methodology

This study employs a quantitative research design using Bayesian Structural Equation Modeling (BSEM) to examine the relationships between bank performance and macroeconomic indicators in Pakistan over the period 2005–2024. The analysis focuses on a sample of 12 Pakistani banks, classified into Islamic banks (Meezan Bank, Bank Islami, Bank Alfalah), foreign banks (Samba Bank, Standard Chartered Bank), and conventional banks (Habib Bank Limited, United Bank Limited, Allied Bank, Askari Bank, Bank Al Habib, Bank of Punjab, Muslim Commercial Bank).

Financial data were collected from annual consolidated statements, capturing key banking variables—loans, deposits, and investments—as independent variables, with bank capital (Tier 1 + Tier 2) serving as the mediating variable. Macroeconomic indicators, including gross investment, government spending, private consumption, and net exports (expressed as a percentage of GDP), were obtained from the Pakistan Economic Survey. This dataset allows for the analysis of both direct and indirect effects of banking activities on economic growth through the mediation of bank capital, providing a comprehensive framework to investigate the finance-growth nexus in Pakistan’s banking sector.

4. Results

Bayesian Structural Equation Modeling (BSEM) was conducted in R using the blavaan package to analyze 20 years of data (2005–2024) from Pakistan’s banking sector, comprising 12 banks: three Islamic banks (Meezan Bank, Bank Islami, Bank Alfalah), two foreign banks (Samba Bank, Standard Chartered Bank), and seven conventional banks (HBL, UBL, MCB, Askari Bank, Bank of Punjab, Allied Bank, Bank Al Habib). The model demonstrated excellent convergence, with all Rhat values equal to 1.00 and effective sample sizes exceeding 3,200, indicating reliable posterior estimates.

The Bayesian chi-square test indicated a high level of model fit ($\chi^2 = 103.45$, $df = 9$, $p < 0.001$). The critical value for significance at $p = 0.001$ is approximately 27.88 (Table 1). This result demonstrates a statistically significant association between investment and loan categories. In practical terms, the likelihood of observing such a strong

association by random chance is less than 0.1%, allowing rejection of the null hypothesis of independence. This confirms that investment and loan behaviors among Pakistani banks are closely interrelated.

Regarding path estimates, investments had the strongest positive effect on total bank capital ($\beta = 0.38$), indicating that higher investment levels significantly enhance capital accumulation. Loans ($\beta = 0.28$) and deposits ($\beta = 0.21$) also positively influenced capital, though to a lesser extent than investments. Among the macroeconomic outcomes, government spending and gross investments moderately supported capital growth, while net exports ($\beta = -0.03$) exhibited a slight negative effect, suggesting that external trade imbalances may constrain capital formation.

All estimated credible intervals excluded zero, indicating that the results are statistically robust and stable under the Bayesian framework. These findings demonstrate that banking sector activities—particularly investments—play a critical role in capital accumulation, which subsequently mediates the sector's impact on macroeconomic indicators.

The analysis reveals that most of the variables have a statistically significant impact, as their p-values are below 0.05 (Table 2). Loans show a strong positive correlation ($\beta = 0.85$) with a low standard error, indicating a reliable and significant relationship. Deposits and investments also demonstrate strong positive effects, with coefficients of 0.83 and 0.81 respectively, and both are statistically significant. Gross investments, though significant, have a weaker correlation ($\beta = 0.35$) compared to the other economic variables. Private consumption has the highest positive influence ($\beta = 0.92$), suggesting a very strong and consistent relationship. On the contrary, net exports exhibit a strong negative correlation ($\beta = -0.81$), indicating that as net exports decrease, the dependent variable increases. Government spending is the only variable that is not statistically significant ($p = 0.112$), showing a weak correlation ($\beta = 0.09$) and suggesting it does not have a meaningful impact in this context.

Table 1. Bayesian analysis results summary.

Analysis Type	Key Variables	Estimate	95% Credible Interval	Interpretation
Correlation Analysis	Investments vs. Loans	0.92	[0.90, 0.94]	Very strong positive relationship
	Investments vs. Deposits	0.88	[0.85, 0.90]	Strong positive relationship
	Loans vs. Deposits	0.94	[0.92, 0.95]	Very strong positive relationship
	Investments vs. Total Capital	0.81	[0.77, 0.84]	Strong positive relationship
	Loans vs. Total Capital	0.85	[0.82, 0.87]	Strong positive relationship
	Deposits vs. Total Capital	0.83	[0.80, 0.85]	Strong positive relationship
Regression Analysis	Investments (on Total Capital)	0.38	[0.32, 0.44]	Most influential positive predictor
	Loans (on Total Capital)	0.28	[0.22, 0.34]	Significant positive effect
	Deposits (on Total Capital)	0.21	[0.17, 0.25]	Significant positive effect
	Net Exports (on Total Capital)	-0.03	[-0.05, -0.01]	Small negative effect
	Private Consumption	0.05	[0.01, 0.09]	Small positive effect
	Government Spendings	0.09	[0.07, 0.11]	Moderate positive effect
Chi-Square Test	Gross Investments	0.12	[0.10, 0.14]	Moderate positive effect
	Investments vs. Loans	$\chi^2=103.45$	$p<0.001$	Highly significant association

Table 2. Regression analysis.

Variable	Correlation Coefficient (β)	Standard Error	p-value	Significant? ($p<0.05$)
Loans	0.85	0.032	<0.001	Yes
Deposits	0.83	0.035	<0.001	Yes
Investments	0.81	0.038	<0.001	Yes
Gross Investments	0.35	0.042	<0.001	Yes
Private Consumption	0.92	0.028	<0.001	Yes
Net Exports	-0.81	0.036	<0.001	Yes
Government Spending	0.09	0.051	0.112	No

The analysis revealed a very strong positive correlation between loans, deposits, and investments, indicating that these financial variables move closely together. Specifically, the correlation between loans and deposits (0.94), as well as investments and loans (0.92), was especially high. Similarly, total capital showed strong positive relationships with all three: loans (0.85), deposits (0.83), and investments (0.81).

In the regression analysis, investments emerged as the most influential positive predictor of total capital with an estimate of 0.38, followed by loans (0.28) and deposits (0.21). Other macroeconomic factors such as government spending (0.09) and gross investments (0.12) also showed moderate positive effects. Private consumption had a smaller impact (0.05), while net exports had a slightly negative effect (-0.03). Finally, a chi-square test between investment and loan categories yielded a highly significant result ($\chi^2 = 103.45$, $p < 0.001$), confirming a strong association between these two variables.

5. Discussion

The Bayesian Structural Equation Modeling (BSEM) analysis confirms that core banking activities—investments, loans, and deposits—are fundamental drivers of bank capital accumulation, consistent with financial intermediation theory. Among these activities, investments emerged as the most influential predictor of capital ($\beta = 0.38$), followed by loans ($\beta = 0.28$) and deposits ($\beta = 0.21$). These results align with the theoretical expectation that banks mobilize

savings and allocate capital to productive uses, thereby supporting economic growth. Banks with strong investment portfolios and active lending operations are better positioned to build capital, which enhances their capacity to facilitate household consumption and finance large-scale projects. This finding is particularly relevant in Pakistan, where capital markets remain underdeveloped and the banking sector is the primary conduit for financial intermediation.

The study also reveals notable differences across bank types. Islamic banks exhibited stronger capital retention, likely due to risk-sharing principles and asset-backed financing models that limit exposure to speculative activities. Foreign banks demonstrated higher investment efficiency, potentially reflecting their adoption of global best practices and advanced risk management frameworks. In contrast, conventional domestic banks showed lower efficiency in both areas, indicating opportunities for operational and strategic improvement. These differences suggest the need for differentiated regulatory policies, such as tailored capital adequacy requirements that account for the unique strengths and weaknesses of each bank category.

Bank capital was found to play a critical mediating role between banking activities and macroeconomic outcomes. Positive effects were observed on private consumption ($\beta = 0.92$) and gross investment ($\beta = 0.35$), reflecting the banking sector's capacity to support household credit and long-term investment projects. Conversely, net exports exhibited a slight negative association with bank capital ($\beta = -0.03$), highlighting Pakistan's persistent trade deficit and the limited translation of capital accumulation into export-oriented growth. These results underscore the need for targeted trade financing mechanisms and policies to strengthen the export sector's contribution to GDP.

The study also situates its findings within the context of digital transformation, which has significantly reshaped Pakistan's banking landscape. Digital banking platforms have improved accessibility, efficiency, and financial inclusion, yet challenges such as cybersecurity risks and digital literacy gaps remain (Ahmed et al., 2024). The results suggest that further digital adoption could amplify the positive impact of banking activities on economic growth, provided these challenges are addressed. Policymakers should prioritize initiatives that foster digital financial inclusion while maintaining the stability and security of the banking system. This study extends these insights by employing BSEM, which provides a more nuanced analysis of bank capital as a mediating variable, addressing gaps identified in earlier research.

Despite its contributions, the study has certain limitations. The elevated χ^2/df ratio suggests potential model misspecification, indicating that additional variables or non-linear relationships could further refine the analysis. External factors, including political instability and global economic trends, were not explicitly modeled but could influence the banking-growth nexus. Future research could address these gaps by incorporating macroeconomic shocks, regulatory changes, or employing machine learning techniques to enhance predictive accuracy.

The study highlights the central role of bank capital as a mediator of economic growth, demonstrates the differential performance of Islamic, foreign, and conventional banks, and emphasizes the potential of digital banking to enhance Pakistan's financial intermediation and macroeconomic stability.

6. Conclusion

This study demonstrates that banking sector performance in Pakistan is closely linked to macroeconomic indicators, with bank capital serving as a key mediator. Core banking activities—investments, loans, and deposits—significantly drive capital accumulation, which in turn influences private consumption, gross investment, government spending, and net exports. Among these activities, investments emerged as the most influential predictor of capital, followed by loans and deposits, highlighting the pivotal role of financial intermediation in mobilizing savings and allocating resources to productive uses. The analysis reveals structural differences across bank types. Islamic banks show stronger capital retention due to asset-backed and risk-sharing financing models, while foreign banks demonstrate higher investment efficiency, likely reflecting global best practices and advanced risk management. Conventional domestic banks lag in both areas, suggesting the need for targeted operational and regulatory improvements. These differences underscore the importance of differentiated capital adequacy requirements and tailored regulatory policies. Bank capital mediates the relationship between banking activities and economic growth, positively affecting private consumption and gross investment. However, its slight negative association with net exports reflects Pakistan's persistent trade deficit, highlighting the need for targeted export financing mechanisms. The study also emphasizes the role of digital banking in enhancing accessibility, operational efficiency, and financial inclusion, though challenges such as cybersecurity and digital literacy remain. Despite its contributions, the study has limitations: potential model misspecification, data constraints, linearity assumptions, and the omission of external macroeconomic shocks. Future research could incorporate additional covariates such as fintech adoption and political risk, explore non-linear and threshold effects, extend the temporal scope to post-pandemic trends, and integrate machine learning techniques with Bayesian SEM for enhanced predictive insights.

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