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## Article

# Banking sector and economic growth in the digital transformation era: Insights from maximum likelihood and Bayesian structural equation modeling

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# Banking sector and economic growth in the digital transformation era: insights from maximum likelihood and Bayesian structural equation modeling

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## Abstract

**Purpose** – In the digital era, the banking sector has transformed into a powerful intermediary, effectively connecting surplus and deficit units. This dynamic landscape empowers savers to secure their finances and generate returns, while simultaneously enabling businesses and individuals to access capital for investment and promoting economic growth. This study explores the relationships among banking development dimensions – represented by primary assets and liabilities, bank capital (core capital and required reserves) and economic growth as measured by components of gross domestic product (GDP).

**Design/methodology/approach** – The study consolidated monthly balance sheets from digital banks over a 20-year period, resulting in an aggregate monthly balance sheet that reflects the financial position of all digital banks in the Palestinian economy. The research employs both maximum likelihood and Bayesian structural equation modeling to measure the causal pathways of the consolidated balance sheet with the individual components of GDP.

**Findings** – The results revealed that bank main assets (investments and loans) and liabilities (deposits) collectively explain for 97% of bank capital. Investments and loans demonstrate significant negative correlations with bank capital, while deposits exhibit a positive impact. This leads to a fundamental conclusion that a substantial proportion of retained earnings within the banking sector is reinvested, fueling expansion and growth. Additionally, the results showed a significant relationship between bank capital and various GDP components, including private consumption, gross investment and net exports ( $p = 0.000$ ). However, while the relationship between bank capital and government spending was insignificant in the maximum likelihood estimation, Bayesian estimation revealed a slight yet positive impact of bank capital on government spending.

**Originality/value** – This research stands out due to its unique exploration of the intricate relationship between bank sector development dimensions, primary assets and liabilities and their impact on bank capital in the digital era. It offers fresh insights by dividing this connection into specific dimensions and constructs, utilizing a comprehensive two-decade dataset covering the digital banks records.

**Keywords** Bank capital, Deposits, Economic growth, GDP components, Loans

**Paper type** Research paper

**JEL Classification** — C11, C58, G21, O16

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## Introduction

Digital banking development has transformed the way individuals and businesses manage their finances. These innovative services leverage digital technology to provide customers with a convenient and efficient way to access and manage their accounts, conduct transactions, and engage with their banks (Profinch, 2023). With digital banking, customers can perform a wide range of tasks from the comfort of their smartphones, tablets, or computers, eliminating the need for physical visits to bank branches (Gavriluk, 2023). This accessibility is particularly advantageous in today's fast-paced world, where time and convenience are highly valued. Moreover, with digital platforms, banks can reach a broader audience, making it easier for individuals and institutions to deposit their savings, and for businesspeople and manufacturers to secure loans. This expanded reach not only increases the liquidity available for loans, but also enhance economic growth by reducing geographical limitations and transactional barriers (Feyen *et al.*, 2021).

Therefore, the development of digital banking has had a significant impact on increasing bank deposits, loans, and investments (Tantoco, 2021). A bank's primary assets consist of loans and investments, while its primary liabilities involve deposits from both individuals and institutions (Bhattacharyay, 2015). The amount attributed to the bank owner's equity, or capital, is essentially the difference between the total assets and total liabilities (Suresh and Paul, 2014). An increase in bank capital enables the bank to engage in more investments, extend additional loans, and pursue new avenues of development (Kim and Sohn, 2017; Furlong, 1992). Consequently, bank capital serves as a true and representative indicator of a bank's developmental and growth prospects (Kishan and Opiela, 2000).

The question at hand pertains to whether the banking sector with its digital development can contribute to economic growth as indicated by GDP (Batrancea *et al.*, 2021), and, if so, in what dimension of growth. In the existing literature, the relationship between banking sector development and economic growth is not straightforward (Odhiambo, 2014). Several researchers have identified a positive correlation between banking sector development and economic growth (Levine and Zervos, 1998; Nyasha and Odhiambo, 2015; Alkhazaleh, 2017; Ye and Zhao, 2019; Islam *et al.*, 2019). On the other hand, some researchers have found a negative relationship (Shen and Lee, 2006; Naceur and Ghazouani, 2007; Petkovski and Jordan, 2014; Nwani and Jacob, 2016). In essence, the impact of banking sector development on economic growth remains a subject of debate and may vary depending on specific circumstances and factors. Many of these studies have assessed banking sector using specific indicators such as bank size, return on equity, return on investment, liquid liabilities, operating profit rate, and credit to the private sector, bank capital to assets ratio as evidenced by the works of Petkovski and Jordan (2014), Tripathy and Pradhan (2014), Imam and Kpodar (2016), Abusharbeh (2017), Batrancea *et al.* (2022). However, it's noteworthy that none of the previous studies have systematically explored banking sector development in terms of its major components, including banking major assets (loans and investments), major liabilities (deposits), and owner equity (bank capital as an intermediary).

Moreover, there has been limited attention given to understanding the relationship between banking sector development and the individual components of GDP. GDP is composed of various elements, including consumption, government spending, investment, and net exports. Our hypothesis suggests that advancements in the banking sector, especially through digital banking, have a significant and measurable impact on the different components of GDP, thereby influencing overall economic growth. Analyzing the impact of banking development on each of these GDP components can provide a more comprehensive understanding of the state of the economy and its performance in different areas. It can shed light on how banking sector development influences consumer behavior, government fiscal policies, investment decisions, and trade dynamics, all of which contribute to overall economic growth.

The purpose of this research is to investigate how banking sector development influences economic growth, focusing on the following objectives: (1) To evaluate how deposits, loans, and investments within the banking sector contribute to the overall banking sector capital. (2) To analyze the impact of bank capital on the various components of GDP, including consumption, government spending, investment, and net exports. In essence, this study aims to uncover the relationships between banking sector development, capital accumulation, and their effects on the different aspects of economic growth, providing valuable insights into these critical interconnections.

The outcome of this research are anticipated to be highly valuable for both commercial bank executives and policymakers, especially those working within central banks and ministries of finance. The research findings are geared towards optimizing the banking sector's contribution to economic growth. Furthermore, this study adds to the existing body of literature on the banking sector by addressing the ongoing debate surrounding the extent and mechanisms through which the banking sector impacts economic growth across various economic dimensions. It aims to shed light on these intricate relationships and provide a deeper understanding of the banking sector's role in shaping a country's economic landscape.

The subsequent sections of this study are structured as follow: [Section 2](#) covers the theoretical framework review. [Section 3](#) introduces and defines empirical model. [Section 4](#) explains the research methodology. [Section 5](#) forms the heart of study by presenting analyzing. and discussing the findings. [Section 6](#) represents the conclusion of the research. Lastly, practical policy implications and future research directions will be formulated.

## Theoretical framework

The development of the banking sector and its association with various economic factors have garnered significant attention from academic researchers and policymakers. Existing research has generally indicated the presence of a relationship, whether positive or negative, between banking sector development and economic growth.

### *Bank assets, liabilities and capital as indicators for banking development*

Banking assets can be categorized into two main types: loans and investments ([Suresh and Paul, 2014](#)). Loans are a primary income source for banks, representing the money lent to borrowers ([Bhattacharyay, 2015](#)). Investments, on the other hand, are securities held by banks to generate income or manage liquidity ([Gitman et al., 2015](#)). The growth of banking assets serves as a significant indicator of economic activity. An increase in borrowing by businesses and consumers suggests economic expansion. However, rapid asset growth may also indicate excessive risk-taking, potentially increasing banks' vulnerability to losses.

Bank liabilities can be categorized into two main types: deposits and other liabilities ([Suresh and Paul, 2014](#)). Deposits represent the funds entrusted to the bank by depositors, while other liabilities include borrowings from other institutions, repurchase agreements, and accrued expenses ([Bhattacharyay, 2015](#)). The growth of bank liabilities is a key indicator of public confidence in the banking system. When depositors have trust in their banks, they are more motivated to deposit their funds with them. However, excessive growth in bank liabilities can also expose banks to liquidity risk, which is the risk of being unable to meet their obligations to depositors.

Bank capital represents the difference between a bank's assets and its liabilities ([Bhattacharyay, 2015](#)). Capital is important because it helps to protect depositors and other creditors from losses ([Suresh and Paul, 2014](#)). The level of bank capital is an important indicator of a bank's financial strength ([Furlong, 1992](#)). A higher level of capital means that a bank is better able to bear losses without having to resort to bailout by the government or other creditors ([Rose and Hudgins, 2008](#)).

In the context of bank sector development, previous researchers indicated bank development by (ROA), Return on Equity (ROE), and credit facilities (King and Levine, 1993; Imam and Kpodar, 2016; Abusharbeh, 2017; Lay, 2020). However, measuring bank development through bank capital presents a more comprehensive and robust approach compared to relying solely on metrics like Return on Assets (ROA) and Return on Equity (ROE). This is because bank capital summarizes a holistic view of a bank's financial position, covering not only the outcomes of its assets and liabilities but also its owner equity (Bhattacharyay, 2015; Suresh and Paul, 2014). In essence, it offers a more complete representation of the bank's overall financial health. As a result, bank capital serves as a more reliable indicator of banking development and growth, providing a well-rounded perspective on a bank's capacity to support economic activities and contribute to the financial stability of the broader economy.

The literature on bank assets suggests that they are essential for understanding a bank's ability to generate income and support economic activities through lending and investment practices (Batrancea, 2021). Studies by Berger and Bouwman (2009) highlight how bank assets, particularly loans and investments, act as core driver of growth which facilitating liquidity in the market and enabling businesses to expand and grow. This perspective is supported by Demirgüç-Kunt and Levine (2001), who argue that the diversity and volume of banking assets are indicative of the sector's strength and its ability to support economic growth.

On the bank liabilities side, deposits play a key role in the banking sector's development by providing the primary source of funding for banks' lending activities. The literature emphasizes the importance of deposits in maintaining the liquidity and stability of banks, thereby ensuring their ongoing ability to contribute to economic development. According to Diamond and Rajan (2001), the ability of banks to attract and retain deposits is crucial for their operational stability and for increase confidence among customer and investors. This view is resonated by Gorton and Winton (2003), who note that a healthy growth in deposits is often associated with an increase in customer trust and a stable economic environment, both of which are essential for stabilized banking development.

Capital adequacy, the third dimension, is recognized in the literature as a critical measure of a bank's financial health and its resilience against potential shocks (Mendy *et al.*, 2023). The capital base of banks not only supports their lending and investment activities but also acts as a shield against losses, thereby ensuring the stability of the overall financial system (Huu Vu and Thanh Ngo, 2023). Research by Floreani *et al.* (2023) demonstrates that adequate bank capital is fundamental to risk management and is essential in promoting confidence among depositors and investors. Furthermore, the relationship between capital adequacy and regulatory frameworks, as discussed by Grzeta *et al.* (2023), recognizes the role of bank capital in supporting banks' operational practices with broader economic objectives. These discussions conclude that bank assets, liabilities, and capital are not only indicators of individual banks' performance but also the overall sector's contribution to economic development.

#### *Relationship between banking sector development and economic growth*

Economic growth refers to the increase in the production of goods and services within an economy (Petkovski and Jordan, 2014). In many cases, economic growth is quantified by measuring the change in a nation's GDP over a specific period (Timsina, 2014). Policymakers, government officials, and analysts commonly employ GDP as a key indicator to assess the overall health of a nation's economy and to analyze growth trends in both the short and long term (Alkhazaleh, 2017). A well-functioning financial system is crucial for economic growth, as it facilitates the flow of funds from savers to borrowers, thereby enabling investment and innovation.

Bank capital, which refers to the financial resources held by banks to absorb losses, plays a critical role in ensuring the stability and resilience of the financial system (Kishan and Opiela, 2000). The financial intermediation hypothesis suggests that banks play a central role in channeling savings into productive investments, and higher levels of bank capital enhance this intermediation process by reducing the risk of bank failures and encouraging lending (McKinnon, 2010). Moreover, the risk management hypothesis emphasizes the importance of bank capital in mitigating financial crises. Higher bank capital cushions banks against losses during economic downturns, enabling them to continue providing credit and prevent a credit crunch that could stifle economic growth (Berger and Christa, 2013).

Numerous studies have found a positive relationship between bank development and economic growth (Abusharbeh, 2017; Alkhazaleh, 2017; Hussain and Kumar Chakraborty, 2012; Lay, 2020; Guru and Yadav, 2019; Ozturk and Ullah, 2022). This suggests that higher levels of bank capital can contribute to faster economic growth. The strength of the relationship between bank capital and economic growth can vary across countries, depending on factors such as the level of financial development, institutional quality, and macroeconomic conditions (Levine *et al.*, 2000).

Bank capital plays a crucial role in facilitating trade finance, which is essential for businesses to engage in international commerce (Niepmann and Schmidt-Eisenlohr, 2013). When banks have adequate capital levels, they are more willing to extend credit to exporters and importers, thereby raising cross-border trade and boosting net exports, a component of GDP. Batrancea *et al.* (2022) found that the growth of the GDP serving as a proxy for economic growth, was influenced by the ratio of bank capital to assets over three decades in several countries, including Bolivia, the Czech Republic, Estonia, Malaysia, Peru, Poland, and Thailand. Additionally, well-capitalized banks can provide hedging instruments to mitigate foreign exchange risks, further encouraging international trade (Gitman *et al.*, 2015).

Bank capital is a key determinant of investment, another component of GDP. When banks have sufficient capital, they are more confident in their ability to absorb losses and maintain lending during economic downturns (King and Levine, 1993). This confidence leads banks to extend more credit to businesses for investment purposes, driving economic growth. Moreover, well-capitalized banks are better equipped to monitor and evaluate investment projects, reducing the risk of misallocation of capital and promoting productive investments (Bhattacharyay, 2015).

Bank capital influences private consumption, a significant component of GDP, by affecting household borrowing capacity (Santomero, 1997). When banks have sufficient capital, they are more likely to approve loans to consumers, allowing them to purchase goods and services, thereby stimulating consumption-driven economic growth. Additionally, well-capitalized banks can offer lower interest rates on consumer loans, further enhancing households' purchasing power and improving consumption.

Bank capital plays a less direct role in influencing government spending, another component of GDP. While banks do not directly finance government expenditures, they can indirectly affect government borrowing capacity (Jácome *et al.*, 2012). Well-capitalized banks are more likely to purchase government bonds, providing a source of financing for government spending (Gitman *et al.*, 2015). Additionally, a well-functioning financial system, underpinned by adequate bank capital, can boost tax revenues, providing the government with more resources for spending.

### Model development

This research evaluates the causal relationship by examining, in the first round, the relationships between the (loans, investment, and deposits) as exogenous variables, and the bank capital as an endogenous variable. In the second round, the bank capital is an exogenous variable and the four GDP components are endogenous variables.

The predictors of the Bank Capital (*CAP*) in the model are the following exogenous variables: Investments ( $c_1$ ), Deposits ( $c_2$ ), Loans ( $c_3$ ). These exogenous variables represent the direct causal effects in the model on the Bank Capital (*CAP*). This relationship represents all effects which are determined by sums of products of structural coefficients, and it is illustrated in the following equations (1) and (2):

$$CAP = \alpha_1 c_1 + \alpha_2 c_2 + \alpha_3 c_3 + \varepsilon_3 \quad (1)$$

$$CAP = \sum_{n=1}^3 \alpha_n c_n + \varepsilon_i \quad (2)$$

Furthermore, the model includes four additional endogenous variables (GDP dimensions). The arrow links the first level three exogenous variables to level of Bank Capital (*CAP*), and then, it links Bank Capital (*CAP*) (second level exogenous variable) to Private Consumption (*PC*), Government Spending (*GS*), Gross Investment (*GI*), and Net Exports (*NE*) suggesting the indirect linkage.

Hence, to estimate the total effect on the Private Consumption (*PC*), we sum up the effects of the three exogenous variables (first level exogenous) on the Bank Capital (*CAP*), and Bank Capital (*CAP*) in the (second level exogenous) itself on the Private Consumption (*PC*). The mathematical formulas for the total effect on Private Consumption (*PC*), are denoted in equations (3) and (4):

$$PC = \beta_1 * CAP + \varepsilon_1 \quad (3)$$

$$PC = \beta_1 \alpha_1 c_1 + \beta_1 \alpha_2 c_2 + \beta_1 \alpha_3 c_3 + \varepsilon_3 + \varepsilon_1 \quad (4)$$

Also, to estimate the total effect on the Government Spending (*GS*), Gross Investment (*GI*), and Net Exports (*NE*); we follow the same logic in Private Consumption (*PC*) case. The mathematical equations for the total effect on Government Spending (*GS*) are denoted in equations (5) and (6). The mathematical formulation for Gross Investment (*GI*), are represented in equations (7) and (8), and mathematical formulation of Net Exports (*NE*) are denoted in equations (9) and (10).

$$GS = \gamma_1 * CAP + \varepsilon_2 \quad (5)$$

$$GS = \gamma_1 \alpha_1 c_1 + \gamma_1 \alpha_2 c_2 + \gamma_1 \alpha_3 c_3 + \varepsilon_3 + \varepsilon_2 \quad (6)$$

$$GI = \kappa_1 * CAP + \varepsilon_4 \quad (7)$$

$$GI = \kappa_1 \alpha_1 c_1 + \kappa_1 \alpha_2 c_2 + \kappa_1 \alpha_3 c_3 + \varepsilon_3 + \varepsilon_4 \quad (8)$$

$$NE = \nu_1 * CAP + \varepsilon_5 \quad (9)$$

$$NE = \nu_1 \alpha_1 c_1 + \nu_1 \alpha_2 c_2 + \nu_1 \alpha_3 c_3 + \varepsilon_3 + \varepsilon_5 \quad (10)$$

Since it is not obvious what combinations of parameters measure the indirect effect on Private Consumption (*PC*), we suggest to evaluate the fraction of the total effect of Private Consumption (*PC*), which is explained by the Bank Capital (*CAP*) and the fraction of the total effect of Private Consumption (*PC*), which is owed to the Bank Capital (*CAP*). Specifically, in order to quantify the degree to which the Bank Capital (*CAP*) modifies the effects of the first level three exogenous variables—Investments ( $c_1$ ), Deposits ( $c_2$ ), and Loans ( $c_3$ ), on Bank Capital (*CAP*), we calculate the fraction of output response for which Bank Capital (*CAP*) would be sufficient in the case of Private Consumption (*PC*), which is embodied in the following mathematical equations:

$$\frac{CAP}{PC} = \frac{\sum_{n=1}^3 \alpha_n c_n + \varepsilon_i}{\beta_1 * CAP + \varepsilon_1} \quad (11)$$

$$\frac{CAP}{PC} = \frac{\alpha_1 c_1 + \alpha_2 c_2 + \alpha_3 c_3 + \varepsilon_3}{\beta_1 \alpha_1 c_1 + \beta_1 \alpha_2 c_2 + \beta_1 \alpha_3 c_3 + \varepsilon_3 + \varepsilon_1} \quad (12)$$

Following on the same logic as performed previously for the fraction of output response in the case of the Government Spending (*GS*), Gross Investment (*GI*) and Net Exports (*NE*), we can also calculate the same fraction of output response for which the level of Bank Capital (*CAP*) would be sufficient in the case of the Government Spending (*GS*), which is denoted in mathematical equations (13) and (14), Gross Investment (*GI*) as showed in mathematical equations (15) and (16), and Net Exports (*NE*), as represented in mathematical equations (17) and (18):

$$\frac{CAP}{GS} = \frac{\sum_{n=1}^3 \alpha_n c_n + \varepsilon_i}{\gamma_1 * CAP + \varepsilon_1} \quad (13)$$

$$\frac{CAP}{GS} = \frac{\alpha_1 c_1 + \alpha_2 c_2 + \alpha_3 c_3 + \varepsilon_3}{\gamma_1 \alpha_1 c_1 + \gamma_1 \alpha_2 c_2 + \gamma_1 \alpha_3 c_3 + \varepsilon_2 + \varepsilon_1} \quad (14)$$

$$\frac{CAP}{GI} = \frac{\sum_{n=1}^3 \alpha_n c_n + \varepsilon_i}{k_1 * CAP + \varepsilon_1} \quad (15)$$

$$\frac{CAP}{GI} = \frac{\alpha_1 c_1 + \alpha_2 c_2 + \alpha_3 c_3 + \varepsilon_3}{\kappa_1 \alpha_1 c_1 + \kappa_1 \alpha_2 c_2 + \kappa_1 \alpha_3 c_3 + \varepsilon_4 + \varepsilon_1} \quad (16)$$

$$\frac{CAP}{NE} = \frac{\sum_{n=1}^3 \alpha_n c_n + \varepsilon_i}{v_1 * CAP + \varepsilon_1} \quad (17)$$

$$\frac{CAP}{NE} = \frac{\alpha_1 c_1 + \alpha_2 c_2 + \alpha_3 c_3 + \varepsilon_3}{\nu_1 \alpha_1 c_1 + \nu_1 \alpha_2 c_2 + \nu_1 \alpha_3 c_3 + \varepsilon_5 + \varepsilon_1} \quad (18)$$

## Methodology

In this research, secondary data were gathered from reputable sources including the Palestinian Central Bureau of Statistics (PCBS), the Association of Banks in Palestine (ABP), and the Palestinian Monetary Authority (PMA). The PCBS functions as the official Palestinian statistical agency, tasked with the essential role of providing reliable statistical data both domestically and on the global stage. Conversely, the PMA serves as the emerging central bank of Palestine. These organizations serve as crucial sources of data and insights for this research, ensuring the reliability and credibility of the information used in the study.

### Data and sample

The study relied on monthly and quarterly reports issued by the Palestinian Monetary Authority (PMA) that detail the performance of the banking sector (PMA, 2023a). These

reports contain valuable data, including information on the volume of bank loans, deposits, and investments. The PMA data was sourced from the monthly and quarterly financial reports submitted by all digital banks operating within the Palestinian economy. These banks are categorized into various groups, including national and international banks, as well as Islamic and conventional banks. The utilization of this comprehensive dataset from the PMA reports ensured a thorough and inclusive analysis of the banking sector's activities and contributions to the Palestinian economy.

Among the crucial reports, the consolidated balance sheet stands out as one of the most vital resources (PMA, 2023b). This comprehensive report amalgamates the financial data of all active digital banks at the main account level and is updated on a monthly basis. It serves as a valuable tool for gaining insights into the collective financial position of all Palestinian digital banks. Furthermore, the PMA releases a series of detailed reports that delve deeply into specific facets of the banking sector (PMA, 2023c). These reports cover a wide range of aspects, including deposit types, currency breakdowns, loan maturity profiles, sectoral distribution, loan sizes, investments, cash reserves, and various other critical financial metrics. Together, these reports present a comprehensive perspective of the Palestinian digital banking sector, serving as rich resources for researchers and policymakers.

Conversely, the Palestinian Central Bureau of Statistics (PCBS) plays a key role by issuing a range of periodic reports that span across all economic sectors (PCBS, 2023a). Notably, the GDP breakdown by component report, which separates Private Consumption, Government Spending, Gross Investment, and Net Exports holds particular significance (PCBS, 2023b). These reports undergo a strict process of exchange and verification, involving multiple Palestinian institutions such as the Ministry of Finance, the Ministry of Economy, and the Palestinian Central Bureau of Statistics itself, before their official release. This collaborative validation process serves as a crucial step in ensuring the accuracy and reliability of the data presented in these reports.

#### *Technical method*

Prior researchers have employed various statistical methodologies to assess the relationship between banking sector development and economic growth. Some have utilized regression analysis and Granger causality tests (Tripathy and Pradhan, 2014; Islam *et al.*, 2019). Others, such as Chien and Hu (2008), Acquah-Sam and King (2014), Lee *et al.* (2018), have selected more complex approaches such as Structural Equation Modeling (SEM). SEM is particularly relevant when there are multiple dependent variables in the analysis (Streiner, 2005). This technique exceeds multiple regression by concurrently conducting multiple regression analyses and generating an overall model fit assessment. In evaluating the model's fit, the SEM method employs various goodness-of-fit indexes including chi-square statistics, GFI, RMSEA, CFI, NFI, and RMR (Singh and Wilkes, 1996). These methods collectively provide a comprehensive toolkit for exploring the intricate relationships between banking sector development, economic growth.

In this study, SEM method is employed to examine the relationships among the variables, specifically the impact of main assets (loans and investments) and the primary liability (deposits) on bank capital, followed by an assessment of the influence of bank capital on the components of GDP. Maximum likelihood method of estimation is used in this research as it is the default in most structural equation modeling software (Streiner, 2005). The minimum number of cases for maximum likelihood estimation should be at five times the number of free parameters including error terms (Golob, 2003). The number of observations in this research is 164 records that meets the requirement as the estimation model contains 13 variables including the error terms.

Moreover, this research incorporates Bayesian SEM, which allows for the integration of prior information into the analysis, providing an alternative estimation method to the maximum likelihood approach. By comparing the outcomes derived from both maximum likelihood and Bayesian SEM, the study aims to verify the robustness of the findings across different estimation techniques and to confirm the consistency of the relationships observed between the banking sector variables and GDP components.

The study specified normal priors for the parameters within the model. The choice of normal priors for regression coefficients is particularly advantageous in Bayesian SEM because it facilitates a balance between flexibility and computational efficiency. Specifically, the study chooses Normal priors with a mean of 0 and a standard deviation of 1, denoted as  $N(0,1)$ . This specification implies a neutral initial belief about the direction and magnitude of the relationships between variables. The variance of 1 was chosen to reflect a moderate level of uncertainty around these coefficients, allowing the data to play a significant role in updating our beliefs about these parameters.

Normal priors are linked to the likelihood function of Normal regression models, which means that the posterior distributions are also Normal. This greatly simplifies the computation of the posterior distributions, enabling more straightforward analytical solutions or more efficient numerical approximations. Furthermore, employing Normal priors also allows for a straightforward interpretation of the results. Since the priors are centered at zero, any posterior estimates of the regression coefficients that deviate significantly from zero can be interpreted as evidence of a meaningful relationship between the corresponding variables in the model. This interpretation is particularly useful in policy analysis and decision-making processes, where understanding the direction and strength of such relationships is crucial.

## Results and discussion

In evaluating the overall model fit of this research framework, the results indicated that the Chi-Square goodness-of-fit statistic was 83.068 with 18 degrees of freedom, and this value was statistically significant at  $p = 0.000$ , which is less than the conventional threshold of 0.05. To assess the model's fit, the Chi-Square divided by the degrees of freedom was considered (Bentler, 1995). In this case, the resulting value was 4.6, which falls below the threshold of 5, indicating a good fit for the model.

Furthermore, several comparative fit indicators were used for baseline comparison, including the Normed Fit Index (NFI), Relative Fit Index (RFI), Incremental Fit Index (IFI), Tucker–Lewis Index (TLI), and Comparative Fit Index (CFI). These indices assess the proportion of improvement in the overall fit of the model relative to an independence model. Values close to 1 for NFI, RFI, IFI, TLI, and CFI are generally considered indicative of a good fit (Diamantopoulos *et al.*, 2000). In this study, the values for NFI (0.947), RFI (0.895), IFI (0.958), TLI (0.916), and CFI (0.958) collectively suggest that the estimated model is a good fit.

In the Bayesian SEM conducted for this research, the posterior predictive  $p$ -value (PPP) is a Bayesian measure used to compare the observed data with data simulated from the model based on the estimated parameters. A PPP value near 0.5 generally signals a good model fit, indicating that the observed data are likely under the proposed model. The PPP value found in this study is precisely 0.5, which is often regarded as ideal, suggesting that the model's predictions are in harmony with the observed data.

### *Descriptive statistics on the Palestinian banking sector and GDP components*

The Palestinian banking sector is composed of 14 digital commercial banks, comprising a network of 219 branches and 118 offices that extend across all governorates. These

commercial banks can be categorized into various types, such as conventional, Islamic, foreign, and community banks. To provide more specific details, the Palestinian banking landscape includes 11 conventional banks actively engaged in the economy, in addition to three Islamic banks. Alternatively, there are seven foreign banks with their headquarters situated in foreign countries, yet they operate as private entities within the Palestinian economy. The remaining seven banks are recognized as community banks, known for their local ownership and concentrated operational focus (PMA, 2023d).

The data revealed a substantial growth within the Palestinian banking sector over time. For instance, in the year 2000, the total value of loans stood at approximately 1.26 billion dollars, while in the year 2020, it had increased to 9.21 billion dollars. Notably, loans to the private sector accounted for 82% of the total bank loans, with government loans comprising the remaining 18%. Furthermore, the banking sector demonstrated strong growth in terms of investments, with the value of bank investments doubling over the same period, indicating the sector's increasing economic significance (PMA, 2023d).

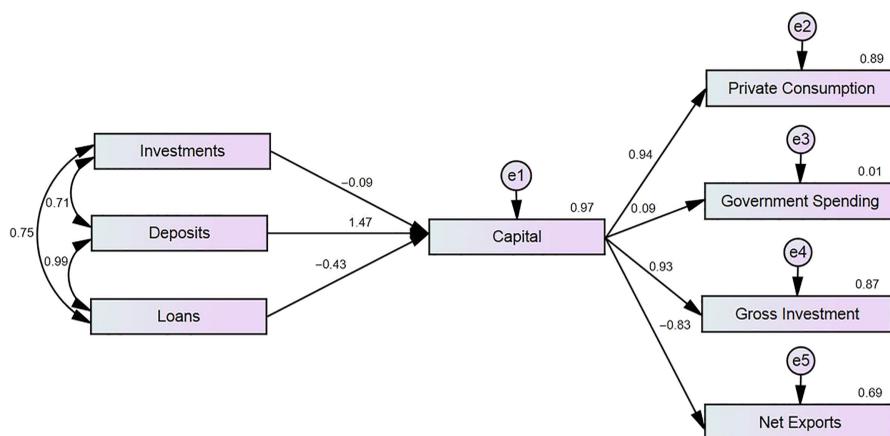
In total, the gross assets within the banking sector experienced substantial growth. In the year 2000, these assets amounted to about 4.6 billion dollars, which increased to approximately 18 billion dollars by 2020. This increase in asset value is in agreement with the growth in bank liabilities, represented by deposits. In 2000, deposits stood at approximately \$3.47bn, whereas, in 2020, they had reached a substantial \$13bn. It's important to note that a significant portion of these deposits, approximately 96%, originates from the private sector. Finally, when considering bank capital, it nearly expanded over the past two decades. In 2000, it amounted to a quarter billion dollars, and by 2020, it had reached an impressive 2 billion dollars.

This growth within the banking sector was concurrent with overall GDP expansion. To illustrate, the GDP value in the year 2000 amounted to approximately 6.50 billion dollars, and by the year 2020, it had risen significantly to 15.76 billion dollars. This growth was not limited to the overall GDP figure; it was evident across all components of the GDP. Within the composition of the GDP, personal consumption plays a significant role, making up approximately 50% of the total GDP. Government spending, which includes non-profit and semi-government institutions, contributes 14% to the GDP. Gross investment represents around 15%, while net exports account for 21% of the overall GDP. It's worth noting that, as to many developing countries, Palestine faces a trade deficit, where the value of imports exceeds that of exports.

#### *Relationship between loans, investment, deposits and capital in banking sector*

The model in this study as shown in Figure 1 takes into account the primary assets and liabilities within the banking sector as predictors of bank capital. To measure the model's effectiveness, the coefficient of determination, commonly known as R-squared, is employed. The adjusted R-squared quantifies the percentage of variation explained by the predictor construct. A higher R-squared value signifies a better fit of the model to the data. According to Cohen (1988), when the R-squared value for an endogenous variable exceeds 75%, it is considered substantial. In the context of this research, Figure 1 including investments, loans, and deposits demonstrates a strong level of explanatory power, explaining 97% of the factors that influence bank capital. This path analysis aligns with theories in the bank management, and underscores the role of loans and investments (as major assets) alongside deposits (as major liabilities) in shaping bank capital (Wright and Quadrini, 2012; Gitman *et al.*, 2015).

Table 1 outlines the impact of investments, loans (main assets), and deposits (main liabilities) on the bank capital of the banking sector. The findings indicate that both investments and loans exhibit significant and negative associations with bank capital, with coefficients of ( $\beta = -0.090$ ;  $p = 0.000$ ) and ( $\beta = -0.434$ ;  $p = 0.000$ ) respectively. Conversely, the deposit variable shows a significant and positive effect on bank capital, with a coefficient of ( $\beta = 1.417$ ;  $p = 0.000$ ).



Source(s): Authors' own work

Figure 1.  
The conceptual model

Relationship	Estimate	S.E.	<i>p</i>	Result
Bank capital ← Bank investments	-0.090	0.222	0.000	Significant
Bank capital ← Bank deposits	1.417	0.016	0.000	Significant
Bank capital ← Bank loans	-0.434	0.020	0.000	Significant

Source(s): Authors' own work

Table 1.  
Standardized  
regression weights of  
bank capital

In a broader context, a bank's profits can be allocated in two ways: distributed dividends or retained earnings. Retained earnings represent accumulated profits that can be used for investment and debt repayment. The results suggest that banks often choose to reinvest retained earnings (capital) in assets such as investments and loans, rather than relying on external borrowing. This approach is favored due to its relative safety in liquidation, lower funding costs, and consequently, higher profits (Sufian, 2011; Shamki *et al.*, 2016; Prabowo *et al.*, 2018). Additionally, the findings indicate that bank management perceives potential opportunities for high growth in the future, making the allocation of bank capital to assets a strategic choice to generate substantial returns. Furthermore, this observation aligns with the fundamental accounting equation, which states that assets are equal to liabilities and owner equity (capital) at all times. In essence, an increase in assets results in a decrease in bank capital and an increase in liabilities (deposits) (Wright and Quadrini, 2012). In this research, the growth in assets (including investments and loans) is accompanied by a reduction in bank capital (retained earnings) and an increase in the liabilities (deposits).

These results have implications for bank management strategies and policy formulation. Banks might consider optimizing their portfolio of loans and investments to ensure they contribute positively to the growth of bank capital. For policymakers, the findings emphasize the importance of creating an enabling environment that encourages the growth of bank deposits and the wise management of banking assets, which are essential for the health and expansion of the banking sector.

The discussion of these findings supports established theories in bank management that highlight the roles of assets and liabilities in shaping bank capital (Bhattacharyay, 2015; Furlong, 1992). It also provides empirical evidence for the strategic allocation of capital within

banks, which is geared towards future growth and profitability (Suresh and Paul, 2014). This insight is valuable for banking sector stakeholders, including managers and policymakers, who aim to enhance and stabilize the banking system that contributes to broader economic development.

*Relationship between bank capital and gross domestic product components*

In Table 2 analysis, bank capital is an exogenous variable, while the GDP components are endogenous variables. The results showed that bank capital exhibits a positive and significant impact on both gross investment ( $\beta = 0.331; p = 0.000$ ) and private consumption ( $\beta = 0.933; p = 0.000$ ), indicating that an increase in bank capital is associated with higher levels of investment and private consumption. Conversely, the net export demonstrates a significant and negative influence ( $\beta = -0.830; p = 0.000$ ), suggesting that an expansion of bank capital is associated with a decrease in net exports. However, it's worth noting that the relationship between bank capital and government expenditures is positive but statistically insignificant ( $\beta = 0.090; p = 0.588$ ), indicating that there is no strong evidence to suggest a significant impact of bank capital on government spending. Consequently, on the construct level, the study aligns closely with prior research conducted in various economies and regions, supporting the positive relationship between banking sector development and its impact on economic growth (Abusharbeh, 2017; Alkhazaleh, 2017; Hussain and Kumar Chakraborty, 2012; Lay, 2020).

On the dimension level, this study underscores the essential role played by the bank sector in supporting various economic functions. These functions include the provision of credit and banking services that facilitate a wide range of activities, including private consumption, and gross investment. Drawing on previous research by Udoka et al. (2016) and Ebi and Emmanuel (2014), it can be concluded that an increase in bank lending to these sectors has the potential to stimulate industrial growth and enhance production. In essence, the findings of this study confirm the idea that banking sector, through its ability to provide financial resources and services, serves as an essential hub for positive driving development and growth across a spectrum of economic activities.

Furthermore, the study's findings emphasize a negative relationship between bank capital and net exports. This negative relationship can be understood in the context of Palestine and its trade dynamics, where the value of imports exceeds that of exports, a common scenario in many developing countries as reported by UNCTAD (2019). Therefore, the model reflects this by indicating a negative association between net exports (exports minus imports) and bank capital. The significant relationship observed between bank capital and net exports suggests that banks play a pivotal role in providing services that can potentially enhance a country's net exports. These services may include export and import loans, money transfers, and payment facilities, among others. These findings align with previous research conducted by Abora et al. (2014), Holod and Torna (2018), Trần et al. (2020), which all underscore the significant role of bank loans in supporting export-related activities in different countries, including Ghana, the USA and Vietnam.

**Table 2.**  
Standardized  
regression weights  
of GDP

Relationship	Estimate	S.E.	<i>p</i>	Result
Exports - imports ← Bank capital	-0.830	0.086	0.000	Significant
Gross investment ← Bank capital	0.933	0.039	0.000	Significant
Private consumptions ← Bank capital	0.942	0.051	0.000	Significant
Government spending ← Bank capital	0.090	0.025	0.588	Insignificant

**Source(s):** Authors' own work

In practice, these findings suggest that banks and policymakers should consider the implications of bank capital allocation on different economic sectors. For example, to address the trade deficit, there might be a need for targeted financial products that encourage export activities. Furthermore, the strong link between bank capital and private sector activities suggests that banks could play a role in stimulating economic growth by supporting consumer lending and investing in sectors that drive private consumption and investment.

#### *Comparative analysis of maximum likelihood and Bayesian estimation results*

Table 3 presents a comparison between Maximum Likelihood (ML) and Bayesian estimation techniques applied in Structural Equation Modeling (SEM) to understand the intricacies of banking sector dynamics. This comparative analysis helped to identify any divergences or confirmations between the different methodologies, providing a more comprehensive understanding of the research findings.

The relationship between bank capital and bank investments is clarified by both ML and Bayesian methods, with each suggesting a negative correlation. The coefficients, while marginally different ( $-0.926$  for ML-SEM and  $-0.918$  for B-SEM), support the consistency and robustness of this finding. This negative correlation indicates that heightened investment activities by banks might match with a reduction in immediate bank capital, possibly due to the temporal lag between investment outflows and their returns.

When examining the relationship between bank capital and deposits, a positive association emerges, with coefficients that are nearly identical across both methods ( $0.263$  for ML-SEM and  $0.264$  for B-SEM). Both models agree that deposits contribute positively to bank capital, resonating with the traditional banking business model where deposits are a primary source of capital. In the case of loans, negative relationship, as seen by the close coefficients of  $-0.091$  for ML-SEM and  $-0.092$  for B-SEM. This suggests that the dispersion of loans might slightly reduce bank capital in the short run, likely due to the immediate allocation of funds into the economy before their recuperation through repayments.

Moreover, Table 3 shows a strong negative effect of bank capital on the trade balance in both ML ( $-1.173$ ) and Bayesian ( $-1.172$ ) estimations. This could suggest that a strong banking sector might be correlated with a net import scenario, where capital is used to finance imports exceeding exports.

Both estimation techniques also depict a positive interplay between bank capital and gross investment, as well as private consumption—each indicating that an augmentation in bank capital correlates with an uptick in these economic activities. With coefficients of  $0.599$  for ML-SEM and  $0.605$  for B-SEM for gross investment, and even higher at  $0.859$  for ML-SEM and  $0.864$  for B-SEM for private consumption. This indicates that higher bank capital is associated with increased investment, which is a key driver of economic growth.

Relationship	ML- SEM	B- SEM
Bank capital ← Bank investments	$-0.926$	$-0.918$
Bank capital ← Bank deposits	$0.263$	$0.264$
Bank capital ← Bank loans	$-0.091$	$-0.092$
Exports - imports ← Bank capital	$-1.173$	$-1.172$
Gross investment ← Bank capital	$0.599$	$0.605$
Private consumptions ← Bank capital	$0.859$	$0.864$
Government spending ← Bank capital	$0.014$	$0.015$

Source(s): Authors' own work

**Table 3.**  
Estimated parameters  
of SEM using ML and  
Bayesian estimation

Government spending has a very slight but positive relationship with bank capital in both models, though the impact is minimal (0.014 for ML-SEM and 0.015 for B-SEM). The ML method found this effect to be non-significant, whereas the Bayesian approach identified it as significant. This difference underscores one of the key strengths of the Bayesian approach compared to the ML method. Unlike ML estimation, which evaluates the likelihood of the observed data under different parameter values without considering prior information, the Bayesian method integrates prior knowledge or beliefs about the parameters before observing the data. This incorporation of prior information allows Bayesian analysis to provide a more comprehensive view of the parameter space, considering the entire distribution of possible parameter values rather than focusing solely on point estimates. As a result, the Bayesian approach can offer insights into the effects of all independent variables, including those that might be deemed non-significant in frequentist estimation, which relies on ML methods.

### Conclusion

Banking sector development and its impact on economic growth have been subjects of extensive research in recent decades. The significance of this connection arises from the fact that the banking sector is a vital component of the economy and often plays a leading role, particularly in developing countries. Hence, the growth of banking sector is indicated by the growth of bank main assets (loans and investment), main bank liabilities (deposits), and the bank owner equity (capital), while economic growth is measured by the growth in GDP components.

To investigate this intricate relationship, the research consolidates the balance sheets of individual banks into a single comprehensive balance sheet that represents the collective financial position of all banks operating within the Palestinian economy. This consolidated balance sheet covers the primary assets, such as investments and loans, as well as the primary liabilities, namely deposits, for all digital banks operating in the Palestinian economy. The study employed Structural Equation Modeling using both maximum likelihood and Bayesian methods.

The results revealed that loans, investments (main assets), and deposits (main liabilities) together explain 97% of bank capital. Notably, investments and loans demonstrated significant negative associations with bank capital, whereas deposits exhibited a significant positive impact. This result leads to the primary conclusion that a substantial portion of retained earnings in the banking sector is reinvested to facilitate expansion and growth. From an accounting perspective, this reinvestment results in a decrease in owner's equity, an increase in assets, and a concurrent increase in liabilities. The study's results have important theoretical implications, reinforcing the notion that the banking sector is instrumental in driving economic development. From a practical standpoint, the research emphasizes the confidence of shareholders in the banking sector's management and its strategy of reinvestment for future growth.

Furthermore, the study showed a significant influence of bank capital on all GDP components except government spending. However, despite the relationship between bank capital and government spending being insignificant in the maximum likelihood estimation, Bayesian estimation highlighted a slight positive influence. This emphasizes the integral role of the banking sector in the economic growth process and its mediation in various economic activities such as wholesale and retail trade, exports and imports, and private investments. It's worth noting that while the banking sector assists the Palestinian government in addressing fiscal deficits, government expenditure as a percentage of GDP exhibited variability due to reliance on international donations, particularly for infrastructure projects.

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In summary, the study contributes to both theory and practice by confirming the banking sector's central role in economic growth, and by demonstrating the strategic reinvestment decisions made by banks that shape their impact on the broader economy.

### **Theoretical contribution**

This research makes several theoretical contributions to the fields of banking, finance, and economic development. Firstly, it provides empirical evidence of the positive relationship between banking sector development, as represented by bank capital, and economic growth. This finding supports and extends prior research conducted in different economies and regions. By demonstrating the significant impact of bank capital on gross investment and private consumption, this study confirms the essential role of the banking sector in driving economic growth.

Secondly, the research contributes to the understanding of the complex relationship between banking sector development and trade dynamics. The negative relationship between bank capital and net exports highlights the trade deficits in developing countries. It underscores the importance of considering trade dynamics when assessing the impact of banking sector development on various components of economic growth. Additionally, this study underscores the functions of the banking sector in an economy. It highlights how banks serve as crucial intermediaries by providing credit and banking services that facilitate a wide range of economic activities, from wholesale and retail trade to imports and exports, as well as gross investment. This understanding supports the notion that a thriving banking sector plays a pivotal role in raising economic development across diverse economic sectors.

Furthermore, the research aligns with fundamental accounting principles by illustrating how changes in banking sector assets (investments and loans) are accompanied by corresponding adjustments in capital (retained earnings) and liabilities (deposits). This observation adds a financial perspective to the study's theoretical contributions, emphasizing the interconnectedness of banking sector components.

Finally, this study contributes to a more holistic understanding of the banking sector's role in economic development. It bridges gaps in existing research by integrating financial management principles with macroeconomic impacts, offering a strong theoretical framework. This framework can inform both future academic inquiries and practical policy formulation. Such policies are designed to leverage the banking sector's capabilities to support sustainable economic growth.

### **Practical implications**

The findings carry several practical implications that can guide policymakers, banking institutions, entrepreneurs, investors, and economic stakeholders. Policymakers can use the empirical evidence presented in this study to inform their decisions regarding the banking sector's role in economic development. Recognizing the positive impact of bank capital on gross investment and private consumption, policymakers may consider policies that encourage and support the growth and stability of the banking sector. Measures such as regulatory frameworks that promote banking sector development can be adopted to stimulate economic growth.

Further, given the observed negative relationship between bank capital and net exports, trade policies should be designed with an understanding of the role of the banking sector in trade dynamics. Policymakers may explore strategies to enhance banking services that support export-oriented industries, such as providing favorable loan terms and financial instruments for exporters. These findings can also be applied to developing economies facing trade deficits. Policymakers and banking institutions in such countries can consider tailored approaches to banking sector development to address trade imbalances and support

economic growth. Therefore, developing financial infrastructures, such as export credit agencies or guarantee schemes, could also be beneficial.

Furthermore, banking institutions can take strategic actions based on the understanding that loans, investments, and deposits are critical determinants of bank capital. They may focus on prudent risk assessment and diversification strategies to optimize their loan and investment portfolios. Banks could also explore innovative deposit mobilization strategies to grow their capital, which, in turn, could fund further investments and loans, creating a worthy cycle of growth.

Furthermost, the study's insights could inspire educational and capacity-building initiatives to enhance financial literacy, enabling entrepreneurs and consumers to make more informed financial decisions that contribute to economic growth. Understanding the broader impact of banking activities could lead to more sustainable business practices and investment choices that align with national economic objectives.

Finally, economic stakeholders, including entrepreneurs and investors, can use the findings to better understand the banking sector's role in economic development. For instance, entrepreneurs seeking capital for investment projects can collaborate with banks to access financing for projects that stimulate economic growth.

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