



The impact of digital transformation strategy on the performance of commercial banks: Evidence from an emerging economy

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ABSTRACT

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This study examines the impact of digital transformation strategies on the financial performance of commercial banks in Vietnam, an emerging economy with significant digital growth potential. Using a sample of 18 Vietnamese banks from 2015 to 2022, the study employs the Generalized Method of Moments (GMM) to address endogeneity concerns and provide robust estimates of the relationship between digital transformation and bank performance. The digital transformation strategy variable is measured through a text analysis of bank annual reports. Our findings reveal that banks integrating digital transformation into their strategies exhibit improved financial performance, with a more pronounced effect among banks that comply with Basel II standards. The study's insights have important implications for both policymakers and bank managers in emerging markets. Policymakers are encouraged to support digital transformation as a pathway to enhanced financial sector growth, while bank managers are advised to treat it as a strategic priority to unlock efficiency and competitive advantages. Moreover, the results emphasize the value of strong regulatory compliance in maximizing the benefits of digital transformation strategies in the banking sector.

Contribution/Originality: This study offers a unique contribution by investigating the impact of digital transformation strategy on bank performance in an emerging economy context, using a novel text analysis approach to measure digital transformation strategies. It also highlights the role of Basel II compliance in amplifying digital transformation's benefits, addressing gaps in existing literature.

1. INTRODUCTION

The beginning of the Fourth Industrial Revolution has brought about changes in sectors including banking (Alt & Puschmann, 2012; Vives, 2019). Cutting-edge technologies such as cloud computing, blockchain, big data, and artificial intelligence (AI) are leading a transition towards digital transformation that is now considered vital for streamlining business processes and improving customer interaction (Verhoef et al., 2021; Vial, 2019). Digital evolution encompasses integrating technologies into all facets of a company's operations to fundamentally change the way businesses operate and deliver value to their clients (Berman, 2012; Vial, 2019).

The banking sector has long been recognized for its stance on changes. Currently, it is spearheading digital advancements (Alt & Puschmann, 2012). This shift is not a reaction to progress but a crucial move toward staying relevant in today's digital-driven economy (Gomber, Koch, & Siering, 2017). The evolution of banking in the era encompasses a variety of projects ranging from banking and online services to electronic payment solutions and the

integration of AI in customer support services as well as risk assessment and fraud prevention (citation (Zhu & Jin, 2023a)).

The banking industry, traditionally known for its conservative approach to change, is currently leading the way in digital advancements (Alt & Puschmann, 2012; Gomber et al., 2017; Vives, 2019). This shift is not a reaction to progress but a crucial move toward staying relevant in today's digital-driven economy. Digital transformation in banking includes a wide array of initiatives, from mobile banking and online services to digital payment systems and the use of AI in customer service, risk management, and fraud detection (Zhu & Jin, 2023a). Commercial banks are leveraging digital technologies to streamline operations, enhance customer experiences, and develop new business models (Gomber, Kauffman, Parker, & Weber, 2018; Pousttchi & Dehnert, 2018; Vives, 2019). For instance, the implementation of AI and machine learning algorithms has improved risk management and credit scoring processes, thereby increasing the efficiency and accuracy of banking operations (European Central Bank, 2023; McKinsey & Company, 2024). Furthermore, banks can use data analytics to understand customer behavior and provide personalized banking experiences. This also helps them implement marketing strategies (Margiono, 2021).

Despite the clear benefits, digital transformation in banking is not without challenges. One major obstacle is the high cost of technological investments, which can be particularly burdensome for small financial institutions (Chiamonte, Poli, & Oriani, 2015; Eling & Lehmann, 2018). Moreover, the shift towards digital platforms brings about concerns regarding cybersecurity and privacy of data, highlighting the need for security protocols to safeguard confidential information (Kim, 2014). Additionally, the COVID-19 outbreak has accelerated the digital transformation of banks while underscoring the importance of resilience and adaptability. To remain competitive in a post-pandemic landscape, banks need to innovate and adapt to evolving customer expectations and technological developments (Zhu & Jin, 2023a).

Emerging economies present a unique context for studying the impact of digital transformation on commercial banks. The rapid economic growth and increasing internet penetration in these regions provide fertile ground for digital innovation. Particularly in Vietnam, where approximately 70% of the population uses smartphones and internet penetration stands at 67%, providing a solid foundation for the adoption of digital banking services, according to World Bank database. Additionally, the proactive approach of the government towards advancing banking is apparent through efforts like the "National Digital Transformation Program," which targets the digitization of different sectors by 2025, including finance. This initiative is expected to establish a setting for the growth of financial services. However, compared to other countries in the region and around the world, Vietnam's financial sector, and particularly its commercial banks, are still in early stages of the digital transformation process. The pace and extent to which banks embrace and incorporate transformation into their plans vary greatly across the industry landscape. Some leading banks have made digital transformation a strategic priority, while others have only implemented basic digitalization processes in their business operations. Significant investment capital and technological barriers pose challenges for some banks, particularly smaller ones. Consequently, the effectiveness of the digital transformation strategies remains uncertain in commercial banks.

This research aims to address gaps in the body of literature by exploring how the implementation of digital transformation strategies impacts the performance of commercial banks. Firstly, prior research on digital transformation in banking has predominately concentrated on developed countries, leaving emerging economies with minimal attention. Research conducted by Lee and Shin (2018) and Gomber et al. (2017) has explored how digital banking innovations, such as mobile banking, online payments, and AI-driven customer service, are reshaping financial services in North America and Europe. These studies underscore the advantages of digital transformation in boosting customer satisfaction levels, operational efficiency, and overall profitability. However, this body of work often assumes a high level of technological readiness and resource availability, which may not be applicable in emerging markets. In contrast, research on digital transformation in emerging economies remains limited. Existing studies on regions like Southeast Asia and Africa have noted that banks in these areas face unique challenges,

including limited infrastructure, high costs of technology adoption, and varying degrees of regulatory support. For example, [Asongu and Nwachukwu \(2018\)](#) analyze digital financial inclusion in Sub-Saharan Africa, identifying key challenges such as low internet connectivity rates and substantial costs associated with setting up digital infrastructure. Similarly, [Mothobi and Grzybowski \(2017\)](#) examine the adoption of mobile money in Africa, highlighting the challenges posed by insufficient infrastructure and low digital literacy that impede the banking sector's ability to embrace digital solutions effectively. While these studies provide valuable insights, they primarily focus on the barriers to digital adoption rather than the strategic impact of digital transformation on bank performance. Furthermore, these studies often fail to consider the formulation and implementation of digital transformation strategies within diverse institutional contexts. This study addresses these gaps by focusing on Vietnam, a rapidly developing economy with substantial potential for digital banking growth and where resource constraints and regulatory factors differ significantly from those in developed countries.

Secondly, while existing studies such as those by [Vial \(2019\)](#) and [Gomber et al. \(2018\)](#) have primarily used financial metrics to assess the impact of digital transformation, this study employs content analysis of annual reports to quantify banks' digital transformation strategies. This approach allows for a more granular understanding of how specific strategic initiatives correlate with performance outcomes. By connecting these strategic factors to performance data, this study gives a fuller picture of the connection between digital transformation and bank performance. It does this by fixing the flaws of earlier studies that mostly looked at overall financial indicators without looking into the strategic choices that went into them. Thirdly, this study not only explores the overall impact of digital transformation on bank performance but also provides a nuanced analysis of how compliance with regulatory standards like Basel II influences the effectiveness of digital strategies. While previous research, such as that by [Gozman, Liebenau, and Mangan \(2018\)](#) has extensively documented the general benefits of digital transformation in the banking sector, few studies have examined how regulatory compliance interacts with digital strategies to shape performance outcomes. By identifying that digital transformation has a more pronounced impact on banks adhering to Basel II standards, this paper adds an important dimension to the literature on digital banking and regulatory compliance.

This study aims to examine the influence of digital transformation strategies on the financial performance of banks, using a comprehensive dataset of 18 Vietnamese banks from 2015 to 2022. Our findings indicate that banks incorporating digital transformation into their business strategies tend to achieve superior performance. Additionally, we find that the positive effects of digital transformation are more pronounced among banks that comply with Basel II standards. The results of this study provide valuable insights for both policymakers and bank managers in Vietnam and similar markets. For policymakers, understanding the link between digital transformation strategies and bank performance can inform the development of more targeted regulations that promote effective digital transformation within the financial system. These insights can aid bank managers in crafting digital transformation strategies that enhance overall performance and competitiveness.

The remainder of the paper is organized as follows: Section 2 presents a review of the relevant literature. Section 3 outlines the model, data, and estimation methodology. Section 4 discusses the empirical results and provides an analysis. Finally, Section 5 concludes the paper.

2. LITERATURE REVIEW

[Vial \(2019\)](#) describes digital transformation as a process intended to elevate an organization by effecting profound changes in its fundamental characteristics through the incorporation of computing, information, and connectivity technologies. Digital transformation in banking encompasses integrating digital technologies across all aspects of the organization, fundamentally altering how banks operate and deliver value to customers ([European Central Bank, 2023](#)). Key technologies include AI, blockchain, big data analytics, and cloud computing, which collectively enable banks to streamline operations, enhance customer experiences, and innovate product offerings ([Zhu & Jin, 2023a](#)).

In the banking sector, digital transformation strategies require thorough planning and implementation across various organizational dimensions. According to [Berman \(2012\)](#) successful digital transformation requires top management commitment and a clear articulation of how digital technologies align with the bank's broader business goals. Besides, aligning digital initiatives with overall business objectives is essential for achieving desired outcomes. [Westerman, Bonnet, and McAfee \(2014\)](#) emphasize the importance of integrating digital strategies into the core business strategy to ensure coherence and synergies across different organizational functions. This alignment helps in prioritizing digital projects that have the most significant impact on business performance.

The effectiveness of digital transformation strategies significantly influences bank performance. Research indicates that banks with clear, well-defined digital transformation strategies achieve better alignment between digital initiatives and overall business objectives, resulting in improved financial performance ([McKinsey & Company, 2023](#)). These banks tend to outperform peers by achieving higher operational efficiency, reducing costs, and providing superior customer service through personalized digital channels. One of the primary benefits of well-defined digital transformation in banking is enhanced operational efficiency. Automation of routine processes, improved data management, and the use of advanced analytics lead to faster processing times, reduced errors, and lower operational costs. [McKinsey & Company \(2023\)](#) highlighted that digital transformation enabled banks to optimize back-office functions and improve overall efficiency, which in turn enhanced profitability. [Zhu and Jin \(2023b\)](#) conducted a study on Chinese commercial banks and found that digital transformation significantly improved both efficiency and Environmental, Social, and Governance (ESG) performance. [European Central Bank \(2023\)](#) emphasized that nearly all significant European institutions have a digital transformation strategy, although the degree of maturity varies. Banks with mature strategies were more customer-centric and focused on modernizing IT infrastructures to improve operational efficiency.

Digital transformation strategies equip banks with a competitive advantage by allowing them to deliver innovative products and services that align with changing customer demands ([Tinashe & Kelvin, 2016](#)). Banks that successfully adopt digital platforms can enhance customer acquisition and retention, thus increasing their market share ([European Central Bank, 2023](#)). Furthermore, [Jia and Liu \(2024\)](#) examine the connection between digital transformation and systemic risk within the banking sector, concluding that digital transformation can substantially lower systemic risk by strengthening risk management and operational resilience. This reduction in risk contributes to greater overall stability and enhances the competitive position of banks.

However, the implementation of digital transformation may have adverse effects on the performance of banks. Firstly, the initial costs of digital transformation can be high. Research on Indonesian banks by [Zhu and Jin \(2023a\)](#) shows that while digital transformation incurs significant upfront costs, the long-term benefits include higher efficiency and profitability. Additionally, [McKinsey & Company \(2023\)](#) reported that 70% of digital transformation projects exceed their initial budgets due to underestimating technical debt and the complexity of integrating new technologies with legacy systems. Many banks struggle with legacy systems that are incompatible with new digital technologies, leading to increased technical debt and slower transformation processes.

Although there is a growing body of research on the relationship between digital transformation and bank performance, notable gaps remain. First, existing studies predominantly focus on isolated technological adoptions or general digitalization, rather than examining digital transformation as a comprehensive strategy. While studies by [Berman \(2012\)](#) and [Westerman et al. \(2014\)](#) discuss the importance of strategic alignment, there remains a lack of concrete research on how different digital transformation strategies impact bank performance beyond just technology adoption alone. Second, existing literature primarily concentrates on developed economies with advanced technological infrastructures, such as North America and Europe ([Gomber et al., 2017](#); [Lee & Shin, 2018](#)). These studies often neglect the obstacles that banks encounter in developing markets when undergoing digital transformation due to varied regulatory frameworks and resource limitations unique to these environments. For example, research by [Mothobi and Grzybowski \(2017\)](#) and by [Asongu and Nwachukwu \(2018\)](#) on African financial

institutions highlights barriers to digital adoption, such as limited infrastructure and high costs, but does not examine how strategic alignment of digital initiatives influences bank performance in these regions. Finally, the role of regulatory compliance in shaping the impact of digital transformation on bank performance has not received attention so far. While previous studies have examined the operational benefits of digital transformation, few have considered how regulatory frameworks, such as Basel II standards, interact with digital strategies to influence outcomes (Gomber et al., 2017; Ozili, 2018; Vives, 2019). Compliance with Basel standards, which focus on risk management and capital adequacy, may provide banks with a stable foundation for implementing digital transformation initiatives effectively (Gennaioli, Shleifer, & Vishny, 2012; Vives, 2019).

This research adds to existing knowledge by examining the impact of digital transformation strategies in the context of Vietnamese commercial banks, where resource constraints and regulatory factors differ significantly from those in developed countries. By exploring the alignment of transformation strategies with business goals and how regulatory compliance influences their effectiveness, this study offers a nuanced view of digital transformation that goes beyond the mere adoption of technology.

3. DATA AND METHODOLOGY

3.1. Model Specification

To investigate the effect of the digital transformation strategy on bank performance, we adopt the following specification:

$$P_{i,t} = \beta_0 + \beta_1 STRATEGY_{i,t} + \beta_2 CONTROL_{i,t} + \theta_t + u_{i,t} \quad (1)$$

The subscript i represents banks, while t signifies this year. The time-fixed effect (θ_t) is also incorporated and the error terms are denoted as $u_{i,t}$.

$P_{i,t}$ is a dependent variable representing the performance of bank i in year t . We use return on total assets (ROA) as a primary proxy to measure bank performance. We also employ Return on Equity (ROE) and Net Interest Margin (NIM) as alternative specifications of a dependent variable.

To measure the digital transformation strategy disclosure, we use STRATEGY as our main independent variable. First, following Verhoef et al. (2021) and Xie and Wang (2023) we develop a list of terms related to digital transformation strategy, including “digital technology,” “digitalization,” “digital transformation,” “digital banking,” “digital platform,” “information technology,” “automation.” Next, based on this list, the authors score banks on the level of digital transformation strategy through text analysis of their annual reports. The bank awards 1 point if a keyword appears in its vision and mission statement, and 0.5 points if it appears in its operational strategy. Finally, the index for digital transformation strategy of banks is measured as follows:

$$STRATEGY_{i,t} = \ln(1 + SCORE_{i,t})$$

Where $SCORE$ is the score of bank i in year t .

In addition to the main variables, we include a set of control variables to account for both bank-specific and macroeconomic factors that may influence bank performance. Loan Loss Provision (LLP) is included as a measure of credit risk management, reflecting how banks set aside reserves for potential loan losses. Higher LLP generally indicates higher risk exposure, which can negatively affect profitability (Ahmed, Takeda, & Thomas, 1999; Bikker & Metzmakers, 2005). The equity-to-total-assets (ETA) ratio is used to assess capital adequacy in banking by measuring the ability of a bank to withstand losses. A higher ETA indicates a more stable financial structure, which can enhance bank performance by reducing financial vulnerability (Berger & Bouwman, 2013). The cost-to-income ratio (CIR) serves as an indicator of efficiency. A lower CIR reflects better operational efficiency, which is crucial for profitability (Dietrich & Wanzenried, 2011). Macroeconomic controls include inflation (INF), which affects both bank costs and income, as high inflation can erode the real value of interest income (Boyd & Champ, 2009; Perry, 1992). Additionally, we include a variable to account for the effects of COVID-19 pandemic (COVID), given its significant impact on the banking sector globally, influencing loan loss provisions, liquidity, and profitability (Demirgüç-Kunt,

Pedraza, & Ruiz-Ortega, 2021). These control variables enable us to isolate the effect of digital transformation on bank performance while accounting for other relevant factors. Table 1 presents the definition of all variables used in this study.

Table 1. Variable definition.

Variable	Description
ROA	Returns on assets
STRATEGY	Digital transformation strategy index
LLP	Loan loss provision
CIR	Cost to income ratio
ETA	Equity to total assets
INF	Inflation
COVID-19	COVID-19 pandemic, takes the value "1" from 2020 to 2022 and "0" for the other years

Our research employs panel data to examine the impact of digital transformation on bank performance. Common approaches for analyzing panel data include pooled ordinary least squares (OLS), fixed effects (FE) models, and random effects (RE) models. Each of these methods has advantages, but they also come with limitations, particularly when addressing endogeneity, which can bias estimates and compromise the validity of findings. People often use the pooled OLS approach because of its simplicity. However, it does not control for unobserved heterogeneity, which can lead to biased estimates (Baltagi, 2008). Additionally, OLS assumes no correlation between the independent variables and the error term, an assumption that may not hold in dynamic models where reverse causality is a concern. The FE model improves upon OLS by controlling for unobserved individual heterogeneity, but it may introduce bias when dealing with lagged dependent variables (Nickell, 1981). This bias can lead to inconsistent estimates in dynamic models, making the fixed effects approach less appropriate for scenarios where past results impact current outcomes (Bond, 2002). On the other hand, the RE model addresses unobserved heterogeneity by assuming it has no correlation with the regressors. However, RE is inefficient and biased when this presumption is violated—a situation that frequently arises in banking data since endogenous relationships exist between variables (Wooldridge, 2010). Both FE and RE models lack the tools to address endogeneity resulting from reverse causality or omitted variable bias.

To address these challenges, we utilize the Generalized Method of Moments (GMM) system proposed by Arellano and Bover (1995). By using lagged values of the dependent variable and other potentially endogenous regressors as tools, this method effectively reduces endogeneity. Moreover, it accounts for unobserved heterogeneity and the persistence of the dependent variable, resulting in consistent parameter estimates (Blundell & Bond, 1998; Roodman, 2009). This method works better than OLS, fixed effects (FE), and random effects (RE) models in dynamic contexts, as it simultaneously controls for the persistence of the dependent variable and the endogeneity of regressors, both of which are crucial for accurately capturing the effects of digital transformation on bank performance.

3.2. Data and Sample

The study utilizes panel data on Vietnamese commercial banks from 2015 to 2022. For bank-specific variables, the data is collected from the annual report of commercial banks. The selection criterion was to include banks that have complete data for all variables used in the model during the study period. The final sample comprises 18 commercial banks, whose total asset size represents approximately 76% of the market share of Vietnamese commercial banks. For macroeconomic variables, we obtain data from the World Bank database.

4. EMPIRICAL RESULTS

4.1. Summary Statistic

Table 2 presents the summary statistics for 18 commercial banks in Vietnam, including the mean, standard deviation (SD), and range of minimum and maximum values, offering an overview of these banks' performance. The

average ROA in our sample is 0.0131, with an SD of 0.0088. The independent variable, STRATEGY, ranges from 0 to 0.6931 with an SD of 0.2807, showing significant variation in digital transformation strategy among the banks during research period. CIR has relatively high mean values of 0.7911. The period from 2015 to 2022 has seen significant investments in digital transformation across the banking sector globally. Vietnamese banks may have incurred high costs associated with upgrading their IT systems, adopting new technologies, and enhancing digital banking services. Equity ratio ranges from 3.72% to 22.05% with an SD of 3.67%, reflecting considerable variation in capital structures.

Table 2. Statistical summary.

Variables	Obs.	Mean	Sd	Min.	Max.
ROA	144	0.0131	0.0088	0.0003	0.0411
STRATEGY	144	0.2787	0.2807	0	0.6931
LLP	144	0.0129	0.0057	0.0016	0.0312
CIR	144	0.7911	0.1176	0.4303	0.9925
ETA	144	0.0881	0.0367	0.0372	0.2205
INF	144	0.0233	0.0180	-0.0172	0.0436
COVID	144	0.3750	0.4858	0	1

4.2. Results

Table 3 presents the regression results of models evaluating the impact of digital transformation strategies on the performance of commercial banks, with ROA as the dependent variable. The estimated coefficient of STRATEGY is 0.0017 and statistically significant. This finding indicates that banks that incorporate digital transformation into their core business strategy tend to operate more efficiently. The result is in line with the finding of [Westerman et al. \(2014\)](#). Integrating digital transformation into their business strategies allows banks to enhance customer satisfaction and strengthen their competitive advantage. [Lee and Shin \(2018\)](#) highlight that digital transformation helps banks automate routine processes, optimize resource allocation, and improve decision-making through data insights. Furthermore, [Gomber et al. \(2017\)](#) investigate the role of digital transformation in enhancing bank performance and demonstrate that banks adopting advanced digital technologies are better equipped to meet evolving customer expectations, respond more quickly to market dynamics, and enhance their risk management capabilities. This supports our finding by suggesting that banks leveraging digital transformation are more agile in handling both external pressures and internal demands, leading to improved performance outcomes.

The observed value for the coefficient of STRATEGY stands at 0.0017. Is deemed significant, which suggests a distinctively positive influence of digital transformation strategy on bank performance. This discovery implies that banks integrating transformation into their business approach tend to function effectively. The study by [Westerman et al. \(2014\)](#) supports this outcome. By integrating transformation into their business strategies, banks can improve efficiency, elevate customer satisfaction levels, and secure a competitive advantage. According to [Lee and Shin \(2018\)](#) digital transformation allows banks to automate tasks better and make data-driven decisions effectively by optimizing resource usage. This implies that the beneficial effects of transformation on ROAs in our research could be due to improvements in efficiency and cost reduction. Additionally, in a study by [Gomber et al. \(2017\)](#) they explored how digital transformation contributes to improving bank performance and discovered that banks that embrace cutting-edge technologies can effectively address evolving customer needs and react promptly to market changes while bolstering their risk management capabilities. This aligns with our discovery as it indicates that banks that harness digital transformation have an advantage in dealing with challenges and internal requirements leading to performance results.

Table 3. Regression results.

Variables	Dependent variable: ROA
STRATEGY	0.0017** (0.0021)
ROA(-1)	0.2240*** (0.0141)
LLP	-0.1760*** (0.0057)
ETA	0.0200** (0.0025)
CIR	-0.0600*** (0.0012)
INF	-0.0584*** (0.0032)
COVID	-0.0012*** (0.0036)
Obs.	144
Time dummy	Yes
S-test	75.62
AR (1)	0.206
AR (2)	0.241

Note: This table displays the regression estimates for the relationship between ROA and STRATEGY, using the system GMM estimator. Standard errors are reported in parentheses, *** and ** denote significance at the 5%, and 10% levels, respectively.

Besides, the orientation toward risk management according to Basel Accord standards may influence the impact of the digital transformation strategy on the operational performance of banks. Therefore, the authors divided the data sample into two groups: (i) banks that met Basel II standards (including 11 commercial banks in the sample) and (ii) banks that have not meet Basel II standards (including the remaining 7 commercial banks). The author conducts regression analysis of the equation with ROA as the dependent variable on the data samples from these two groups. Table 4 presents the regression results. Column (1) shows the regression results for the group of banks that meet Basel II standards, and column (2) shows the regression results for the group of banks that have not met Basel II standards. The findings show that digital transformation strategy has a stronger effect on banks that adhere to Basel II standards. This difference is statistically significant at the 1% level.

The findings suggest that following Basel II guidelines may provide an enabling environment for digital transformation by enhancing risk management, financial stability, and operational efficiency. Adhering to Basel II standards guarantees that banks maintain adequate capital buffers and effective risk management frameworks, which are essential for managing the risks associated with digital initiatives. Vives (2019) argues that banks adhering to robust regulatory frameworks are more equipped to integrate digital innovations effectively, as regulatory compliance provides a stable foundation that minimizes potential disruptions and supports strategic transformation. This aligns with our findings, suggesting that banks with Basel II compliance can more effectively leverage digital transformation to enhance operational performance. Furthermore, Laeven, Ratnovski, and Tong (2016) demonstrate that banks with strong risk management practices are better equipped to handle the operational and cybersecurity risks introduced by digital transformation. These banks are better capable of mitigating risks associated with digital initiatives. This supports the observation in our study that Basel II-compliant banks derive greater performance benefits from digital transformation than their non-compliant counterparts.

Table 4. Regression results for the two groups of banks.

Variables	Group 1: Banks that meet Basel II standards	Group 2: Banks that have not meet Basel II standards
STRATEGY	0.0046*** (0.0013)	0.0095 (0.0018)
ROA(-1)	0.3079** (0.0290)	-0.3715 (0.0304)
LLP	-0.1896** (0.0915)	-0.2844** (0.1002)
ETA	-0.0257 (0.0051)	-0.0493 (0.0058)
CIR	-0.0599*** (0.0278)	-0.0703*** (0.0145)
INF	0.1038* (0.0065)	0.0308* (0.0029)
COVID	-0.0005** (0.0002)	-0.0015** (0.0003)
Obs.	88	56
Time dummy	Yes	Yes
S-test	17.91	16.1
AR (1)	0.865	0.326
AR (2)	0.317	0.564

Note: This table displays the regression estimates for the relationship between ROA and STRATEGY, using the system GMM estimator. Standard errors are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

4.3. Robustness Check

In order to check the robustness of our models, we ran Equation 1 using alternative measures of dependent variable, including ROE and NIM. Table 5 reports the empirical results. Furthermore, we apply different regression methods, including pooled ordinary least squares, fixed-effects models, and random-effects models, to Equation 1. Overall, the findings support the results of the baseline model.

Table 5. Regression results using alternative measures of dependent variable.

Variables	ROE	NIM
STRATEGY	0.0033** (0.0046)	0.0108* (0.0072)
ROE(-1)	0.0547*** (0.0414)	
NIM(-1)		0.9280*** (0.1345)
LLP	-0.9210** (0.1470)	-0.3570 (0.0071)
ETA	0.9770*** (0.1201)	0.0219 (0.0041)
CIR	-0.673*** (0.1830)	-0.0221*** (0.0093)
INF	0.0365 (0.0205)	0.7170*** (0.2361)
COVID	-0.0060* (0.0018)	-0.0007 (0.0001)
Obs.	144	144
Time dummy	Yes	Yes
S-test	67.68	32.4
AR (1)	0.198	0.006
AR (2)	0.192	0.597

Note: This table presents regression estimates of the relationship between alternative measures of financial performance (ROE and NIM) and STRATEGY, using the system GMM estimator. Standard errors are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

5. CONCLUSION

This study investigates the impact of digital transformation strategy on bank performance in Vietnam between 2015 and 2022 by using the system GMM. The results reveal that banks that integrate digital transformation into their business strategy tend to demonstrate better performance. We also document that digital transformation strategy has a more significant impact on the group of banks that comply with Basel II standards. These findings carry important implications. First, digital transformation should be viewed as a strategic priority rather than a mere operational upgrade. By integrating digital technologies at a strategic level, banks are able to unlock efficiency gains that directly contribute to improved financial performance. This is particularly relevant in the context of emerging markets, where digital transformation can offer a path to competitive parity with banks in more developed economies. For policymakers, these findings highlight the importance of supporting digital transformation initiatives as part of a comprehensive strategy for sustainable growth in the financial sector. Second, the findings suggest that digital transformation strategies are most effective when combined with strong regulatory compliance, particularly in emerging markets where regulatory standards may vary widely. Therefore, Vietnamese commercial banks should focus on risk management frameworks and regulatory compliance, particularly with Basel II standards, which can leverage digital transformation to achieve sustainable growth, improved customer trust, and a competitive advantage in the financial industry.

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