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The Nexus Between Fintech Adoption & Bank Performance: A Role of Competitiveness

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ABSTRACT

This research investigates the relationship between fintech adoption, competitiveness, and bank performance within Pakistan's banking industry, encompassing Islamic and conventional banking practices. This study empirically examines the impact of fintech adoption on the performance of banks in Pakistan, unveiling a nuanced relationship shaped by the moderating effect of competitiveness. The findings of this research reveal that the relationship between fintech adoption and bank performance is significantly influenced by competitiveness, displaying a complex interplay with both positive and negative implications. While fintech adoption holds the potential to enhance banks' efficiency, profitability, and customer loyalty, it also introduces challenges and threats to the established norms of the traditional banking sector. Moreover, this study identifies several critical research gaps and proposes avenues for future investigations to comprehensively understand the role of Fintech within Pakistan's financial system. The evolution and integration of Fintech present both opportunities and challenges, underscoring the need for continued exploration and analysis to navigate this transformative landscape better. However, this research contributes to understanding how adopting Fintech impacts bank performance in Pakistan, highlighting the moderating role of competitiveness and the duality of opportunities and challenges presented by Fintech in the banking realm.

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1. Introduction

One of the most significant forces influencing change in the financial services sector in recent years has been the rise of Fintech. Fintech is defined as "technologically-enabled innovation in financial services that could result in new business models, applications, processes, or products with an associated material effect on the provision of financial services," which is the definition that appears most frequently in the literature. Since it can define FinTech for new and established financial service providers, this definitional approach can be characterized as functional and broad. Nevertheless, this method does not allow examining the effects of technology companies' forays into the finance sector, including potential interactions with incumbents (Zhao, Li, Yu, Chen, & Lee, 2022). The banking sector is now utilizing Fintech. The public can easily, practically, and securely access fintech services, which greatly facilitates the public's ability to obtain banking financial services (Abdillah, 2020). The integration of financial services and technology, known as financial technology (FinTech), transforms the traditional business model into a moderate one. People could now

use online payment systems to complete long-distance transactions instead of paying pace to pace and carrying a specific amount of cash. Fintech refers to innovations in the financial services sector driven by technology. Typically, fintech services take the shape of a system made to carry out financial transaction processes.

Fintech is an innovative financial platform or application that provides simple, secure, and useful financial services to benefit society and improve the economy. This definition is based on the definition that has been provided (R. Singh, Malik, & Jain, 2021). Adopting Fintech represents an investment in innovation, establishing an online payment system guided by strategic management decisions with the belief that this initiative will enhance organizational efficiency. Assessing success involves managing the interplay between the positive and negative impacts on customers, businesses, employees, marketplaces, economic sectors, and broader societal responsibilities. The company's earnings, stemming from well-structured information systems, serve as the metric for evaluating the effectiveness in striking this balance (Anggreni, Ariyanto, Suprasto, & Dwirandra, 2020). In 2007, the State Bank of Pakistan (SBP) published a policy statement on the Regulatory Framework for Mobile Banking in Pakistan, which marked the official start of Pakistan's journey toward digitization. Immediately after this development, Branchless Banking Regulations were released in March 2018. As a stepping stone for developing the country's Fintech sector, many early adopters came up to offer Digital Financial Services. This study examines the key elements of the process for identifying Fintech investment targets as well as the difficulties banks have when putting it into practice (Butt & Khan, 2019). The difficulties that banking industries face while making Fintech investments were examined in this study. A convenience sample and five Pakistani banks were used in this analysis. The conclusions cover topics like (1) Fintech in the banking sector of Pakistan, (2) Banks prepared to implement new financial technology, (3) Requirements for starting a Fintech company, (4) Technology as a vocation in banking, and (5) Challenges for Fintech acceptance in Pakistan. Pakistan is encouraged to enhance its FinTech infrastructure and a few other things. To address these concerns, the government must work more (Lee, Li, Yu, & Zhao, 2021). The banking sector plays a critical role in the economic growth and sustainability of the nation, industry, and individual. To achieve competitiveness and continuous performance in the banking industry, banks must reinvent processes and services and add value for stakeholders. Adopting and utilizing cutting-edge technology-enabled goods and services for stakeholders and service delivery can enable growth (Sharma, 2017). As a result, technological adoption has led to innovations in banking products and services that fundamentally alter how the banking sector functions. FinTech aims to enhance business processes by optimizing its operations and services, potentially leading to increased competitiveness and performance. Effectiveness, efficiency, adaptability, technology, quality, productivity, value creation, and so forth are some of the implications of competitiveness (Arulraj & Annamalai, 2020). According to this research, the use and adoption of Fintech can improve the performance and competitiveness of the banking and finance sector in the United Arab Emirates. Additionally, effective management of FinTech use can boost the industry's performance and competitiveness (Dwivedi, Alabdooli, & Dwivedi, 2021).

1.1. Problem Statement

This study aims to address a significant knowledge gap concerning the influence of adopting new technology on commercial banks' competitive positioning and financial performance. Over the past decade, there has been a substantial expansion in the range of remote access methods for financial services, accessible through various channels like mobile devices, ATMs, point-of-sale (POS) systems, and banking correspondents. As banks employ diverse strategies across different nations to enhance financial inclusion, costs emerge as a significant barrier affecting customer retention and, consequently, the financial performance of these institutions. In Pakistan, where banking heavily relies on financial performance, challenges persist in achieving effective strategic positioning due to stakeholder issues, inadequate planning, resource constraints, weak leadership, and ideological complexities. While previous studies have explored strategic management in the banking sector, few have delved into the impact of technology adoption on commercial banks' strategic posture and financial performance (Ben Bouheni, Tewari, Sidaoui, & Hasnaoui, 2023). This study seeks to address this gap by investigating the impact of technology adoption on commercial banks' financial performance and strategic positioning. Therefore, the research intends to evaluate the influence of technology, especially within commercial banking operations, on financial

performance, aiming to shed light on the beneficial association between fintech adoption, bank performance, and competitiveness. In recent years, many banks in Pakistan have adopted new technologies as part of their business approach to improve customer experience, increase efficiency, and reduce costs (Al-Shari & Lokhande, 2023). However, the impact of these technology adoption initiatives on the financial performance of Pakistani banks remains unclear. There is a need to evaluate the impact of technology adoption as a business approach on the financial performance of Pakistani banks. Up until now, limited evidence has been available to answer these questions.

What is the impact of fintech adoption and bank performance?
What is the impact of the bank's competitiveness and performance?
Does competitiveness moderate the relationship between fintech adoption and bank performance?

1.2. Research Objectives

1. The primary aim of this study is to evaluate the importance of financial technology and to identify the problems and obstacles that prevent it from being adopted in Pakistan.
2. To investigate the relationship between bank performance and Fintech adoption.
3. To investigate the connection between bank performance and competitiveness.
4. To investigate how competition affects the relationship between bank performance and the use of Fintech.

1.3. Significance of The Study

This research study significantly enhances the current understanding of several key aspects. Firstly, it fills a notable void in the existing literature by investigating the connection between bank Fintech and bank performance, an area that has received limited attention in prior studies. This research brings valuable insights to the banking sector by focusing on this relationship. Additionally, the study provides objective evidence and practical guidance for implementing bank Fintech effectively. It expands the scope of analysis beyond conventional performance indicators like profitability and efficiency, exploring the impact of bank Fintech on Pakistan's banking sector. This examination highlights how Fintech influences competitiveness and overall effectiveness. Moreover, the research underscores the potential of Fintech to drive the creation of new banking products, emphasizing the advantages of early adoption. It stresses the strategic importance of leveraging innovative technologies to enhance competitiveness and performance within the banking industry. This study addresses a critical knowledge gap and offers actionable insights that could reshape decision-making processes, assisting banks in strategically integrating FinTech for improved performance and a stronger competitive edge.

1.4. Organization of the Study

This study is organized into five key sections for a systematic exploration of the research topic. Section 2 critically examines existing literature, identifying gaps in knowledge. Section 3 outlines the research methodology, including data collection and analysis methods. In Section 4, results are presented and discussed, offering insights derived from data analysis. The study concludes in Section 5, summarizing key findings and providing a conclusive perspective on the research topic. This structured approach ensures a coherent and insightful examination of the subject matter.

2. Literature Review

Financial technology (FinTech), a term of recent origin, embodies a lengthy lineage within the banking and financial sectors. Defined by Razzaque, Cummings, Karolak, and Hamdan (2020) as the convergence of financial services and technology through the streamlining of information and communications technology (ICT), it encompasses various innovations. These include but are not limited to automated teller machines (ATMs), credit cards, online banking, and more contemporary advancements like mobile banking and e-wallets. The scope of FinTech services, as outlined by Xie, Ye, Huang, and Ye (2021), spans online payments, peer-to-peer lending, crowdsourcing, budgeting, financial planning, and investment tools. The evolution of FinTech continues, now advancing through the amalgamation of new and traditional technologies such as blockchain, machine learning, and big data, as highlighted by Schindler (2017). This convergence allows for development of increasingly intricate and tech-driven financial products and services. By digitizing processes,

FinTech holds significant promise in addressing various sustainability challenges. However, the main challenge lies in formulating an effective model for widespread FinTech adoption. This model aims to encourage a mass shift from conventional financial services to fully leverage the advantages offered by FinTech, as discussed by (Abdul-Rahim, Bohari, Aman, & Awang, 2022).

2.1. Disruptive Innovation Theory

This theory shows how simpler, newer technologies or business models can disrupt established industries by offering more accessible and affordable alternatives. Fintech, a burgeoning sector leveraging technology for innovative financial solutions, aligns closely with this theory. Fintech companies target underserved markets, introducing user-friendly, cost-effective services that challenge traditional financial institutions (Solanki & Sujee, 2022). By addressing issues like high fees and outdated technology, they cater to a broader customer base, particularly those ignored by conventional banks. Fintech's relationship with Disruptive Innovation Theory is evident in its embodiment of disruptive models. Startups identify and serve unserved or underserved segments with tailored, technology-driven solutions that are cheaper and more accessible. Over time, these innovations pose a substantial competitive threat to established financial institutions. Fintech's use of technology to create new financial products disrupts the traditional financial landscape, compelling incumbents to adapt or risk losing market share. The interplay between Fintech and Disruptive Innovation Theory showcases how innovation addresses unmet customer needs, gradually displacing established players. As Fintech evolves, its impact on the financial industry deepens, underscoring the enduring relevance of Disruptive Innovation Theory in modern business contexts (Ibidunni, Ufua, & Opute, 2022).

2.2. Porter's Theory of Competitive Advantage

Financial technology (Fintech) companies strategically align with Porter's theory by emphasizing differentiation through innovative, user-centric financial products and pursuing cost leadership via streamlined operations. They target niche markets, creating new customer segments while offering competitive pricing and challenging traditional financial institutions constrained by legacy systems. By adopting strategies resonant with Porter's principles, fintech firms disrupt the finance sector, effectively competing and establishing a unique edge. This strategic alignment echoes Porter's enduring influence, steering competition and reshaping the financial industry within the dynamic realm of Fintech (Nayak, Bhattacharyya, & Krishnamoorthy, 2023).

2.3. Fintech Adoption and Bank Performance

FinTech has completely transformed the banking industry. So, increasing customer interest in FinTech services resulted in positive and negative ways. The positive impact is the collaboration between FinTech and the banking industry, leading to increased efficiency and effectiveness in the banking industry (John, 2017). The transaction cost reduction is due to the collaboration of different stakeholders across the industry, resulting in customer benefits. It also boosts performance and, attracts new customers, improves customer engagement approaches, and enhances brand loyalty, as posited (Obeidat & Saxena, 2015). This factor boosts the industry's general competitiveness on a global scale. With the help of FinTech, banks can increase product and service offerings in the digital world. Banks provide unique mobile banking services. Modern channels (e-banking, m-banking) of operations are possible with the help of FinTech in the banking industry to provide quality and convenient services to people (Obeidat & Saxena, 2015).
H1:

2.4. Competitiveness and Bank Performance

The integration of Fintech within the banking sector significantly impacts competitiveness and bank performance. Fintech adoption challenges traditional banking norms by introducing innovative, tech-driven solutions that improve operational efficiency, customer experiences, and service delivery. The relationship between competitiveness and bank performance is vital to the financial industry. Competitiveness shapes how banks operate, innovate, and serve their customers. A competitive environment compels banks to strive for excellence and efficiency, directly impacting their overall performance. In a competitive landscape, banks are motivated to adopt innovative strategies and technologies to distinguish

themselves (Donnellan & Rutledge, 2019). This drive for innovation can lead to introduction of new, customer-centric services and products. As banks cater to their customers' evolving needs and preferences, they can improve their performance by staying relevant and attractive in the market. Furthermore, competition encourages banks to manage their resources efficiently. They must focus on cost management and operational excellence to remain competitive. This, in turn, positively impacts their financial performance, as effective resource allocation and cost control lead to improved profitability (Behl, 2022). The interplay between competitiveness and bank performance extends beyond financial metrics. It also influences customer satisfaction and trust. Competitive banks are often more attentive to customer needs, offering better customer service and engagement. As a result, they can build stronger brand loyalty and trust, ultimately enhancing their long-term performance and reputation in the market. However, competitiveness and bank performance are intricately linked. Competitive pressures drive banks to innovate, manage costs effectively, and prioritize customer satisfaction. These factors collectively contribute to a bank's overall performance, making it a key determinant of success in the financial sector.
H2:

2.5. Competitiveness Moderates the relation between Fintech Adoption and Bank Performance

Competitiveness significantly moderates the relationship between Fintech adoption and bank performance. The competitive landscape influences the integration of Fintech tools and strategies within banks, ultimately shaping how effectively this adoption affects overall bank performance. In highly competitive markets, Fintech adoption becomes a critical factor for banks to maintain or enhance their position (Dwivedi et al., 2021). The intense competition demands a more proactive and innovative integration of Fintech solutions, driving banks to seek a competitive edge through technological advancements. This leads to a more substantial impact on bank performance as these institutions strive to differentiate themselves from their rivals. Conversely, in less competitive environments, the impact of Fintech adoption might be less pronounced on bank performance. Banks operating in markets with limited competition may not feel as much pressure to rapidly adopt Fintech innovations, potentially resulting in a more modest effect on their overall performance (Chan, Troshani, Rao Hill, & Hoffmann, 2022). Recognizing the crucial role of competitiveness in moderating the relationship between Fintech adoption and bank performance is essential. This underscores the importance for banks to assess the competitive landscape when integrating Fintech solutions, acknowledging that the resulting impact on performance can differ based on the level of competition prevailing in the market (Hur & Akram, 2023).
H3:

2.6. Research Framework

Figure 1: Theoretical Research Framework

3. Methodology

The research endeavours to comprehensively explore the integration of Fintech within banking operations and its consequential impacts on various facets such as operational performance, customer experiences, and the competitive advantage within the banking industry. Specifically, it delves into how Fintech technologies augment operational efficiency,

reduce operational costs, and enhance customer service provisions within the banking sector. The study notably underscores the pivotal role Fintech plays in addressing customers' evolving demands, especially in their quest for swift, accessible financial solutions. Additionally, the study highlights the potential risks banks face that fail to adapt to this changing landscape, which could result in a loss of market share to more adaptable competitors (Sunardi & Tatariyanto, 2023). The primary finding of this research is the strong association observed between the implementation of Fintech, the overall performance of banks, and their competitive positioning within the banking sector. Integrating Fintech into traditional banking systems significantly elevates operational efficiency by streamlining processes, reducing operational costs, and introducing innovative products and services (Yan et al., 2022). This integration empowers banks to expand their customer base, increase satisfaction, and bolster their financial performance. To gather insights, a survey was conducted among staff members of both conventional and Islamic banks. Adhering to a deductive methodology, the survey was designed based on a general theory or hypothesis, framing specific research questions related to Fintech adoption, bank performance, and competitiveness (Marei, Mustafa, Othman, Daoud, & Lutfi, 2023). The survey consisted of questions focused on Fintech adoption (8 questions), bank performance (3 questions), and competitiveness (5 questions), rated on a five-point Likert scale. Targeting users of Pakistani Islamic banks, a convenience sampling method secured 205 responses, offering insights into the extent of Fintech adoption in this specific banking sector. Overall, this survey approach provides a comprehensive understanding of how Fintech impacts various banking aspects, shaping operational efficacy and competitiveness in the industry (Al-Matari, Mgammal, Alosaimi, Alruwaili, & Al-Bogami, 2022). The survey questionnaire encompassed 8 inquiries addressing Fintech adoption, 3 questions on bank performance, and 5 on competitiveness. The responses were rated using a five-point Likert scale. With a focus on users of Pakistani Islamic banks, the survey utilized a convenience sampling technique, amassing a total of 205 responses. These responses were analyzed to evaluate the Fintech adoption level among users of Pakistan's Islamic banks. Additionally, a recent study employed 20 surveys and the smartPLS tool to collect and demonstrate Fintech adoption's impact on competitiveness and banking performance. This further solidified the findings and insights derived from the initial research on the subject matter.

4. Data Analysis and Results

4.1. Construct Reliability and Validity

Cronbach's Alpha is a statistic that assesses a scale or list of items' internal consistency or dependability. It shows how closely related the components of each build are to one another. In general, values greater than 0.7 are regarded as suitable for research. With great Cronbach's Alpha values ranging from 0.835 to 0.993, all structures have good internal consistency. Rho Alpha Another internal consistency metric, Rho A, is comparable to Cronbach's Alpha. It evaluates the scale's dependability as well. High internal consistency is indicated by values near 1.0.

Table 1: Construct reliability and validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
FIN adoption	0.904	0.907	0.923	0.601
Moderating Effect 1	0.993	1.000	0.993	0.778
Competitiveness	0.874	0.878	0.909	0.666
Performance	0.835	0.839	0.901	0.752

Rho A values for constructs range from 0.839 to 1.000, which is quite high and indicates outstanding dependability (Wang et al., 2019). Composite Reliability: This statistic also measures the reliability of a scale, and values above 0.7 are generally acceptable. In this case, all constructs have excellent composite reliability values, ranging from 0.901 to 0. 993. Average variance Extracted (AVE) measures how much variance a construct manages to capture about measurement error. Values over 0.5 are normally seen as positive. All of the constructs in the study have AVE values between 0.601 and 0.778, which are generally regarded as satisfactory and show that the constructs account for a sizable part of the variance in the assessed items (Lim, Kim, Hur, & Park, 2019). Thus, the measuring instruments appear valid and reliable for evaluating the relevant constructs in a research

project, according to the reliability and validity of the data provided. The strong Cronbach's Alpha, Rho A, Composite Reliability, AVE scores, and moderately high AVE values all imply that constructs are well-measured and produce reliable results.

4.2. Discriminant validity Fornell-Larcker Criterion

In structural equation modelling (SEM), the Fornell-Larcker Criterion is a technique for evaluating the discriminant validity of latent constructs in a measurement model. The level of discriminant validity measures how different a model's constructs (variables) are from one another. The constructs measuring should not be highly correlated because this can cause problems with model identification and interpretation (S. Singh, Sahni, & Kovid, 2021). The Fornell-Larcker Criterion is typically assessed using each component's square root of the average variance extracted (AVE). The AVE measures the variance that the construct captures regarding measurement error. According to the Fornell-Larcker Criterion, the square root of the AVE for each construct should be greater than the correlation between that construct and any other construct in the model (S. Singh, Sahni, & Kovid, 2020).

Table 2: Discriminant validity

	FIN adoption	Moderating Effect 1	competitiveness	Performance
FIN adoption	0.775			
Moderating Effect 1	-0.710	0.882		
Competitiveness	0.817	-0.670	0.816	
Performance	0.769	-0.658	0.773	0.867

This study uses a correlation matrix between four constructs: FIN adoption, Moderating Effect 1, competitiveness, and performance. To assess discriminant validity using the Fornell-Larcker Criterion, calculate the AVE for each construct and compare it to the correlations between the constructs. To determine the square root of the AVE for each build, follow these steps: FIN adoption AVE = 0.775, Moderating Effect 1 AVE = 0.882, Competitiveness AVE = 0.816, Performance AVE = 0.867 (Lim et al., 2019). To compare these AVE values to the correlations between the constructs: Square root of FIN adoption AVE = $\sqrt{0.775} \approx 0.880$.The correlation between FIN adoption and Moderating Effect 1 = -0.710 (less than 0.880). The correlation between FIN adoption and Competitiveness = 0.817 (less than 0.880). The correlation between FIN adoption and Performance = 0.769 (less than 0.880). The square root of Moderating Effect 1 AVE = $\sqrt{0.882} \approx 0.939$ Correlation between Moderating Effect 1 and Competitiveness = -0.67 (which is less than 0.939) Correlation between Moderating Effect 1 and Performance = -0.658 (which is less than 0.939) Square root of Competitiveness AVE = $\sqrt{0.816} \approx 0.903$ Correlation between Competitiveness and Performance = 0.773 (which is less than 0.903) Square root of Performance AVE = $\sqrt{0.867} \approx 0.930$. The square root of the AVE for each construct is bigger than the correlations between that construct and other constructs, which, according to the Fornell-Larcker Criterion, indicates that discriminant validity is generally supported. This shows that the constructs in the measurement model are sufficiently distinct from one another (Wang, Guan, Hou, Li, & Zhou, 2019).

4.3. Cross Loading

In a factor analysis or structural equation modelling (SEM) setting, the values provided in the table seem to be cross-loadings for various variables. The amount that each item (represented by the rows) loads on each latent construct or component is shown by cross-loadings (represented by the columns) (Zhao et al., 2022). The strength and direction of the relationships between the items and factors can be evaluated using these values. Each row represents indicator variables or items. Each column depicts a latent factor or concept. The values in the cells show how strongly each item and each factor are related (called loading). Let us use the first row (BP1) as an illustration: BP1 has a factor loading of 0.669 for "FIN adoption". About the "competitiveness" factor, BP1 has a loading of 0.591. The loading on the "performance" factor for BP1 is 0. 846. These numbers show the degree to which each BP1 item is related to each factor. Higher absolute values show a stronger association. Here are a few typical explanations: A strong correlation between the item and the factor is indicated by a loading close to 1 (positive or negative). A weak association is indicated by a loading near 0, which shows that the item does not do much to explain the factor. A relationship is said to be positive or negative depending on whether the loading is positive or negative (Wang et al., 2019).

Table 3: Cross Loading

Cross loading	FIN adoption	competitiveness	performance
BP1	0.669	0.591	0.846
BP2	0.599	0.645	0.887
BP3	0.722	0.762	0.867
C1	0.684	0.824	0.605
C2	0.673	0.832	0.716
C3	0.648	0.772	0.586
C4	0.670	0.847	0.640
C5	0.660	0.802	0.600
IB1	0.749	0.612	0.619
IB2	0.697	0.533	0.565
IB3	0.817	0.648	0.633
IB4	0.750	0.676	0.549
IB5	0.732	0.596	0.542
IB6	0.841	0.718	0.616
IB7	0.763	0.601	0.577
IB8	0.838	0.675	0.656

Researchers use cross-loadings to evaluate a measurement model's discriminant and convergent validity. Items with high cross-loadings on the same factor are used to establish convergent validity, whereas low cross-loadings on distinct factors indicate discriminant validity. To make sure that items are accurately measuring the intended constructs or factors in the analysis, that would evaluate the validity and reliability of the measurement model in the context of particular data by considering the pattern of cross-loadings, factor loadings, and other pertinent statistics (Razzaque et al., 2020).

4.4. Collinearity Statistics (VIF)

This study was used to assess multicollinearity in a regression analysis. Multicollinearity occurs when independent variables in a regression model are highly correlated, which can lead to unstable and unreliable coefficient estimates (Dianty & Faturohman, 2023). Variance Inflation Factor (VIF) values are a critical indicator of multicollinearity, a phenomenon where independent variables within a regression model are highly correlated. In the context of the values provided, the VIFs exceeding the common threshold of 2 signify a notable level of multicollinearity among several predictor variables.

Table 4: Variance Inflation Facator (VIF)

Collinearity Statistics (VIF) Outer VIF Values	VIF
BP1	1.923
BP2	2.325
BP3	1.821
C1	2.192
C2	2.024
C3	1.949
C4	2.414
C5	2.059
IB1	2.053
IB2	1.816
IB3	2.487
IB4	2.010
IB5	2.331
IB6	3.492
IB7	2.225
IB8	2.856

This can impact the regression analysis by inflating the variance of the estimated coefficients, potentially leading to less reliable and interpretable results. Specifically, variables like IB6 stand out with a VIF of 3.492, indicating a higher correlation than others. Additionally, variables labelled as BP1, BP2, BP3, C1, C2, C4, C5, IB1, IB2, IB3, IB4, IB5, IB7, and IB8 exhibit VIF values notably above 2, indicating a substantial level of multicollinearity among these predictors (Yan et al., 2022). When VIF values surpass a threshold of 5 or 10, it typically raises a red flag, signifying a more severe multicollinearity issue. At this level, the standard

errors of the regression coefficients become substantially inflated, impacting the interpretability and reliability of the model's predictions. Several strategies can be employed to address multicollinearity concerns. Variable selection techniques, like stepwise regression, domain knowledge-based elimination of highly correlated variables, or regularization methods, such as Ridge Regression or Lasso Regression, can mitigate the impact of multicollinearity (Nayak et al., 2023). Additionally, Principal Component Analysis (PCA) offers a way to transform the original variables into a smaller set of uncorrelated variables, known as principal components. Another strategy involves consolidating highly correlated variables into a single variable, reducing the number of predictors in the model. Overall, the approach to mitigate multicollinearity issues should be guided by the data's specific context and the analysis's objectives. Addressing multicollinearity is crucial to ensure the stability and reliability of the regression model, enabling more accurate interpretations and predictions (Marei et al., 2023).

4.5. Path coefficient mean, t-value, standard, and p-value

In this analysis, we are examining the relationship between various factors and performance. Let us start with the first factor: adoption of FIN. The sample mean for FIN adoption is 0.337, showing that, generally speaking, implementing financial technology favours performance. The standard deviation of 0.345 shows that the data points are erratic. The statistical significance of the difference between the sample and the actual population mean is shown by the t-value of 3.187.

Table 5: Path Coefficient

Mean, T-Values, STDEV, and P-Values	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
FIN adoption -> performance	0.337	0.345	0.106	3.187	0.001
Moderating Effect 1 -> performance	-0.081	-0.077	0.031	2.586	0.010
competitiveness -> performance	0.395	0.395	0.113	3.500	0.000

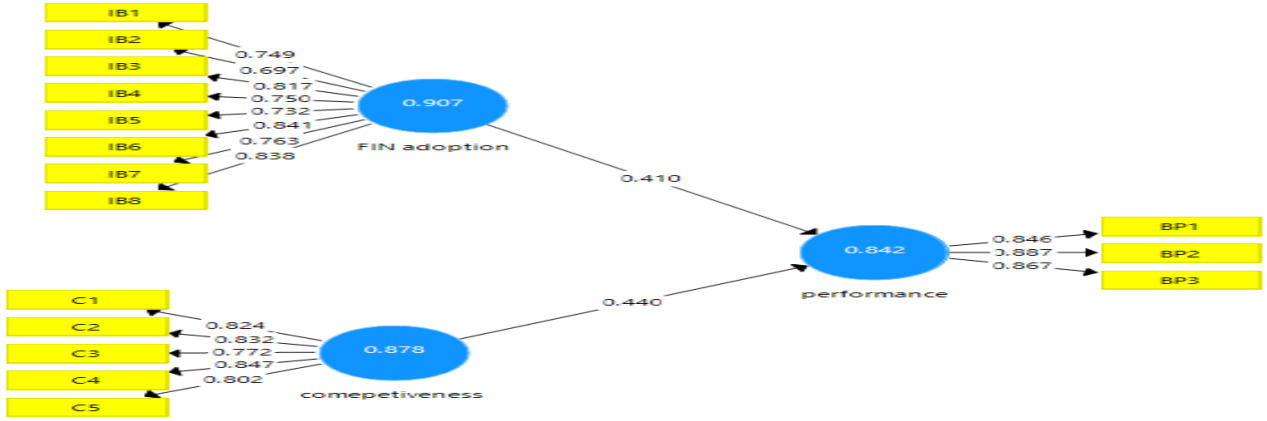
Strong evidence that the adoption of FIN has a significant impact on performance, as illustrated by the p-value of 0.001, strongly supports the null hypothesis (Ibidunni et al., 2022; Wang et al., 2019). The second element, Moderating Effect 1, is next. The sample mean in this case is -0.081, indicating a poor correlation between this component and performance. The data points are near the mean because the standard deviation is -0.077. Based on the t-value of 2.586 and the corresponding p-value of 0.010, we can conclude that there is a statistically significant difference between the sample mean and the population mean for this factor. Lastly, the competitiveness and its impact on performance is 0.395, implying a positive association with performance (Marei et al., 2023; Xie et al., 2021). The standard deviation of 0.113 indicates that the data points' variability around the mean is present. The t-value of 3.500 demonstrates a significant difference between the sample mean and the population means, while the p-value of 0.000 provides strong evidence to reject the null hypothesis (Abdillah, 2020). These findings indicate that FIN adoption and competitiveness play significant roles in determining performance outcomes. On the other hand, Moderating Effect 1 appears to have a smaller but still noteworthy impact on performance. Considering these factors when making decisions and implementing strategies to maximize overall performance (Abdul-Rahim et al., 2022).

4.6. Structural Equation Model

A method used to explore complex relationships between constructs and their respective indicators is a structural equation model (SEM). Constructs represent underlying or latent factors that are not directly observable but can be inferred from other measured variables. For instance, FIN (Fintech) adoption and performance could be considered constructs (Al-Matari et al., 2022). On the other hand, C1 through C5 represent indicators, which are observable variables directly measurable within the study. They serve as tangible elements that help to define or measure the latent constructs. In a structural equation model, arrows represent the connections or relationships between these constructs and their associated indicators. The arrows signify the direction of influence or effect, indicating how these constructs relate to and manifest through the observed indicators (Arulraj & Annamalai, 2020). Moreover, the numbers associated with these arrows denote the strength or magnitude of these relationships. Higher numbers typically indicate stronger relationships, showing how

much the observed variables are affected by or are indicative of the latent constructs they represent (Behl, 2022).

Figure 2: Structural Equation Model



This analytical approach allows researchers to evaluate the direct relationships between observed variables and understand the broader, unobservable factors (constructs) influencing these observed indicators. The SEM method provides a comprehensive framework to assess the complex interplay between these latent constructs and the measurable indicators, offering insights into the underlying dynamics shaping the observed phenomena (Chan et al., 2022).

5. Conclusion

This research investigated how fintech adoption and competitiveness impact the performance of banks in Pakistan, using established theoretical frameworks. The study revealed a nuanced relationship where fintech adoption contributes positively to various aspects of bank performance while simultaneously challenging the traditional banking industry (Donnellan & Rutledge, 2019). The findings offer valuable insights for policymakers and industry stakeholders in the Pakistani banking sector, contributing to a deeper understanding of technology integration within financial systems. The study's objectives included evaluating the impact of fintech adoption on bank performance, exploring the connection between competitiveness and bank performance, and examining how competition moderates the relationship between fintech adoption and bank performance (Hur & Akram, 2023). These objectives facilitated a comprehensive analysis of how Fintech, competitiveness, and bank performance intersect within Pakistani banks. The study emphasizes the need for ongoing research to understand further the multifaceted impacts and implications of fintech adoption on various dimensions of bank performance and the broader regulatory and institutional factors influencing technology integration within the Pakistani banking sector. This ongoing exploration will aid in devising effective policies and strategies for technology implementation, propelling advancements and innovations within Pakistan's financial landscape (Ibidunni et al., 2022).

In Pakistan, the relationship between fintech adoption, bank competitiveness, and performance, examined through studies by Dwivedi et al. (2021) and OECD (2020), highlights Fintech's potential to enhance bank performance and competitiveness. This integration yields positive outcomes like improved productivity, earnings, and customer satisfaction, enhancing overall bank performance (Razzaque et al., 2020). However, regulatory barriers, cybersecurity concerns, and integration costs hinder traditional banks' competitiveness. Identifying growth areas within Pakistan's financial system presents opportunities for both traditional banks and fintech firms to adapt effectively. Collaboration between these sectors could leverage their strengths and promote a resilient financial ecosystem. Navigating this landscape requires addressing challenges while capitalizing on Fintech's benefits, demanding strategic adaptation from traditional banks and fintech companies for sustained success in Pakistan's competitive financial market (Shiau et al., 2020).

5.1. Implications of the Study

- Fintech adoption can enhance a bank's productivity, creativity, and competitiveness and introduce challenges and complexities.

- Integration of Fintech impacts traditional banking models, necessitating a reevaluation and potential adaptation of existing business models.
- Implementing Fintech in banks is complex, requiring thorough evaluation of customer needs, legal compliance, and cost-effectiveness.
- The benefits of fintech adoption in banking depend on the market's competitiveness; highly competitive markets tend to benefit more than less competitive regions where traditional banking methods prevail.
- The Pakistani government's initiatives aim to address limited access to financial services by integrating Fintech, transitioning away from a closed banking system, and promoting financial inclusion.

5.2. Limitations and Future Recommendations

The study acknowledges limitations concerning data availability, assessed factors, and the generalizability of findings. Data constraints restricted a comprehensive analysis of fintech adoption's impact on bank performance, while critical variables might have been overlooked. The study also recognizes that its findings might not universally apply due to specific contextual factors or variations in the banking landscape. For future research, the study suggests exploring other dimensions of bank performance impacted by Fintech, such as risk management and social responsibility practices. It also recommends examining how fintech adoption affects different bank types, like Islamic and conventional banks, to understand their varied impacts on performance and adaptation. Additionally, it urges an examination of the role of regulatory and institutional factors in facilitating or impeding fintech adoption within Pakistan's banking sector to comprehend the contextual impact of technology integration better.

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