Impact of competition and risks on the financial performance of Pakistani banks: An application of Panzar-Rosse H Statistic

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Abstract
This study investigates how competition influences the financial stability and profitability of Pakistani commercial banks within a dynamic and evolving financial environment. Using panel data of 26 banks operating from 2007 to 2024, the research employs the Panzar-Rosse H-statistic to assess competition levels and fixed-effects regression to explore the relationship between competition, risk-taking behavior, and performance indicators such as return on assets (ROA), return on equity (ROE), net interest margin (NIM), and profitability before taxation. The findings reveal that increased competition enhances banks' profitability, supporting the Structure-Conduct-Performance (SCP) hypothesis, while excessive credit and liquidity risks undermine financial performance. Moreover, larger and well-capitalized banks demonstrate greater resilience and profitability compared to smaller ones. Among industry and macroeconomic factors, e-banking adoption and GDP growth positively contribute to profitability, whereas rapid sectoral expansion and technological substitution, such as mobile financial services, have mixed effects. The results highlight the importance of balanced competition, prudent risk management, and regulatory oversight in promoting sustainable banking performance and financial stability in Pakistan's banking sector. The study offers valuable insights for policymakers and regulators aiming to strengthen market competitiveness without compromising stability.

Introduction
Financial intermediaries play an important role in the development of economies. As financial intermediaries, banks facilitate the efficient capital allocation, manage various types of risks, and provide an important financial service that leads economic growth. So, a robust banking system is essential particularly for developing countries to achieve sustainable economic growth (Shair et al., 2021). The performance of banks play crucial role in economic health and financial stability of every country, particularly in developing countries like Pakistan. The performance of the banking

industries can affect economic growth of the countries while at the same time their insolvencies can result in systemic crises that can result in unfavorable consequences for the economy as whole. The financial system around the globe has undergone several changes in the last three decades to improve the performance of banks. To understand what drives banks performance in developing economies has become more important because banks are facing unique challenges related to market dynamics, resource constrains and regulatory changes (Mansour, Sayed, & Adel, 2023).

Most direct indicator of banks' performance is profitability as it shows ability of banks to generate income relative to their expanses and sustain their operations over time. Actually, profitability indicates how well a bank increases its revenue, manage their costs and ability to adopt according to regulatory requirements and market demand. For Pakistani banks, profitability metrics are not only indicators of success but also measure of resilience because these indicators also show that how will bank can survive with economic uncertainties. It is a main indicator that attracts investments and contributes to the broader economic development, making it most important for shareholders, investors and regulators to monitor. Furthermore, in highly competitive markets, profitable banks are better equipped to face financial crises and capable to adjust against regulatory shifts without compromising their financial stability. Particularly, its importance in Pakistan cannot be overlooked where banks are facing various challenges including inflationary pressure, credit risk management and interest rate fluctuations.

The Pakistani government had initiated and implemented several reforms during last three decades to create more competitive environment and to improve the performance of the Pakistani banks. The Pakistani banking industry has undergone significant transformations since the early 1990s, transitioning from a heavily regulated environment dominated by state-owned banks to a more liberalized structure following financial reforms. These financial reforms were initiated to improve competition level and banks performance in Pakistan.

However, before 2013, most of the Pakistani banks were involved in anti-competitive practices. Therefore, competitive commission of Pakistan (CCP) started inquiry to maintain healthy competition in the Pakistani industry as it influences the performance of banks. As a result of that inquiry the CCP came to know that Pakistani banks were involved in anti-competitive practices. So, State bank of Pakistan imposed a penalty of 25 million on the big seven banks and 30 million on the Pakistan banking association. That inquiry had raised several questions regarding the competitive conditions in the Pakistani banking industry. Although competitive conditions and prudential regulations in the banking industry are tangled in several ways, the stability and strength of the financial sector is directly linked with the degree of competition and concentration (Delis, Staikouras, & Varlagas, 2008). Based on this scenario, it is crucial to investigate the competition dynamics in the Pakistani banking industry, its relationships with various risk-taking behaviors and performance indicators.

Literature Review

The literature is rife with examples of how the role of competition for banks' performance is completely unclear. The studies which observed the relationship between competition and efficiency came up with two hypotheses. The first hypothesis argues that in high competition the relationship of customers and banks is less stable and there is a probability that customers can move to another competitor. This can cause information asymmetry and banks must use more resources for borrowers' screening and monitoring which asserts a negative effect on banks' efficiency. This is known as competition- inefficiency hypothesis and supported by many researchers like,(Mateev, Usman Tariq, & Sahyouni, 2023; Olszak & Kowalska, 2023).

Second hypothesis is known as competition-efficiency hypothesis that suggests that competition leads to enhance performance by fostering efficiency. The scholars in favor of competition-efficiency hypothesis argue that competition motivates banks to enhance lending technologies and borrowers' screening which ultimately improves banks' performance. To support this hypothesis Zarutskie [198] argued "more competition prompts banks to specialize and focus on specific types of loans and targeting a particular group of borrowers". It encourages management to adjust their lending technologies which result in better borrowers screening and reduce lending cost. The competition-efficiency hypothesis is also supported by (Ferreira, 2023; Handoyo, Suharman, Ghani, & Soedarsono, 2023; Tuyet & Ninh, 2023).This prevailing confusion regarding the impact of competition on banks' performance is one of the motivations of this study.

Risk-taking is another important factor that can have a significant impact on the performance of the banks. The modern banking theory demonstrates that the conduct of borrowers, depositors, and the financial markets in which they interact leads to uncertainty in the performance of banks. Commonly referred to as "bank risk-taking," this sort of uncertainty represents the level of risk that banks are ready to accept, which is dependent on corporate governance, competition, and regulation (Abel, Mukarati, Jeke, & Le Roux, 2023; M. H. Pham & Nguyen, 2023; Sharma, Gupta, & Jangir, 2024). According to Beltratti and Stulz (2012) excessive risk-taking was linked to bank runs, fire sales, restricted lending, and financial fragility during the global financial crisis of 2007–2008. Higher capital and liquidity requirements, leverage ratios, countercyclical provisions for loan losses, and other regulatory measures have been implemented by banks authorities in reaction to this behavior (Basel III, 2013; BCBS III, 2010; BIS, 2011). The overall goal of these regulatory measures is to discourage risk-taking by making banks incur higher costs for taking on more risk. Thus, it has become crucial in literature to comprehend how risk-taking affects bank performance. Some studies also conducted observe the impact of risk on the performance of the Pakistan banks like (Hussain, Ihsan, & Hussain, 2016; Saghir & Ch, 2020). However, these studies primarily address credit risk or capital risk; they do not take insolvency risk or liquidity risk into account. Studying the impact of liquidity risk and insolvency risk on the performance of banks is crucial due to their profound implications for financial stability and the overall economy. Liquidity risk

refs to a bank's ability to meet its short-term obligations, while insolvency risk refers to the possibility of a bank's assets falling below its liabilities, leading to bankruptcy. Understanding and managing these risks are essential for maintaining the smooth functioning of the banking sector, as they directly affect a bank's ability to fund its operations, honor customer withdrawals, and lend to the economy. In Pakistan, economic volatility and regulatory requirements pose unique challenges for banking sector to maintain a certain balance between returns and risks. Investigating the impact of risk-taking behaviors on the profitability is crucial to shape regulatory policies and managerial strategies.

In addition to the competition and risks, this study also examines the role of explanatory variables including bank-specific, industry-specific and macroeconomic variables to shape the performance of the Pakistani banks. While competition and risk-taking behaviors are included as primary drivers of banks' performance but these effects do not occur in isolation. Bank-specific variables such as banks' size, capitalization, diversification and operational cost management act as explanatory factors that can mitigate or increase the impact of competition and risks on the performance of banks. For instance, well capitalized and larger banks may have better resources to face competitive pressure and implement more risk-taking strategies to enhance their profits. Similarly, among bank-specific variables, like banking sector development and e-banking influence how banks innovate and enhance their productivity. Among macroeconomic variables, GDP growth rate and information infrastructure development create the external conditions that shape the market opportunities and systemic risks. So, the use of these explanatory variables with competition and risk-taking behaviors provides a comprehensive understanding for the determinants of banks' performance.

Research Methodology

Population and Sampling

Evaluation of this study is based over the period from 2007-2024 and population of this thesis encompasses all commercial banks operating in Pakistan during this period. The banking sector consists of 36 institutions, comprising state-owned banks, private banks, Islamic banks and foreign banks by 2024. To maintain consistency and ensure data reliability, the sample this study will include only those banks that have operated continuously from 2007 to 2024, resulting in a total of 26 banks being selected. This approach ensured a robust longitudinal analysis of the banking sector in Pakistan, accounting for structural changes and temporal trends.

The sample selection is guided by the availability of complete and reliable data. Banks that entered the market after 2007 or had important missing data related to the variables of interest are excluded from the analysis. This decision is obligatory to ensure the accuracy and consistency of the empirical results of this study, as incomplete data could lead to biased or unreliable findings.

To ensure uniformity, all monetary values are converted to Pakistani rupees (in millions). The variables selection and time span are constrained by data availability, particularly for some banks and variables. Despite these limitations, the

comprehensive dataset compiled for this study provides a robust foundation for investigating the nexus among competition, risk-taking behaviors and banks' performance in Pakistan.

Purposive sampling method is employed, as it aims to include all banks that meet the criteria of continuous operation and availability of required data over the entire study period. This method made ensure that the sample is representative of the core banking sector in Pakistan, encompassing diverse ownership structures and operational models, such as foreign, Islamic, state-owned, and private banks. By focusing on a consistent sample over an extended period, this research captures the dynamic interplay between competition, risk-taking behaviors, and bank performance in a rapidly evolving economic and regulatory environment.

Measurement of variables and instruments

The study employed various software tools and methodologies to conduct its empirical analysis. Instruments are selected based on its compatibility with the specific analytical requirements of the research.

Our approach to the study employed the Panzar-Rosse H statistic method to determine the degree to which banks compete with each other. Microsoft Excel is used for data preparation and initial computations and for more complex econometric modeling, such as the Panzar-Rosse model and regression analysis, STATA 17 is utilized. STATA's advanced statistical and econometric capabilities will allow for precise estimation and validation of competition metrics, ensuring robustness in the analysis.

Measurement of risks

The study used the Z-index as an inverse proxy for a bank's insolvency risk, integrating profitability, leverage, and return volatility into a single comprehensive measure. The Z-index is widely recognized in banking research for its ability to monitor potential financial distress, offering a nuanced and holistic assessment of insolvency risk compared to individual financial ratios. By combining multiple financial indicators such as profitability, leverage, liquidity, and asset quality, the Z-index captures the interplay of these elements, providing a more accurate picture of a bank's stability. Its simplicity and practicality make it an accessible tool for researchers and policymakers, enabling quick evaluations of financial health. Additionally, the Z-index is particularly valuable in early warning systems, helping to identify banks at risk of insolvency before significant issues arise, thereby facilitating timely intervention and risk mitigation. The Z-index is frequently used as a risk and stability indicator in empirical literature (Berger, Klapper, & Turk-Ariss, 2009; Noman, Gee, & Isa, 2017; Tan, 2016).

The Z-index is calculated using the formula:

$$Z - \text{Index}_{it} = \frac{\text{ROA}_{it} + \frac{E_{it}}{\text{TA}_{it}}}{\delta \text{ROA}_{it}} \qquad ((1)$$

Where

ROA_{it} represents the average return on assets for bank i during period t.

E_{it}/ TA_{it} denotes the average ratio of equity to total assets for bank i in period t.

δROA_{it} is the standard deviation of the return on assets for bank iii over the specified period.

A high Z-index value reflects financial stability and a low probability of insolvency, while a lower value indicates higher credit risk. As an inverse proxy for credit risk, the Z-index remains a critical measure in understanding a bank's financial soundness.

In addition to insolvency risk, the study measures credit risk using the ratio of loan loss provisions to total loans, where a higher ratio implies lower credit risk. This ratio serves as a direct and interpretable indicator of a bank's exposure to credit risk by reflecting the portion of total loans set aside as provisions for potential loan losses. It is a key measure of a bank's risk management and provisioning strategies, demonstrating its ability to absorb credit losses. A higher ratio indicates a more conservative risk management approach, while a lower ratio could signal potential vulnerabilities. By tracking this ratio over time and across banks, researchers can evaluate the adequacy of credit risk management measures and identify emerging credit concerns. Numerous studies have utilized this ratio to assess credit risk (Guevara, J., & Perez, 2005; Tan, 2016).

In addition to measuring insolvency risk, this study also analyzes credit risk, where the closer to zero a loan loss provision to total loans ratio is, the lower is the credit risk. For a long time researchers in the field of banking use this ratio as a reliable estimate of credit risk because it is a simple and easy to interpret indicator of a bank's vulnerability to possible default of loans. For example, what's unique about the ratio is that it shows what percentage of a bank's total loans that bank sets aside for provisions in case these loans go into default. Consequently, it is a valuable signal of how well banks manage their risks of credit losses as well as their ability to absorb credit losses. A higher ratio means a more conservative and proactive risk management and a low ratio may indicate possible weaknesses and vulnerability increase. By looking at this ratio over time and comparing it across different banks, researchers can measure how well banks are managing their credit risk, gauge the emergence of new credit risks and make a contribution to policy development and numerous studies have relied on this ratio as a pivotal measure of credit risk, including (Guevara et al., 2005; Tan, 2016).

Measurement of competition with Panzar-Rosse H statistic

The methodology followed in this study for the Panzar-Rosse H statistic as applied in this study is the same as that of Tan (2013) and Tahir, Shah, and Afridi (2016) The reduced form of the revenue equation is used to estimate this statistic:

$$\ln TR_{it} = \alpha + \beta 1(\ln w1_{it}) + \beta 2(\ln w2_{it}) + \beta 3(\ln w3_{it}) + \gamma 1(\ln capitalization) + \gamma 2(\ln LOANAST_{it}) + \gamma 3(\ln OITA_{it}) + e_{it} \tag{2}$$

The subscript i is denotes a specific bank and t a particular time period is used in this study. Total revenue-to-total assets ratio, represented as 'TR' is the dependent variable. Interest revenue is disfavored in recent years because total revenue has

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grown, in particular, non-interest income on off balance sheet activities and fee based products. As banks compete on both fronts in a more competitive banking environment interest and non-interest income is less distinguishable. Following the intermediation approach, this study assumes that banks utilize three key inputs: deposits, labor and capital. lnw1 denotes the average cost of funds, which is the ratio of interest expense divided by total funds; lnw2 denotes averaged cost of labor, which is the ratio of personnel expense divided by total assets; and lnw3 denotes averaged cost of capital, which is the ratio of other operating expenses divided by fixed assets.

The equation also includes several bank specific variables, such as capitalization, liquidity and product mix. These variables are denoted by the equity-to-total-assets ratio, loans-to-total-assets ratio, and other income-to-total-assets ratio, respectively. It is expected that the coefficient for capitalization will be positive because the higher capital ratio means a higher risk loan portfolio or the higher revenue. But, Molyneux, Lloyd-Williams, and Thornton (1994) also seemed to suggest that lower capital ratios can still lead to higher bank revenues. It is assumed that the coefficient on loan to total assets should be positive because initially higher loan volume would also result in greater overall bank revenue. Likewise, the other income-to-total asset ratio is also expected to have a positive relationship as increases in volume of non-interest income are directly adding to total revenue.

H- statistic can be estimated by summing the elasticities of total revenue with respect to the input prices w1,w2 and w3.

$$H = \beta1 + \beta2 + \beta3 \tag{3}$$

For the Panzar-Rosse H statistic to be valid, it mandatory to test data that mirrors a market in long-run equilibrium. For long-run equilibrium test, lnTR in the equation is replaced with lnROA and the H-statistic is computed by summing the elasticities of return on assets with respect to the input prices, as shown in equation (4). It is expected that the resulting H-statistic will be equal to zero if the market is in long run equilibrium and to be negative if the market is in disequilibrium.

$$lnROA_{it} = \alpha + \beta1(lnw1_{it}) + \beta2(lnw2_{it}) + \beta3(lnw3_{it}) + \gamma1(\,lncapitalization) + \gamma2(lnLOANAST_{it}) + \gamma3(lnOITA_{it}) + e_{it} \tag{4}$$

Data collection Procedure

The research data of the current study will be collected from both the published as well as the unpublished sources and therefore the key data source of the current study will be secondary data, which will include banks annual statements, SBP, Finance ministry, and World Bank. Measures for the selected banks will include size, capitalization, cost to operate, diversification and risk, profitability, and competition measurement variables will be obtained from the annual financial reports of the selected banks.

GDP and inflation will be macroeconomic variables that will be obtained from official reports and publications. Data for banking sector's contribution to GDP and no of mobile subscribers per 100 persons will be collected from World Bank databases. To

ensure uniformity, all monetary values will be converted to Pakistani rupees (in millions).

Modeling the impact of competition and risk-taking behaviors on Profitability

To examine the impact of competition and risk-taking behaviors on bank performance, this study employs a fixed-effects regression model. Given that banks exhibit heterogeneous characteristics, such as differences in management practices, risk appetite, and regulatory constraints, the fixed-effects (FE) model is employed to control for unobserved, time-invariant heterogeneity that may influence bank performance (Baltagi & Baltagi, 2008). By differencing out these unobserved effects, the FE model produces more reliable estimates, reducing the risk of omitted variable bias (Wooldridge, 2002). The selection of the fixed-effects model over the random-effects (RE) model is justified through the Hausman test (Hausman, 1978). If the test indicates significant differences in coefficients between the FE and RE estimations, the FE model is preferred as it provides consistent estimates under the assumption that bank-specific unobserved characteristics correlate with explanatory variables. In contrast, the RE model assumes that unobserved effects are uncorrelated with independent variables, an assumption that is often violated in banking studies due to differences in bank size, governance, and strategic orientation (Arellano, 2003). By incorporating fixed effects, this study ensures that the analysis focuses on within-bank variations over time, eliminating potential confounding effects from omitted variables that remain constant across banks.

Using the fixed-effects method, this study will examine how risk-taking behavior along with industry competition on profitability, following the methodologies of (Alhassan & Ohene-Asare, 2016; Ariff & Luc, 2008; Derbali, 2021; Saka, Aboagye, & Gemegah, 2012). The relationships are modeled as follows:

$$\text{Profit}_{it} = \alpha + \beta1\text{Competition}_{it} + \beta2\text{Risk}_{it} + \beta3\text{X}_{it} + \beta4\text{Inds}_{it} + \beta5\,\text{Macro}_t + \text{Dummy}_t + e_{it} \qquad (5)$$

Here, subscript i and t denotes banks and years respectively. Competition$_{it}$ represent market competition that is measured with Panzar-Rosse H statistic. Risk$_{it}$ comprises a vector of risk variables including the liquidity, insolvency and credit risks. X$_{it}$ includes bank-specific variables such as banks size, capitalization, operational cost management and diversification. Inds$_{it}$ are industry-specific variables such as E-banking and banking sector development. Macro$_{it}$ represent macroeconomic variables including GDP and information infrastructure development. Lastly, financial crises are accounted for using dummy variables to observe their effects on the Profitability of Pakistani banks.

Results and Discussions
Descriptive statistics for banks profitability in Pakistan
presents the descriptive statistics for profitability indicators of Pakistani banks, highlighting notable variations among different bank categories. Foreign banks emerge as the top performers in terms of PBTTA, ROA, ROE, and NIM, exhibiting

higher average values compared to private, Islamic, and state-owned banks. Notably, foreign and private banks demonstrate greater volatility in earnings PBTTA, reflecting their exposure to market dynamics and risk factors. Furthermore, foreign banks consistently outperform other categories in terms of profitability metrics, reflecting their competitive advantages and operational efficiencies within the Pakistani banking landscape.

Table 1 presents the descriptive statistics for profitability indicators of Pakistani banks, highlighting notable variations among different bank categories. Foreign banks emerge as the top performers in terms of PBTTA, ROA, ROE, and NIM, exhibiting higher average values compared to private, Islamic, and state-owned banks. Notably, foreign and private banks demonstrate greater volatility in earnings PBTTA, reflecting their exposure to market dynamics and risk factors. Furthermore, foreign banks consistently outperform other categories in terms of profitability metrics, reflecting their competitive advantages and operational efficiencies within the Pakistani banking landscape.

Table 1 Group wise summary of profitability indicators

Variables	Observations	Mean	Standard.Dev.	Min	Max
Overall banks					
PBTTA	468	-0.029	0.426	-4.669	0.211
ROA	468	0.008	0.011	-0.019	0.042
ROE	468	0.094	0.135	-0.377	0.492
NIM	468	0.031	0.012	0.001	0.065
Private banks					
PBTTA	288	0.009	0.052	-0.492	0.211
ROA	288	0.008	0.011	-0.019	0.034
ROE	288	0.1	0.134	-0.377	0.365
NIM	288	0.03	0.012	0.001	0.065
State owned banks					
PBTTA	72	-0.242	1.063	-4.669	0.037
ROA	72	0.006	0.01	-0.015	0.025
ROE	72	0.061	0.156	-0.231	0.373
NIM	72	0.028	0.012	0.002	0.061
Islamic banks					
PBTTA	72	0.005	0.012	-0.024	0.024
ROA	72	0.003	0.008	-0.017	0.015
ROE	72	0.066	0.108	-0.162	0.349
NIM	72	0.033	0.009	0.009	0.052
Foreign banks					
PBTTA	36	0.035	0.016	0.001	0.067
ROA	36	0.024	0.01	0.001	0.042

ROE	36	0.171	0.12	0.01	0.492
NIM	36	0.042	0.013	0.017	0.061

Figure 1 presents the descriptive statistics for profitability indicators of Pakistani banks, highlighting notable variations among different bank categories. Foreign banks emerge as the top performers in terms of PBTTA, ROA, ROE, and NIM, exhibiting higher average values compared to private, Islamic, and state-owned banks. Notably, foreign and private banks demonstrate greater volatility in earnings PBTTA, reflecting their exposure to market dynamics and risk factors. Furthermore, foreign banks consistently outperform other categories in terms of profitability metrics, reflecting their competitive advantages and operational efficiencies within the Pakistani banking landscape.
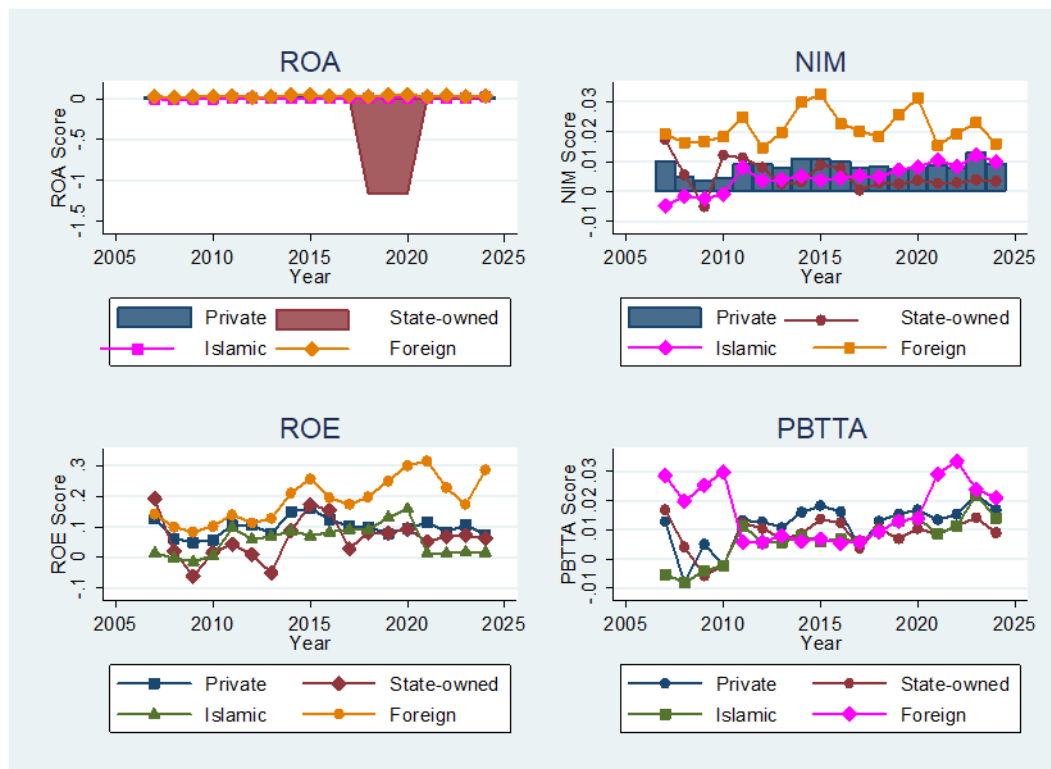

Figure 1 Profitability indicators of Pakistani banks

The summary statistics presented in Table 2 offer insights into the performance and characteristics of the Pakistani banking industry over the study period. It is evident that the PBTTA of the industry exhibited volatility, with values ranging from -4.67 to 0.21. Notably, the average return on assets (ROA) was reported at 0.8%, indicating a moderate level of profitability for Pakistani banks. However, the return on equity (ROE) reflected higher profitability potential, with an average of 9.4%, although it also demonstrated considerable variability, ranging from -37.7% to 49.2%. The industry's net interest margin averaged at 3.1%, surpassing both profitability before taxation to total assets ratio (PBTTA) and ROA. Moreover, the analysis of bank-

specific variables revealed that private banks tended to be larger in size compared to state-owned, Islamic, and foreign banks, as indicated by an average size of 12.37. Interestingly, the statistics indicated that Pakistani banks were more inclined towards liquidity risk (0.092) than credit risk (0.082), suggesting a proactive approach towards generating higher profit margins by accepting increased liquidity risk. These findings provide valuable insights into the performance dynamics and risk management strategies within the Pakistani banking sector, highlighting areas of strength and potential areas for improvement.

Table 2 Descriptive statistics of all variables

Variables Overall banks	Observations	Mean	Standard .Dev.	Min	Max
PBTTA	416	-0.029	0.426	-4.669	0.211
ROA	416	0.008	0.011	-0.019	0.042
ROE	416	0.094	0.135	-0.377	0.492
NIM	416	0.031	0.012	0.001	0.065
Size	416	12.371	1.285	9.098	15.109
Capitalization	416	0.098	0.064	-0.025	0.349
Diversification	416	0.153	0.07	-0.037	0.369
Operational cost management	416	0.029	0.031	0.004	0.48
Credit risk	416	0.082	0.053	0.001	0.232
Liquidity risk	416	0.092	0.037	0.034	0.314
Z-index (Insolvency risk)	416	17.251	16.782	-4.958	274.947
Banking sector development	416	0.517	0.038	0.454	0.587
E-Banking	416	0.183	0.121	-0.004	0.343
GDP	416	0.036	0.018	0.004	0.058
Information infrastructure development	416	64.286	10.483	39.204	79.5

Impact of risk and competition on the profitability of banks
This study uses fixed effect model By following the work of Goswami, Hussain, and Kumar (2019), who claimed that fixed effects model and random effects model are more appropriate and widely used techniques for panel data analysis. This study uses fixed effect models to investigate the impact of competition on the risk-taking behaviors of the Pakistani banks. To avoid heteroscedasticity problem fixed effect is used with robust standard error. We also applied Hausman test to choose between fixed-effect and random-effect model. Results of the Hausman test confirms that fixed effect model is more appropriate for our data set. Utilizing fixed effect models to examine the impact of risk-taking behaviors and competition on profitability

indicators in the banking sector is imperative for robust and reliable analysis. By controlling for unobserved heterogeneity across banks, these models effectively isolate the time-invariant factors that may bias the estimation of the relationship between risk-taking behaviors, competition, and profitability indicators (Berger & DeYoung, 1997; Bonin, Hasan, & Wachtel, 2005).This address concerns related to endogeneity and omitted variable biases, ensuring the validity of the findings (Claessens & Laeven, 2004; Maudos & De Guevara, 2004).Additionally, fixed effect models accommodate the panel data structure inherent in the analysis, allowing for the capture of within-bank variations over time (Beck, Demirgüç-Kunt, & Levine, 2006; DeYoung & Rice, 2004). This dynamic approach enhances the accuracy and consistency of the results, enabling policymakers to make informed decisions regarding financial stability and competition promotion within the banking industry (Fu, Lin, & Molyneux, 2014; Pasiouras, Tanna, & Zopounidis, 2009).Moreover, the use of fixed effect models facilitates more reliable policy recommendations by disentangling the effects of risk-taking behaviors and competition from other confounding factors. Hence, employing fixed effect models is essential for synthesizing diverse factors and providing comprehensive insights into the intricate relationship between risk-taking behaviors, competition, and profitability in the banking sector.

The empirical results presented in Table 3 shed light on the impact of competition and risk-taking behaviors on the profitability of Pakistani banks, alongside other explanatory variables encompassing bank-specific, industry-specific, and macroeconomic factors. Notably, competition, measured through the Panzar-Rosse H statistic, exhibits a significant positive relationship with all four profitability indicators, aligning with the Structure-Conduct-Performance (SCP) hypothesis. According to the SCP hypothesis, market structure (i.e., the degree of competition) impacts firms' behaviors (i.e., how they compete), which in turn has an impact on their performance (i.e., profitability). There are some factors that motivated the Pakistani banks to improve their performance while the increase of competition. One important factor is when banks faced higher competition, they motivated to streamline their operations, reduce costs, and improve efficiency (Shair et al., 2021). They adopted more effective technologies and processes to deliver services at lower costs. Improved efficiency allowed the Pakistani banks to maximize their profits by optimizing resource allocation and reducing wasteful expenditures. Another important factor is that during higher competition, the Pakistani banks strived to provide better customer service to differentiate themselves. They offered personalized assistance, faster response times, and improved convenience through digital channels. By delivering superior customer experiences, several banks retained existing customers and attracted new ones, leading to increased profitability. Finally, Innovation and Differentiation is another important factor that helped the Pakistani banks to increase their profitability while increase of competition. The competition usually motivates banks to innovate. They might launch brand-new goods, services, and technologies that better serve consumers. These new technologies particularly digital transactions (ATM machines, mobile banking and internet banking) help banks to gain market

share, improve revenue, and draw in more consumers by providing distinctive and value-added services (DeYoung & Roland, 2001). With the introduction of modern technologies, in Pakistan digital transactions increased in last decade where ATM, internet and banking mobile banking transactions increased 611%, 1994% and 88050% respectively. These digital transactions allowed banks to improve efficiency, cut expenses, increase client base, and take advantage of data-driven insights. By enhancing operational effectiveness, creating new revenue streams, and lowering the risks and expenses related to conventional banking procedures, these aspects help to boost profitability. Our findings are consistent with (Kuknor & Rastogi, 2021; T. Pham, Talavera, & Yang, 2020; Singh & Rastogi, 2020) who argued that competition leads to increase banks profitability. On contrary, these findings are in direct contrast with (Chronopoulos, Liu, McMillan, & Wilson, 2015; Goddard, Liu, Molyneux, & Wilson, 2011; Rakshit & Bardhan, 2022) who argued that higher market power is the pre-condition for banks profitability.

With regards to risk-taking behaviors, this study used loan loss provisions to total loans ratio as a proxy of credit risk. Results conforms that credit risk has negative relationship with all four profitability indicators. This result can be explained by the fact that the Pakistani banks with low quality loans face greater credit risk. Consequently, the Pakistani banks must increase their loans loss provisions by compromising their profitability. These findings are consistent with the findings of (P. P. Athanasoglou, Brissimis, & Delis, 2008; Rakshit & Bardhan, 2022) who argued that increase exposure to credit risk is usually related with reduction of banks profitability. It suggests that banks should improve profitability with proper borrowers screening and monitoring of credit risk that will help them in forecasting future levels of risk. Our findings are mixed with respect to liquidity risk. On one side, it shows significant positive relationship with ROE which indicates that banks that keeps fewer liquid assets with them earn more profit. It can be explained by the reason that the Pakistani banks that invest more money instead of keeping more liquid assets earn more profits. On other side, the significant positive coefficient of liquidity risk with NIM and PBTTA in all three tables show that higher liquidity risk reduced profitability (PBTTA) of the Pakistani banks. This negative impact of liquidity risk on profitability indicates the inability of the Pakistani banks to manage liquidity and asset quality, which in turn increases the probability of default and reduces profitability in the Pakistani banks. the later result is in direct contrast with the findings of (Rakshit & Bardhan, 2022) who investigated the impact of risk on the profitability of the Indian banks. Z- index that we used as an inverse proxy of the insolvency risk shows significant positive coefficients at 1% level with ROA, NIM and PBTTA respectively. This result is consistent with Tan (2016), who argued that banks with lower probability of insolvency earns more profits.

With regards to bank-specific variables, size shows significant positive relationship with ROA, NIM and PBTTA which is consistent with (P. Athanasoglou, Delis, & Staikouras, 2006; Saona, 2016). It may be due to the reduction of cost from economies of scale and better monitoring technologies of large banks to mitigate non-performing loans, which ultimately tends to enhance profitability. The capitalization

shows significant positive coefficients with all profitability Indicators in all three tables. It's because highly capitalized banks are usually less dependent on external funding which helps to reduce funding costs and increase their profitability. Besides, these highly capitalized banks are sound enough to endure their profitability even during economically challenging times. The impact of operational cost management on banks' profitability is mixed, it positively affects net interest margins and PBTTA while negatively affect return on equity of Pakistani banks. It shows when the banks decrease their operational cost; it can increase profitability (ROE) because reduction of cost automatically increases profitability. On the other side banks increase their operational costs by giving more compensation to their competent and hardworking employees who in return play their role to increase banks' profitability (NIM).

With regards to industry specific variables, the coefficients of banking sector development show a significant negative relationship with all profitability indicators that is opposite to our expectation. Findings of the study indicate a significant negative effect of banking sector development on the profitability of Pakistani banks. This implies that as the banking sector develops and expands, it has a detrimental impact on the profitability of individual banks operating within that sector. There are some important reasons behind this observation. First, increased competition within the Pakistani banking sector led to decrease interest rate spreads that reduced banks' profitability margins. Moreover, higher regulatory requirements and compliance costs associated with a developed banking sector also contributed to reduced profitability for individual banks. This result is consistent with the findings of Demirgüç-Kunt and Huizinga (1999) and opposite to the Tan and Floros (2012).

E-Banking has a significant positive impact on all profitability indicators. This suggests that the Pakistani banks adopted and utilized the electronic banking services that successfully contributed to enhanced profitability for banks in Pakistan. E-banking encompasses various digital channels such as online banking, mobile banking, and electronic payment systems, which offer convenience and accessibility to customers. In Pakistan digital transactions increased substantially in last decade where ATM, internet and mobile banking transactions increased 611%, 1994% and 88050% respectively. These transactions increased banking operations which ultimately assert positive impact on the profitability of the Pakistani banks. By embracing E-banking, the Pakistani banks successfully reduced their operating costs associated with traditional brick-and-mortar branches, that helped to enhance profitability. Moreover, E-banking enabled Pakistani banks to reach a wider customer base, expand their service offerings, and potentially increase revenue streams. The positive relationship between E-banking and profitability reflects the evolving customer preferences towards digital banking solutions and highlights the importance of technological innovation in the banking industry. However, it is crucial for banks to ensure robust cybersecurity measures and provide a seamless user experience to capitalize on the profitability potential of E-banking in the Pakistani market.

GDP growth rate has significant positive coefficients with NIM and PBTTA in all tables. This positive impact of the GDP on the profitability can be explained by the following reasons: first, during the period of stable economic conditions, investment

had grown substantially and increased in the volume of traditional and non-traditional activities that help banks to reduce their costs through the economies of scope and economies of scale. This reduction of costs increases profitability. Furthermore, during the period of economic stability, in addition to the increase in volume of loan business, the quality of borrowers also improved. So, the reduction in loan defaults also decreased the cost for risk monitoring that ultimately asserted positive influence on the banks' profits.

Information Infrastructure development which is measured by number of mobile subscribers per 100 persons in the country negatively affected Banks's profitability (NIM). It's because the cellular companies are offering many shadow banking services in Pakistan. These services include money transfer and holding cash in customers' mobile accounts. So, by using these services people can send and receive money just showing their national identity cards. This practice is very common in every village and city in all over Pakistan. So, the customers prefer small money transactions through mobile companies rather going to the banks because it is more convenient for them. So, in this way mobile companies are sharing banks' profits which negatively affect banks' interest margins.

To investigate the impact of global financial crises on the profitability of the Pakistani banks we used years 2008 and 2009 as dummy variables. The estimated results on the impact of financial global crises on the profitability of the Pakistani banks are not clear. The results show that during financial crises ROA and ROE of the Pakistani banks still increased while NIM and PBTTA decreased during the same period. These results can be explained by the fact that prudent regulatory and supervisory measure and small number of foreign banks operating in Pakistan helped the Pakistani banking industry unaffected during the global financial crises.

Table 3 Impact of competition and risk-taking behaviors on Profitability when competition is measured with the Panzar-Rosse H statistic

	(9) ROE	(10) ROA	(11) NIM	(12) PBTTA
H-Statistic	0.133*** (4.07)	0.00637* (2.44)	0.00744* (2.46)	0.298* (2.00)
Credit risk	-0.850*** (-6.50)	-0.0628*** (-6.01)	-0.0439*** (-3.63)	-1.615** (-2.71)
Liquidity risk	-0.0728** (-3.38)	-0.0137 (-0.89)	0.0428* (2.40)	3.391*** (3.86)
Insolvency risk	0.000404 (1.21)	0.000317*** (5.18)	0.000330*** (6.07)	0.000807*** (7.05)

Size	0.0340***	0.00143**	0.000398	0.241***
	(3.32)	(3.75)	(0.42)	(5.18)
Capitalization	0.379**	0.0157**	0.0481***	0.713**
	(2.94)	(3.53)	(4.03)	(3.21)
Diversification	0.170	0.0154	-0.0323***	0.0159
	(1.70)	(1.93)	(-3.50)	(0.04)
Operational cost management	-0.110**	-0.00391	0.0267**	0.417
	(-3.28)	(-0.30)	(3.79)	(0.57)
Banking sector development	0.106	-0.0143	-0.0436**	-1.976**
	(0.73)	(-1.24)	(-3.27)	(-3.00)
E-banking	0.0198**	0.00221***	0.00186**	0.101**
	(3.56)	(5.79)	(3.57)	(3.63)
GDP growth	0.177	0.00260	0.00637**	4.147***
	(0.66)	(0.12)	(3.26)	(3.39)
Information infrastructure development	-0.000792	-0.000629	-0.000793***	0.000629
	(-0.81)	(-0.71)	(-4.36)	(0.43)
Financial Crises	-0.0510***	-0.00462***	0.00410**	0.203**
	(-3.44)	(-3.90)	(2.99)	(3.00)
Constant	-0.436**	-0.00221	0.0433**	-2.566***
	(-3.01)	(-0.19)	(3.24)	(-3.89)
R-Squared (overall)	0.5366	0.4048	0.3180	0.1899
R-Squared (Between)	0.7021	0.5188	0.1233	0.3144
F-Statistic	7.56	8.77	10.21	6.18
P-Value	0.0000	0.0000	0.0000	0.0000
Observations	468	468	468	468

Conclusion And Policy Recommendations

The study provides empirical analysis of financial performance of Pakistani banks. First, this study explains all explanatory variables and their expected return on the profitability of Pakistani banks. Later, it calculated banks profitability with respect to return on assets, return on equity, net interest margin and profitability before taxation. Descriptive statistics show that foreign banks performed better in term of all

profitability indicators, followed by private, Islamic and state-owned banks respectively. Later we investigated the impacts of risk and competition on the profitability of banks. We used fixed effect model to observe the impacts of risk and competition on profitability. Results show that the competition has a significant positive relationship with respect to all four profitability, which is in line with the Structure- Conduct-Performance (SCP) hypothesis. As far as the impact of various types of risk is concerned, we found insolvency risk negatively affects ROA, ROE and net interest margin. However, liquidity risk asserted positive impact on profitability.

Among bank-specific variables, size had a significant positive impact on profitability. It shows that larger banks can reduce their costs from economies of scale and have better monitoring technologies to mitigate non-performing loans, which ultimately tends to enhance their profitability. Capitalization showed a significant positive impact on profitability because highly capitalized banks are usually less dependent on external funding which helps to reduce funding cost and increase their profitability. Operational cost management asserted negative impact on PBT and ROE while positive impact on NIM. The result also revealed that banking sector in Pakistan asserted negative effect on profitability of banks. It shows that with the development of the banking sector competition in industry increased, which ultimately negatively affects profitability. Information infrastructure development negatively affects profitability, but GDP growth asserted positive impact on the profitability of banks. It shows that during stable economic conditions investment had grown substantially and increased in the volume of traditional and non-traditional activities that helped banks to reduce their costs through economies of scope and economies of scale. It ultimately asserted positive impact the profitability of banks.

Policy Recommendations

The results of our study are helpful for the Pakistani government and regulatory authorities to improve the performance of the Pakistani banks. The study suggested following policy recommendations to regulatory authorities in Pakistan to improve banks performance.

First, Policymakers should concentrate on establishing a competitive environment through facilitating market entrance and regulatory control in order to take advantage of the good benefits of competition on profitability in the Pakistani banking business. Additionally, it is important to support technology progress, improve financial inclusion, and make investments in the growth of human capital. Policymakers can establish an environment that leverages the advantages of competition while fostering sustainable growth and efficiency in Pakistani banks by supporting healthy competition, facilitating digital transformation, enhancing access to financial services, and developing talented staff.

Second, strict regulatory policies should be implemented for proper borrowers screening and monitoring to minimize credit risk which adversely affected profitability of the Pakistani banks. Third, Pakistani banks should be encouraged to engage in more loan business with proper risk management. Holding more liquid

assets negatively affected the efficiency and total factor productivity growth, so regulatory authorities should encourage banks to be involved in lending activities with effective borrowers screening, it will also help to enhance investment opportunities in the economy by providing timely loans to entrepreneurs.

Fourth, relevant policies can be made by the State bank of Pakistan to increase capital for Pakistani banks. Higher capital works as cushion to absorb risks and high capitalized banks also engaged more in traditional loan activities, which proceeds an increase in output and enhance performance of banks. Furthermore, high capitalized banks have a good reputation and are capable of attracting more customers and also increase number of transactions which can assert positive impact on the performance of banks.

Finally, the Islamic banking should be encouraged more as it is contributing positively to improving the performance of Pakistani banks with respect to profitability. They performed better as compared to the private and state-owned banks since the last decade.

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