

THE EMPIRICAL MEASUREMENT OF COMPETITION AND DIGITALIZATION FOR THE BANKING SECTOR OF KYRGYZSTAN: IMPACTS OF EFFICIENCY, PROFITABILITY, AND STABILITY

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ABSTRACT

This study investigates the competitive dynamics and digitalization within Kyrgyzstan's banking sector. The study analyzes the interplay between bank competition, digitalization, profitability, and stability using the two-step Generalized Method of Moments. Banking competition is assessed from 2012 to 2022 via the Lerner Index and the Boone Indicator. Furthermore, a novel method is employed to estimate the bank digitalization index based on the System Dynamics Approach. Findings indicate a competitive landscape marked by monopolistic competition, where digitalization enhances operational efficiency and competitive advantage. However, increased market power inversely affects digital adoption, suggesting monopolistic banks innovate less than their competitive peers. Further, the study highlights that intensified competition and digital adoption may encourage riskier bank behaviors, aligning with competition-fragility theory. Digitalization improves profitability, advocating for banks to adopt innovations to surpass competitors and improve financial performance. Policymakers are advised to foster a balanced competitive environment that encourages innovation without compromising bank stability.

Keywords: bank competition; digitalization; profitability

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INTRODUCTION

The banking system is a fundamental component of every economy, as demonstrated by the global average bank assets to GDP ratio of 70% (The Global Economy, 2022). Its key functions of maturity transformation and facilitating payments make the banking system foundational to economic infrastructure (Melicher & Norton, 2013). As a result, disturbances in the banking industry can have a substantial effect on the entire economy, underscoring the scholarly importance of investigating bank competition.

Like other sectors, bank competition can benefit consumers and the broader economy by enhancing customer service, lowering prices, and providing better-quality financial services (Jia & Liu, 2024). Competition also helps to stimulate efficiency and innovation in the financial sector (Claessens, 2009). However, bank competition has unique attributes that distinguish it from other sectors. Some research has indicated that increased competition may prompt banks to assume greater risks (López-Penabad et al., 2021), while others have argued that limited competition contributes to the

fragility of the financial system (Clark et al., 2018).

Furthermore, continuous technological advancements worldwide are reshaping the competitive dynamics in the banking sector (Theiri & Hadoussa, 2024). A rising number of fintech companies offer innovative payment and financial solutions, which pose significant challenges to traditional banks, thereby introducing "external" competition. As a response, many banks are integrating digital technologies into their operations to enhance efficiency and customer experience (Versal et al., 2022). Specifically, in Central Asia, there is an anticipated surge in the digital banking market, with expectations of a consistent annual growth rate of 7.73% from 2024 through 2028, signaling a significant shift towards digital banking solutions in the region (Digital Banks - Central Asia, 2023). At the same time, commercial banks face "internal" competition from both domestic and international banking entities. Additionally, strict regulations imposed by central banks often restrict banks from effectively addressing competitive challenges.

Against the abovementioned backdrop, the concept of competition in the banking sector has received increased attention among scholars and practitioners over the last decade. While conceptual studies have focused on developing innovative methods to assess competition, empirical research has explored the relationship between bank competition and economic growth (Rakshit & Bardhan, 2019), bank stability (Clark et al., 2018), and performance (Tan, 2016). To the best of the author's knowledge, there is a notable gap in research on Kyrgyzstan's banking sector, with the existing studies mainly targeting more developed banking systems. Additionally, no studies have yet explored the relationship between bank digitalization and competition (Begimkulov, 2023).

In this context, the current research is focused on two key objectives. First, the study aims to contribute to the existing body of literature by empirically measuring competition and digitalization in Kyrgyzstan's banking sector. Second, it investigates how bank competition and digitalization interact and influence the stability and performance of the banking sector.

LITERATURE REVIEW

Competition

The empirical literature on measuring bank competition is based on two key approaches: the Structure-Conduct-Performance (SCP) Paradigm and the New Empirical Industrial Organization (NEIO).

The SCP paradigm focuses on measuring the characteristics of market structure, such as the number of institutions, size, assets, capital, and other similar measures of organizational structure. These factors impact the conduct variable of organizations, such as price, quality of products, expenses, etc. Consequently, the conduct variable directly affects organizational performance, e.g., sales, profits, costs, etc. (Mason, 1939; Bain, 1956). The SCP paradigm is based on three key measures: the number of companies, the concentration ratio (Hall & Tideman, 1967), and the Herfindahl-Hirschman Index (Hirschman, 1964). The main advantages of the paradigm include low data requirement, straightforward interpretation, and empirical testability (Leon, 2014). However, it has some conceptual and practical limitations mentioned in the empirical literature (Claessens, 2009).

The NEIO approach estimates the competition without incorporating explicit information about the market structure. Unlike SCP, NEIO is considered more data-intensive and focuses on directly observing organizational metrics such as profit, price, cost, etc. (Leon, 2014). The NEIO approach includes such methods as the Lerner Index (Lerner, 1934), the Panzar-Rosse Model (Panzar & Rosse, 1987), and the Boone Indicator (Boone, 2008). Despite some theoretical and empirical limitations mentioned in the literature (Bulow & Klemperer, 2002) and high complexity in estimations, NEIO methods are characterized by scholars as more precise and informative (Leon, 2014).

Bank competition

Numerous academic studies have been devoted to investigating competition among banks. The importance of banks in supporting economic activities has led researchers to study the effect of bank competition on economic conditions. Overall economic growth alongside appropriate regulatory measures can boost the efficiency of financial intermediation, thus

promoting healthy bank competition (Coccorese, 2008).

Moreover, the distinctive nature of banking operations and strict regulations require banks to balance between stability and competitiveness, a subject widely investigated in empirical research. The "competition-fragility" view proposes that heightened competition may encourage risk-taking among banks (Khattak et al., 2022; López-Penabad et al., 2021; Yudaruddin, 2022). The contrary viewpoint, termed "competition-stability," argues that intensified competition contributes to the stability of banks (Clark et al., 2018; Srivastava et al., 2023).

Besides stability, the profitability of banks is vital for overcoming economic downturns and contributing to the continuous growth and development of the financial system. Some studies have identified a negative relationship between high bank competition and their profits, aligning with a competition-fragility view (Khattak et al., 2023). Conversely, opposing findings have suggested a positive relationship between increased bank competition and bank performance (Zoghلامي & Bouchemia, 2021).

Digitalization

The concept of digitalization in banking is not yet clearly defined (Versal et al., 2022). However, digital transformation has significantly reshaped the financial services sector, including payment systems, deposit acceptance, and lending practices (Khattak et al., 2023). Scholars have explored the bank digitalization (BD) processes, highlighting the effects on competition, stability and bank performance (Jia & Liu, 2024; Khattak et al., 2023).

BD has transformed bank activities by improving responsiveness to market competition and consumer demands, thus expanding the consumer base (Xie & Wang, 2023). BD has improved data collection and processing, enabling precise identification of customers and improving bank profitability and risk management (Guo & Liang, 2016).

Implementing digital innovations has allowed banks to improve performance and productivity by lowering marginal costs (Carbó-Valverde, 2017). Consequently, BD has resulted in above-average return on assets (ROA), highlighting enhanced operational efficiency and profitability

(Versal et al., 2022). Nevertheless, BD might negatively influence bank stability due to the substantial accumulation of risky assets (Carbó-Valverde, 2017).

METHODOLOGY

Estimating Competition

The Lerner Index (LI) is considered one of the most popular measures of bank market power among empirical studies (Leon, 2014). The index is based on the disparity between a firm's pricing and marginal cost, identifying its market power (Lerner, 1934). LI for a bank i at a period t is:

$$L_{it} = \frac{P_{it} - MC_{it}}{P_{it}} \quad (1)$$

where P_{it} is the output price proxied by the ratio of total revenues (interest and non-interest income) to total assets, and MC_{it} denotes marginal cost. LI can vary from 0 in the case of perfect competition to 1 in a monopoly (Lerner, 1934).

Another popular measure of bank competitiveness is the Boone Indicator (BI). According to BI, more efficient firms have greater market shares, and the advantage becomes more pronounced as competition intensifies (Boone, 2008). This study used marginal cost instead of the average cost, as the latter is generally assumed to be a weaker proxy for efficiency (van Leuvensteijn et al., 2011). Based on this, the following equation will be used to estimate the Boone indicator:

$$\ln \pi_{it} = \alpha + \beta \ln MC_{it} \quad (2)$$

where β denotes the Boone indicator; the value of β becomes increasingly negative as the level of competition intensifies (van Leuvensteijn et al., 2011).

Marginal cost (MC) must be derived to calculate both LI and BI. Given that the bank's marginal cost cannot be directly observed, it is essential to determine the total cost (TC) function to derive MC. TC is derived from the trans-logarithmic cost function (TCF), as initially proposed by Gilligan et al. (1984). This approach allows for the aggregate of costs across key bank activities instead of estimating each cost separately. The formula for TCF is written as follows:

$$\ln(TC_{it}) = \beta_0 + \beta_1 \ln Q_{it} + \frac{1}{2} \beta_2 \ln Q_{it}^2 + \sum_{k=1}^3 \gamma_{kt} \ln W_{k,it} + \sum_{k=1}^3 \phi_k \ln Q_{it} \ln W_{k,it} + \frac{1}{2} \sum_{k=1}^3 \sum_{j=1}^3 \ln W_{k,it} \ln W_{j,it} + \varepsilon_{it} \tag{3}$$

where TC_{it} represents total costs, which is the sum of interest expenses, paid commissions and fees, trading expenses, salaries, and other administrative and operating expenses of bank i at time t . Q_{it} is the total output of the bank, which is proxied through total assets. $W_{k,it}$ represents three prices of k^{th} inputs, i.e., labor, deposits, and capital (Fungáčová et al., 2014). The price of labor is estimated as the ratio of personnel expenses to total assets (Prayoonrattana et al., 2020). The price of deposits is calculated as the ratio of interest expenses to total deposits. The price of capital is estimated as the ratio of other administrative expenses to total assets (Zoghlami & Bouchemia, 2021).

The coefficients identified in equation 3 are used to estimate MC:

$$MC_{it} = \frac{\partial TC_{it}}{\partial Q_{it}} = \frac{TC_{it}}{Q_{it}} (\beta_1 + \beta_2 \ln Q_{it} + \sum_{k=1}^3 \phi_k \ln W_{k,it}) \tag{4}$$

Estimating Bank Digitalization

According to the International Monetary Fund, digital financial services include traditional banking services such as deposits, transactions (including debit and credit cards), and loans, all facilitated via digital channels (Agur et al., 2020). Digital channels encompass various electronic tools such as ATMs, POS terminals, internet banking, mobile applications, and electronic wallets (Versal et al., 2022). In line with this, the level of bank digitalization is estimated following the methodology proposed by Versal et al. (2022), which has been slightly adapted to suit the available data specific to Kyrgyzstan's banking sector. From the available data, four main categories have been identified: Digital Financial Services, E-wallets, Electronic Facilities, and Online Platforms, as outlined in Table 1.

Table 1: Components of digitalization index of banks

Tier (j)	Indicator (i)	Estimation	Source
Digital financial services ¹ (DFS)	Payment cards ² (Cards)	Total quantity of payment cards/population	NBKR ⁶
	Volume of card payments (Vcards)	Total volume of card payments/GDP	NBKR
	Quantity of card transactions (Pcards)	Total quantity of card payments/population	NBKR
E-wallets (EW)	E-wallets (EW)	Total quantity of E-wallets/population	NBKR
	Volume of E-wallet transactions (VEW)	Total volume of E-wallet transactions/GDP	NBKR
	Number of E-wallet transactions (NEW)	Total quantity of E-wallet transactions/population	NBKR
Electronic Facilities (EF)	ATMs (ATM) ³	(Total quantity of ATMs/population)*100,000	World Bank
	POS Terminals (POS) ³	(Total quantity of POS terminals/population)*100,000	NBKR, World Bank
Online Platforms ⁴ (OP)	Mobile Application	Bank application users/total users across all bank applications	Play Market / App Store
	Website	Number of visits	similarweb.com
		Complexity of website and server ⁵	WebIX

Notes: NBKR – National Bank of the Kyrgyz Republic.

¹Based on the available data, the information regarding loans is not available.

²Including both deposit and credit cards.

³Following the methodology of the World Bank.



Table 2: Continued

⁴Due to missing historical data, indicators of online platforms were included for recent years only and were not included in the overall composition of the BD index.
⁵Please refer to Lányi et al. (2021) for estimation details.
⁶National Bank of the Kyrgyz Republic

Source: author's own estimations based on (Hornýák, 2017; Lafuente et al., 2016; Versal et al., 2022)

Digital financial services and e-wallets comprise the issued cards and e-wallets, the total volume of transactions as a percentage of the population, and the annual transactions volume as a percentage of GDP. Electronic facilities include the number of ATMs and POS terminals per 100,000 people, calculated according to the World Bank methodology. Online platforms consist of the proportion of mobile application users, the number of website visitors, and the complexity of these digital interfaces.

All indicators except Online Platforms have been derived from the annual reports of the National Bank of the Kyrgyz Republic. Information about application downloads was obtained from application stores and website visits from Similarweb.com.

WebIX indicators have been derived based on the method of Hornýák (2017), which calculates different parameters of bank websites, including Web 1.0 and Web 2.0 technologies. Web 1.0 technology is calculated based on speed, complexity, and appearance. Web 2.0 technology considers such integrated tools as communication and feedback opportunities (Hornýák, 2017).

As the primary methodological tool to build the BD index, this study adopts the System Dynamics Approach in estimating organizational competitiveness (Lafuente et al., 2016). First, all the variables included in the analysis are homogenized within the range of [0,1]:

$$x_{i,t}^* = \frac{x_{i,t}}{\max(x_{i,t})} \quad (5)$$

where, $x_{i,j}$ is the estimated value of indicator i for a year t ; $x_{i,j}^*$ is the adjusted value normalized according to the highest indicator $\max(x_{i,t})$. The highest indicator gets the value 1.

Next, implying that the performance of any system is limited by its weakest component, the

variables are normalized using the following equation:

$$h_{i,t} = \min(x_{i,t}^*) + (1 - e^{-(x_{i,t}^* - \min(x_{i,t}^*))}) \quad (6)$$

where $h_{i,t}$ is the adjusted measure of indicator i for a year t ; $\min(x_{i,t}^*)$ is the lowest indicator. Equation 6 is based on the adapted model of an exponential function ae^{-bx} (Lafuente et al., 2016).

In the final step, the BD index is calculated, which is the sum of all the measures involved in the estimation:

$$BD_t = \sum_i h_{i,t} \quad (7)$$

Macroeconomic and bank-specific determinants

As the primary bank-specific determinant, this study uses return on assets (ROA) as the main indicator of profitability (Tan, 2016) and the level of diversification to account for the effects of digitalization (Suryanto et al., 2022).

As the key measure of bank stability, the study utilizes the ratio of loan loss provisions to total loans (LLPTL) (Clark et al., 2018).

The study incorporates GDP growth as the primary macroeconomic indicator, acknowledging its impact on banking sector competition, stability, and digitalization (Tan, 2016). Table 2 summarizes the variables used in the study and their expected effects on each other based on the literature review.

Table 3: Summary of variables used in the study and expected effects

Variable	Estimation	Source	Expected effect
Bank Competition Indicators			
Lerner Index	Equation 1	Own estimation	- on profitability
Boone Indicator	Equation 2	Own estimation	- on digitalization + on stability
Bank Digitalization Indicator			
Bank Digitalization	Equations 5-7, Table 1	Own estimation	+ on competition + on profitability - on stability
Bank-Specific Indicators			
ROA	Net income / total assets	Own estimation	+ on digitalization
Diversification	Non-interest income/gross revenue	Own estimation	- on stability
Bank Stability Indicator			
LLPTL	Loan loss provisions / total loans	Own estimation	- on competition - on digitalization - on profitability
Macroeconomic Indicator			
GDP growth	Annual growth	World Bank	+ on competition + on profitability

Statistical modeling

Given the specific characteristics of the dataset and study objectives, traditional panel estimators fall short of providing accurate outcomes due to possible endogeneity, multicollinearity, dynamic attributes, and unobserved heterogeneity among variables (Khattak et al., 2023). These issues have led to a preference for dynamic panel estimators among finance and economic studies. Therefore, this study implements the two-step Generalized Method of Moments (GMM) proposed by Arellano and Bond (1991). The GMM estimator can effectively address endogeneity, cross-sectional dependencies within the dataset and unobserved heterogeneity among variables, making it ideal for the research (Khattak et al., 2023).

The regression model to estimate the relationship has the following equation:

$$BC_{bt} = \alpha_0 + \alpha_1 BC_{bt-1} + \alpha_2 BD_{bt} + \alpha_3 BP_{bt} + \alpha_4 GDP_{bt} + \varepsilon_t \quad (8)$$

$$BD_{bt} = \alpha_0 + \alpha_1 BD_{bt-1} + \alpha_2 BC_{bt} + \alpha_3 BP_{bt} + \alpha_4 GDP_{bt} + \varepsilon_t \quad (9)$$

$$BS_{bt} = \alpha_0 + \alpha_1 BS_{bt-1} + \alpha_2 BC_{bt} + \alpha_3 BD_{bt} + \alpha_4 GDP_{bt} + \varepsilon_t \quad (10)$$

Where BC_{bt} – bank competition, BD_{bt} – bank digitalization, BS_{bt} – bank-specific and stability indicators, and GDP is country GDP growth for a bank b at time t . BC_{bt-1} , BD_{bt-1} and BS_{bt-1} – one period lags, and ε is the error term.

DISCUSSION

Data descriptions

Data used to estimate competition in the banking sector of Kyrgyzstan was collected from the financial statements officially published and available on the websites of commercial banks for the period from 2012 to 2022. Data was carefully extracted from the published documents using a character recognition software tool and transferred to an Excel file. Each data row was manually verified for accuracy. The research sample consisted of 23 commercial banks that constitute the foundation of the banking system of Kyrgyzstan. In total, 253 observations were collected from 2012 through 2022, summarized in Table 2.

Table 4: Descriptive statistics

Variable	Mean	St. deviation	Min	Max
LI	0.2966	0.2190	0.0009	0.9981
BI	-0.6541	0.4836	-1.5570	0.1410
BD	0.6039	0.3023	0.2970	1.1119
ROA	0.0149	0.0280	-0.1394	0.1012
Diversification	0.2933	0.2098	-0.2200	0.9402
LLPTL	0.0041	0.0023	-0.0001	0.0098
GDP growth	3.7138	4.2375	-7.1490	10.9155

The LI indicates high competition among Kyrgyz banks, with values ranging from 0.009 to 0.9981 and an average of 0.2966. BI corroborates the findings with values spanning from -1.5570 to 0.1410 and an average of -0.6541. The proximity of means to minimums rather than

maximums signals a competitive commercial banking sector in Kyrgyzstan. At the same time, very high maximum values align with observations of monopolistic competition in the banking sectors of emerging markets (Akande et al., 2018).

Table 5: Correlation matrix

	LI	BI	BD	ROA	Diversification	LLPTL	GDP
LI	1						
BI	0.0280	1					
BD	-0.0443	0.3872***	1				
ROA	0.4486***	0.0429	0.0161	1			
Diversification	0.0887	-0.0375	-0.0870	0.1369*	1		
LLPTL	-0.0108	0.4081***	0.6818***	0.1661**	0.0552	1	
GDP	0.1040	-0.0367	0.1182*	0.1260*	0.1536*	0.0727	1

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1' 1

The correlation matrix in Table 4 demonstrates the absence of multicollinearity with the absence of correlation coefficients above 0.8 (Kennedy, 2008). The most significant correlations are observed between LI and ROA (0.4486), BI and BD (0.3872) and LLPTL (0.4081), BD and LLPTL (0.6818) and ROA and LLPTL (0.1661).

Regression results

In conducting GMM regression, the robustness of estimates was validated. First, the Arellano-Bond test confirms the absence of first- and second-order serial correlations. Also,

insignificant Hansen J-Test p-values confirm the validity of the used instruments. Finally, significant Wald tests indicate that the models' variables are jointly significant (Table 5).

Table 6: GMM regression

	Lerner Index	Boone Indicator	Bank Digitalization	LLPTL	Profit
Lag	0.1301 (0.0964)	0.5028*** (0.01783)	1.2699*** (0.0196)	0.00002*** (0.000001)	0.8710*** (0.1282)
LI			-0.0217*** (0.0048)		
BI				-0.0015*** (0.0001)	0.0003 (0.0038)
BD	0.0851 (0.1537)	0.7523*** (0.0221)		0.0054*** 0.0002	0.0165*** (0.0032)
ROA	7.6041* (3.4487)	0.9873 (0.7833)	-0.1606 (0.3942)	0.0112** (0.0038)	
Diversification	-0.4411 (0.4437)	-0.3396** (0.1107)	0.1295 (0.0868)	-0.0006 (0.0006)	-0.0316* (0.0124)
LLPTL		-149.30*** (3.0420)	-17.8635*** (1.8388)		-0.0148*** (0.0022)
GDP growth	0.0131*** (0.0028)	-0.0281*** (0.0019)	-0.0193*** (0.0014)	-0.00003* (0.00001)	0.0003 (0.0002)
Instruments	26	28	28	28	28
AR1	0.0462	0.0001	0.0001	0.00002	0.0101
AR2	0.8875	0.00004	0.2489	0.6605	0.3654
Hansen J-Test	0.1962	0.0855	0.0021	0.1801	0.2472
Wald Test	78***	177***	257.82***	649.2***	735.43***
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1' 1					

The GMM analysis identified a significant and positive correlation between BD and the BI, with a coefficient of 0.7523. This suggests that as banks undergo digital transformation, their Boone Indicator values increase, indicating a growth in efficiency. This finding is further supported by the negative significant coefficient between LI and BD (-0.0217), which indicates that as the Lerner Index increases or monopolistic power grows, the level of digital adoption tends to decrease.

Furthermore, BD demonstrates a positive and significant impact on profitability, with coefficients of 0.0165. This indicates that digitalization not only enhances market efficiency and competitive positioning but also directly contributes to the financial performance of banks. Our results align with previous research conducted by Versal et al. (2022) and Carbó-Valverde (2017), reinforcing the notion that digitalization in the banking sector significantly enhances both market efficiency and profitability. Concerning bank competition, no significant impact on profitability was identified.

BD demonstrates a significant positive effect on LLPTL (0.0054), while the opposite relationship is negative (-17.86). This finding is consistent with other scientists who revealed the negative impact of digitalization on bank stability due to the accumulation of risky assets (Carbó-Valverde, 2017).

Parallely, a negative association exists between LLPTL and BI (-149.30), implying that increased bank risk-taking leads to increased competition. This is supported by the negative relationship between BI and LLPTL (-0.0015), which demonstrates that less competition in the market leads to higher bank stability. These findings support the classic competition-fragility or concentration-stability view (Khattak et al., 2022; López-Penabad et al., 2021; Yudaruddin, 2022), and is further supported by a negative relationship between LLPTL and bank profitability (-0.0148). The relationship between bank competition and activities is partially rooted in the risk-competition relationship. Higher competition affects the banking system by increasing the risk

undertaken by banks, thus decreasing overall profits (Khattak et al., 2022).

Regarding the influence of macroeconomic variables, the study finds that GDP growth is positively associated with LI (0.0131), indicating that economic expansion correlates with increased market power or pricing above marginal cost among banks. This could suggest that in times of economic growth, banks are able to leverage their position to enhance profitability margins. Conversely, the negative association

with the BI (-0.0281) implies that in times of economic growth, competition among banks might intensify, leading to a decrease in efficiency differences among them. This means that more efficient (and perhaps smaller) banks do not significantly outperform less efficient ones to the same extent. The literature explains that bank monopoly power has an inverted-U relationship with economic growth, peaking at moderate levels (de Guevara & Maudos, 2011). A summary of all empirical results identified in the study is presented in Table 6.

Table 7: Summary of empirical results

Variable	Expected effect	Our findings
Bank Competition Indicators		
Lerner Index	- on profitability	Insignificant effect on profitability
Boone Indicator	- on digitalization + on stability	- on digitalization - on stability
Bank Digitalization Indicator		
Bank Digitalization	+ on competition + on profitability - on stability	+ on Boone Indicator + on profitability - on stability
Bank-Specific Indicators		
ROA	+ on digitalization	Insignificant effects on digitalization and competition
Diversification	- on stability	- on stability (ROA)
Bank Stability Indicator		
LLPTL	- on competition - on digitalization - on profitability	- on competition - on digitalization - on profitability
Macroeconomic Indicator		
GDP growth	+ on competition + on profitability	- on competition Insignificant effect on ROA

CONCLUSION AND RECOMMENDATION

The competitive landscape in the banking sector of Kyrgyzstan is characterized by a significant degree of competition, as evidenced by the range and average values of the LI and BI. However, the occurrence of very high maximum values for both LI and BI indicates the presence of monopolistic competition within the sector.

Further, the study employed GMM regression to examine the relationship between bank digitalization, competition, profitability, and stability within the banking sector.

Our analysis reveals a significant positive relationship between bank digitalization and BI, suggesting that digitalization enhances banks' competitiveness by improving operational efficiency. Conversely, an increase in LI correlates

with a decrease in digital adoption, meaning that monopolistic banks are less pressured to innovate than their competitive rivals.

Increased competition, as suggested by negative associations between BI and LLPTL, appears to drive banks towards riskier behaviors. The study also reveals that increased digital adoption may lead to higher risk-taking, which in turn influences market competition and stability. This supports the concentration-stability and competition-fragility theories within the banking sector of Kyrgyzstan.

Significantly, BD was found to positively affect profitability, affirming the critical role of digitalization in improving financial performance and competitive positioning.

Policymakers should aim to maintain a balanced level of competition within the banking sector by ensuring that regulations and policies do not inadvertently favor monopolistic practices or hinder innovation and efficiency. The study identified that monopolistic and less competitive banks might not feel the same pressure to innovate or adopt new technologies. Therefore, policymakers should encourage a balanced approach to digital adoption in the banking sector. While fostering innovation, it is crucial to monitor the accumulation of risky assets that may compromise bank stability.

Banks should continue to embrace digitalization as a strategic priority. Investing in digitalization practices would enable them to outperform less efficient competitors and increase market share. As banks invest in and implement digital technologies, they not only gain a competitive edge but also see tangible improvements in their profitability. This underscores the dual benefits of digitalization in the banking sector, enhancing both operational efficiency and financial outcomes.

Given the dynamic nature of the banking sector, continuous research is essential to understand the evolving impacts of digitalization, competition, and macroeconomic variables. Further studies could explore the long-term effects of these factors on banking stability and profitability.

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