

AN EMPIRICAL ANALYSIS OF THE IMPACT OF EFFICIENCY, RISK-TAKING, AND COMPETITION ON PROFITABILITY: AN APPLICATION IN IRAQ BANKING

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Abstract

The aim of this study is to investigate the impact of cost efficiency, competition, and risk-taking on the profitability of Iraqi commercial banks for the period between 2010 to 2020. We employ the Two-step Generalized Method of Moments (GMM-SYM) system estimator to examine the relationship between variables. Specifically, we close the empirical research vacuum in the Iraqi banking industry by investigating the effects of varying levels of risk-taking behavior, as well as varying levels of competition and cost-efficiency, on bank profitability. We find that the Bank soundness index, Credit Risk, and Liquidity Risk affect the profitability of banks if Bank soundness is significantly and positively associated with profitability, while Liquidity Risk is negatively associated with ROA, and Credit Risk is negatively associated with NIM. We found that Iraqi banks that have a higher level of cost efficiency have a higher return on assets, and that increased competition will lead to lower profitability in the Iraqi banking industry.

Keywords: Competition, efficiency, risk, stability, Iraq

JEL classification: G21 , C23

1. Introduction

Over the past three decades, the financial system has witnessed many important changes represented in deregulation, financial globalization, and the development of financial innovation mechanisms. Many developing countries such as East Asian and Latin American countries in the 1970s and 1980s implemented ambitious programs of financial and economic liberalization and, within the framework of structural adjustment programmers, implemented numerous agreements in the financial sector. The results of reform efforts have varied, influenced by many factors such

as the design of reform programs, the nature and strength of the economy, and the surrounding environmental factors that negatively and positively affect these programs (Iqbal, 2001). The Arab countries were not far from economic reform programs, although the response to these programs seemed to vary from one country to another, accelerating in some countries and slowing down in others, while Iraq was far from these programs, influenced by the prevailing political ideology in the country and the economic restrictions it suffered from during the 1990s. After 2003, Iraq began to catch the wave of liberalization and financial globalization, moving towards a market economy. Banking activity expanded significantly, as the number of banks in Iraq reached 74 banks distributed among the sector Public and private sector, despite the horizontal expansion of the number of private commercial banks, government banks still own 78.6% of the assets of the banking sector, control 84% of credit paid in cash, and own 87% of total deposits. The majority of banks in Iraq are owned by the private sector, representing 90.5% (67 out of 74 banks) of the total number of banks. Private sector-owned banks own the vast majority of the banking sector's capital, at 75.4%, due to their large number and their commitment to the directives of the Central Bank, with a capital of no less than 250 billion Iraqi dinars. However, these banks are largely overshadowed by state banks, accounting for only 13% of total deposits, 16% of credit paid in cash, and 21.4% of banking sector assets. This may be due to the insufficient infrastructure of private commercial banks to stimulate the development process and transition to an advanced banking system .

According to the structure, behavior and performance (SCP) hypothesis, the degree of concentration has an impact on the degree of competition between firms, as a more concentrated market structure is supposed to lead to a lower level of competition. Highly concentrated companies collude with each other to obtain the highest level of profits, which represents the difference in interest rates between deposits received and loans provided to customers. Similar to the SCP the relative market power hypothesis (RMP) proposed by Rhoades (1983) focuses on the role of market share in profits and prices because the larger the size of the bank, the more it is able to differentiate products and obtain more profits. The other framework from the literature explains the relationship between bank performance and concentration through the efficiency gate. Compared to the SCP hypothesis. The Efficiency Structure Hypothesis (ESH) proposed by Demsetz (1973) assumes that high efficiency replaces competition in order to achieve higher profitability. Highly efficient companies look to reduce costs to increase their profits that leads to an increase in their market share.

In our study, we will look at three important issues in the Iraqi banking sector. First: We will study the effect of efficiency on profitability within the framework of the efficiency structure hypothesis (ESH), which indicates that banks that are more efficient than their competitors can increase their market share and thus increase their profits. In light of this, we will test the following hypothesis: There is a positive relationship between efficiency and profitability in Iraqi banks. Second: Evaluating the impact of competition and many levels of risks on banking performance and banks' profitability during the study period.

Third : Evaluating the impact of competition on banks profitability by investigating the hypotheses of SCP theory.

Our paper contributes to the empirical banking literature in the following three ways: 1- This study evaluate the combined effects of competition, efficiency and risk-taking on profitability in the Iraqi banking sector for the period 2010-2020 using multiple types of competition and risk indicators. 2-The present study employs multiple risks indicators, such as Bank soundness, Credit Risk and liquidity risks within a competitive environment in the transition phase of the economy. In addition, we use several variables that represent the banking industry and the macroeconomics. It is expected that the results will provide a clearer vision for policy makers and supervisory and regulatory regulations makers. We test the hypotheses of two theories (efficiency structure hypothesis (ESH) and structure, behavior and performance (SCP).

Our results show that increased competition reduces profit levels in Iraqi banks. While price efficiency plays an important role in raising the level of banking performance, which motivates banks to make optimal use of resources and thus increase the level of profits. We also found that Z-core, which represents financial health, is associated with a positive relationship with profitability, while we do not find a significant impact of banking industry variables on banks' profitability. The current paper is organized as follows: Section (1) Review to related literature, section(2) presenting the methodology used and relevant data , Section (3) present and discuss empirical results, followed by Section (4) reports and discussions , section(5) reporting and discussion of additional robustness check , Finally : Section (6) conclusion of the paper

2- Literature Review

Bank profitability has been extensively studied in the literature in many developed and developing countries. It is usually represented as a function of internal and external determinants. External factors relate to the environment in which these banks operate, such as economic and political conditions and the legal frameworks that regulate the work of these banks, while internal factors are those related to management, strategy, performance and risks (Jigeer & Koroleva, 2023). The characteristics and objective of each study play a role in proposing explanatory variables. Therefore, we find a discrepancy between these studies and their results depending on their objectives. As a result of the transformations that resulted from recurring global crises, the literature began to show more interest in effective methods for developing the banking sectors. We find many studies to investigate the impact of efficiency on banks' profitability within the framework of its determinants (Bitar et al., 2018; Djalilov & Piesse, 2016; Dsouza et al., 2022; Francis, 2013; Menicucci & Paolucci, 2016). While we find other studies that have investigated the impact of efficiency and competition as part of the determinants of bank profitability (Le & Ngo, 2020; Rahman et al., 2015; Yuanita, 2019). However, the importance of risks and their impact on banks' performance and profitability has been addressed in other studies (Angori et al., 2019; Fang et al., 2019; Moudud-UI-Huq, 2020; Tan et al., 2017). Despite the large number of studies on profitability in many economies, as indicated above, we find that the transitional economies were characterized by a paucity of studies that dealt with the profitability of banks

during that period (M. Ali & Puah, 2019; Derbali, 2021; Havranek & Irsova, 2013; Jiang et al., 2013).

Profitability in the Iraqi banking sector has been tested to a limited extent through the literature. Jadah et al. (2020) examined the elements that affect bank profitability in Iraq both internally (bank-specific features) and externally (macroeconomic factors and government variables). Unbalanced panel data from 18 Iraqi banks over a 13-year period, from 2005 to 2017. The empirical results show that internal factors such as the size of the bank and shareholders' equity have a positive impact on the profitability of banks. At the same time, the study presented an evidence of the inverse relationship between profitability, inflation, interest rates, unemployment, and political instability. Ghafar et al. (2021) studied the determinants of profitability for a sample of Iraqi commercial banks for the period 2009-2018 by using a multiple linear regression model. The results showed experimentally that the liquidity ratio, financial leverage ratio, and retained profits, in addition to the size of the bank, have a positive impact on the bank's profitability. Taha and Top (2022) found that bank size, liquidity ratio, bank age, in addition to gross domestic product and inflation rate, have a varying effect on the performance of banks.

Hussein and Al-Dulaimi (2022) examined the impact of CAMELS criteria such as capital adequacy, asset quality, management, earnings, liquidity, and sensitivity on return on equity in Iraqi commercial banks. The results show that capital adequacy, asset quality, management, profits, liquidity, and sensitivity are positively associated with return on equity. In Iraqi commercial banks. The empirical results of the studies varied; however, it should be noted that there are some commonalities between these results. First, a bank's profitability is usually determined as a function of internal and external drivers. Second: It is evaluated through return on average assets (ROA), return on equity (ROE), and net interest margin (NIM) (Rakshit & Bardhan, 2022; Sufian & Habibullah, 2009; Tan, 2016). Third: The results showed that factors such as bank size, liquidity, capitalization, credit risk, efficiency, diversification, concentration, inflation, and GDP have a significant impact on bank profitability. Empirical results vary depending on the data used and study periods.

3- Data and methodology

3.1 Data

In order to study the impact of cost efficiency, competition, and risks-taking on the profitability of Iraqi banks, a sample of panel data was selected from 20 Iraqi commercial banks for the period between 2010 and 2020. Governmental banks and some commercial banks were excluded due to the lack of their data. Data for banks are collected from the banks' annual statistical bulletins. In Iraq and the database of the Iraqi Stock Market, while data related to banking industry variables and macroeconomic variables were obtained through global development indicators data (WDI).

3.2 Methodology

3.2.1 Empirical framework

When measuring the determinants of bank profitability using panel data, we will face many challenges, the unobserved heterogeneity of cross section (banks) this may be a result of differences in corporate governance in Iraq., converse causality, endogeneity bias: Banks with greater profitability can increase equity compared to those with less profitability. We tackle these issues together by employ the dynamic panel data (DPD) model (Arellano & Bover, 1995). The DPD model shows several advantages: First, it is suitable for short panel data with large N and small T . Second : This technique is suitable for linear equations with a dynamically dependent variable with several controlling variables. In our study will employ one step Generalized Method of Moments (GMM-SYM) system. We express the specifications of our empirical model as follows:

$$\pi_{it} = \alpha_0 + \delta\pi_{it-1} + \sum_{i=1}^i \beta_i x_{it} + \sum_{j=1}^j \beta_j d_{jt} + \sum_{i=1}^s \beta_s m_{it} + v_{it} + u_{it}$$

i representation of the bank , t denotes to year , α_0 it is the constant term , π it is an indicator of bank profitability , π_{it-1} shows first period lag of profitability , x_{it} Refer to the specific determinants of profitability , d_{jt} Refer to the industry specific determinants of banks profitability , m_{it} macroeconomic determinants , v_{it} and u_{it} are unobserved bank specific effects and stochastic error term, respectively , β_i , β_j and β_s are the vector parameters to be estimated.

3.2.2 Definition of variables

Dependent variables

Following up on the previous literature (Bouzgarrou et al., 2018; Djalilov & Piesse, 2016; Martins et al., 2019), we use three different indicators to represent the profitability of banks. First, it is the return on assets (ROA) and the return on equity (ROE), in addition to the net interest margin (NIM) . Return on Assets (ROA) embodies the bank's ability to generate profit by using the financing sources at its disposal .ROE Shows the rate of return achieved by the bank using the investors' money. NIM demonstrates the difference between the interest a bank receives on loans and the interest it pays on deposits. Table (1) shows the variables adopted in our study.

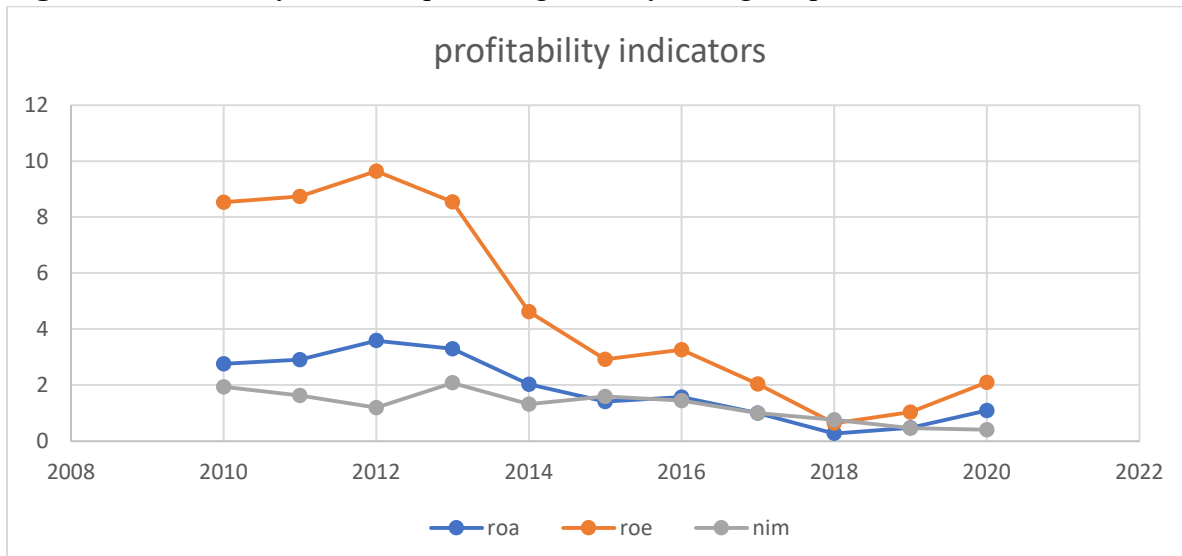
Table (1) Describe the variables and their impact on profitability in banks

Depended Variable	Notation	Measurement	Source
PROFIT			
return on assets	ROA	Net income/total assts	Annual Reports
return on equity (ROE)	ROE	Net income/shareholders' equity	Annual Reports
net interest margin (NIM)	NIM	(Investment Income – Interest Expenses) / Average Earning Assets	Annual Reports
Measurement of bank competition			
	LIX	Lerner Index	Calculated by the author
	LIXX	Adj-Lerner Index	Calculated by the author
	Boone	Boone index	Calculated by the author
Efficiency			
Cost efficiency	CE	Cost efficiency	Calculated by the author
allocative efficiency	ALE	allocative efficiency	Calculated by the author
technological efficiency	TE	scale efficiency	Calculated by the author
Risk-taking indicators			
Bank soundness	Z-SCORE	Ratio between a bank's return on assets plus equity capital/total assets	Calculated by the author
Credit Risk	NPL	Loan-loss provision as a fraction to total loans	Annual report
Liquidity Risk	LRIS	Ratio between a bank's loan / banks deposit	Calculated by the author
Bank-specific variables			
Size	Size	Natural logarithm of total assets	Annual report
Loan to total assets	Liquidity	Ratio of loan to total assets	Annual report
Capital	CAPT	Book value of capital to total assets	Annual report

Labor	Labor	Ratio of gross total revenue to number of employees	Annual report
Industry specific variables			
Concentration	C3	The ratio of large three banks in terms of total assets to the total assets	WDI
Stock market development	RSMD	Ratio of stock market capitalization over GDP	WDI
Macroeconomic variables			
Real GDP growth	GDPG	Year-on-year logarithmic change on real GDP	WDI
inflation	INF	Year-on-year logarithmic change on Consumer Price Index	WDI

Figure 1. shows Profitability indicators in the Iraqi banking industry during the period 2010-2020. We find that ROE, which represents the return on equity index in the Iraqi Stock Exchange, rose to (9.64) at its highest level in the year 2012 and then declined dramatically to reach the lowest level in the year 2018 with a value of (0.6), (ROA) shows the least change during the study period, as it appears from the figure that it was in the year 2012 with a value of (3.586) While the minimum value was (0.27) in 2018 . (NIM) shows more stable during the study period as it appears from the figure that it was in the year 2012 with a value of (1.9) While the minimum value was (0.40) in 2020.

Figure 1. Profitability in the Iraqi banking industry during the period 2010-2020



Independent variables

Several research on financial and non-financial firms have utilized the natural logarithm of total assets to measure the firm size proxy (U. Ali et al., 2015; Bashir et al., 2021; Dang et al., 2018; Hall & Weiss, 1967; Mitchell et al., 1995; Sheikh et al., 2013). According to empirical research, the size of a bank significantly affects its profitability (Aladwan, 2015; Anggari & Dana, 2020; Regehr & Sengupta, 2016). The empirical results showed variation in the effect of bank size on profitability. Rowe reported bank size is positively correlated with profitability, While Gyamerah and Amoah (2015) and Tran and Phan (2020) gave evidence negative relation between bank size and profitability. Additionally, the effects of banking diversity on profitability vary (Gischer & Jüttner, 2001; Nisar et al., 2018; Rakshit & Bardhan, 2022).

Competition measurement

Market power is a representation of the bank's ability to set price by comparison to marginal cost (Lerner, 1934). The Lerner indicator to provide data on competitive levels and to determine market power, which can be written as in the following formula.

$$L = \frac{P - MC}{P}$$

Where P is a representation of the average price or income of the bank (the ratio of total revenues to total earning assets), MC is a representation of marginal cost (the estimate of a translog production function for each bank, taking into account bank and temporal fixed effects).

Koetter et al. (2012) and Rakshit and Bardhan (2022) argued that the traditional approach assumes that banks are fully efficient. Under this assumption the Lerner will be biased because some banks can use price opportunities arising from market dominance to do the following to reduce the assumption that banks are perfectly efficient. To limit the assumption that banks are completely efficient. In this study, I used the modified Lerner index, following up on the previous literature (Clerides et al., 2015; Rakshit & Bardhan, 2022; Tan & Floros, 2018; Williams, 2012). The adjusted Lerner index ($L_{adjusted}$) is expressed in the following way:

$$L_{Adjusted} = \frac{PT_{it} + TC_{it} - MC_{it} * TO_{it}}{PT_{it} + TC_{it}}$$

'i' and 't' are representations of bank and year, PT An expression of profit before tax, (TC) A representation of the total operating cost while (MC) refer to marginal cost and (TO) is the total cost.

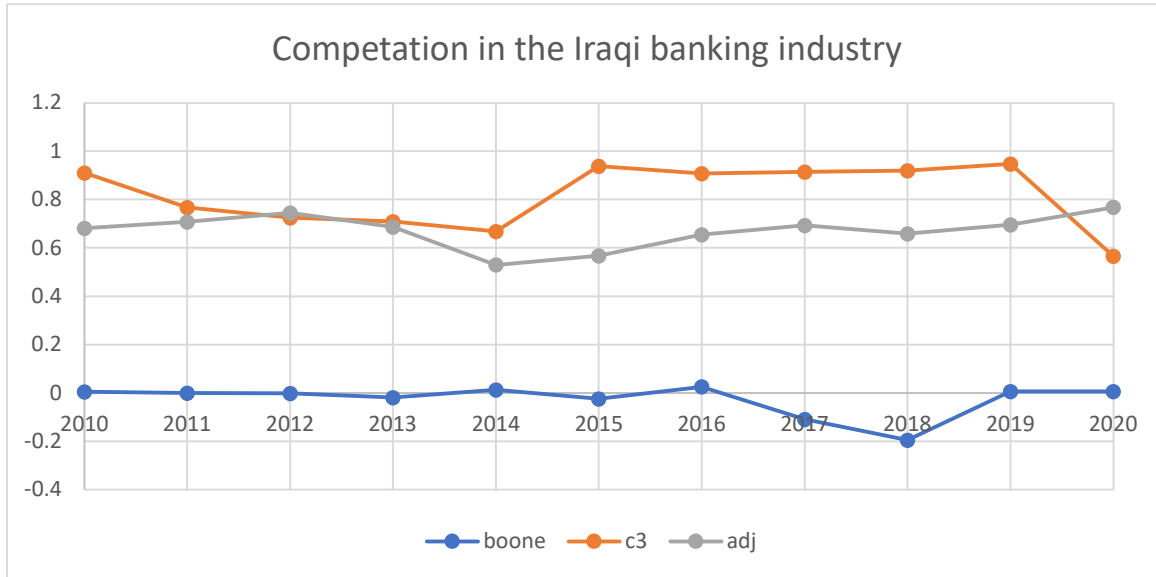
Boone index

The current study adopts, in addition to the adjusted Lerner index, the Boone index, to measure competition (Boone, 2008). The Boone index is consistent with the arguments of the performance hypothesis developed by Demsetz (1973). The hypothesis suggested that efficiency has a positive effect on performance, while competition has an inverse relationship with performance. Performance can be measured through profit or market share. The more negative sign indicates the stronger impact. The Boone indicator can be represented as:

$$\ln(\pi_i = \alpha_i + (mc_{ik}))$$

where π_i is the profit of the i bank at time t . MC it is the marginal costs for the i bank at time t

Figure 2 : Competition in the Iraqi banking industry



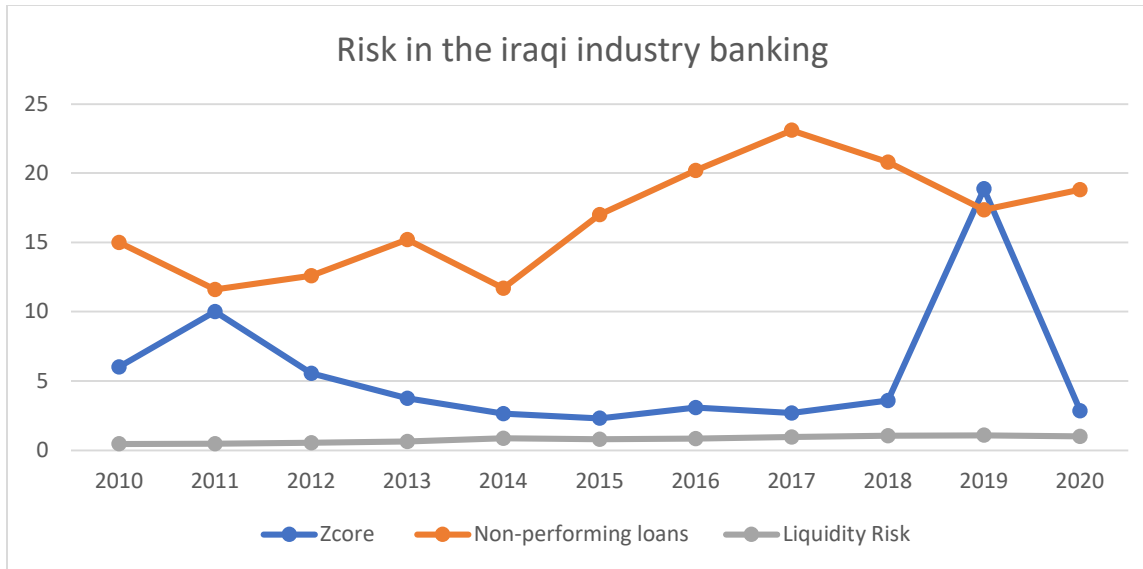
Risk-taking indicators

We employ several risk indicators such as a credit risk indicator, liquidity risk and insolvency. To assess the level of risk-taking in the banking sector in Iraq, we measure credit risk using the non-performing loan to total loans ratio. The higher levels of non-performing loans imply increased credit risk for banks (Maggi & Guida, 2011). Liquidity risk is defined as the ratio of loans to deposits, its representation of the bank's inability to satisfy its short-term financial obligations without suffering significant losses (Acerbi & Scandolo, 2008). To assess banking bank soundness (stability), we adopted Z-score index following (Laeven & Levine, 2009; Lepetit et al., 2008; Li et al., 2022). The Z score is calculated as follows:

$$Z_{Scorei} = \frac{ROA_{it} - \frac{EQ_i}{TA_i}}{\sigma ROA}$$

ROA_{it} Represent to Return on assets of bank i in year t , $\frac{EQ_i}{TA_i}$ Represent to Ratio of total equity to total assets of bank i in year t and σROA represent to Standard deviation of the ROA for each bank calculated on the basis of three years. Athanoglou et al. (2008) point that bank profitability initially favorably correlates with size until it starts to diminish with growth for institutional and bureaucratic reasons.

Figure 3: Risk-taking in the Iraqi banking industry



Banking, industry and macroeconomic factors

We will following up to the literature by employ four variables related to the bank to represent internal characteristics such as bank size, diversification, capitalization, and labor productivity (ACARAVCI & ÇALIM, 2013; Sufian & Chong, 2008).

The size of the bank is typically used to measure possible economies of scale or their absence in the banking industry. This factor regulates variations in costs and products and changes risk depending on the size of the financial organization. If there are considerable economies of scale, the first element may result in a positive association between size and bank profitability (Akhavein et al., 1997; Martins et al., 2019; Regehr & Sengupta, 2016). Second variable refer to banking diversification measured by calculating as the ratio of non-interest income to total revenue (Rakshit & Bardhan, 2022; Tan & Floros, 2012), in addition we represented bank capitalization By comparing the equity to total assets ratio . It is anticipated that capitalization and bank profitability would be positively correlated, because banks with enough capital are more inclined to practice cautious lending. According to one argument, banks with larger capital may avoid the risks associated with hazardous lending, and the interest income generated by the loans increases bank profitability. The ratio of gross revenue to total employees serves as a proxy for labor productivity. Increased labor productivity improves bank management, boosts bank profitability, and promotes bank efficiency (Lozano-Vivas et al., 2002; Nguyen, 2018).

Concentration in the banking sector: The proportion of an economy's assets held by the largest three banks. The link between market concentration and bank efficiency is explained by two primary theories. According to the structure-conduct-performance theory, banks often grow their market power and restrict competition in increasingly concentrated markets, which are characterized by high-power but less efficient enterprises (Altunbaş et al., 2001). According to the efficient structure theory, markets with greater concentrations are characterized by stronger companies and larger levels of market power, since banks with superior cost efficiency would eventually beat rival banks and take control of the market (Goldberg & Rai, 1996; Nguyen, 2018).

Estimation efficiency in the Iraqi banking industry

We use the DEA method to estimate a number of efficiencies. The main advantages of this method are its ability to handle a variety of inputs and outputs. It is particularly helpful since it incorporates returns to scale into the calculation of efficiency, enabling the idea of efficiency growing or decreasing depending on size and output levels. The primary justification for using DEA over SFA is that the former performs especially well with tiny samples. Moreover, DEA does not require knowledge of any functional form of limits and can handle inputs and outputs that are many and expressed in different units of measurement (Charnes et al., 1997). The measured efficiency metrics have pretty straightforward meanings. The percentage decrease in input utilization that might have been made if the company had operated on the efficient frontier is provided by the technical efficiency measure. If no inputs were wasted, the technical efficiency may be broken down into a proportionate decrease in input utilization (Al Shamsi et al., 2009).

In our study, we employ three measures of efficiency: cost efficiency (CE), allocative efficiency (AE), and technological efficiency (TE)

Summary statistics of inputs and output variables are reported in Table (3).

Table 3: Descriptive statistics of inputs and outputs

	Observations	Mean	Maximum	Minimum	Std. Dev.
Loans	215	136544.20	537759.00	12352.0	111800.20
Other earning assets	215	61252.53	698695.00	106.00	111730.80
Deposits	215	286507.10	1491599.00	975.00	272887.10
Labor	215	4689.14	16833.00	497.0000	3295.83
Price of capital	215	0.18	5.95	0.018	0.48
Price of deposits	215	0.01	0.08	0.01	0.016
Price of labor	215	0.62	0.70	0.55	0.03

Notes: All variables are measured in millions of Iraqi dinars , Price of capital , Price of deposits and Price of labor measured in percent

4 Empirical results and discussions

4.1 Empirical results

Table (4) reports the empirical results to investigate the impact of competition, efficiency, and risk tolerance on the profitability of commercial banks in Iraq. The Lerner index and the Boone index used as measures of competition, cost efficiency, Bank soundness (Z-score), Bank-specific variables (size, Liquidity , Capital), Industry specific variables (RSMD), in addition to the growth rate and inflation as variables to represent the macroeconomics . We employ three dependent variables return on assets (ROA), return on equity (ROE), and net interest margin (NIM). The Hansen test is employed to assess the validity of instruments in all specifications. The p-value for the Hansen test indicates that there are no overidentifying restrictions in our estimated models.

Furthermore, the p-values for AR(1) accept the presence of first-order autocorrelation. A second-order autocorrelation was rejected due to non-significant p-values. In order to enhance the results we adopted Jochmans and Verardi (2020) tests for serial correlation of Arbitrary shape in linear panel model errors. The test is designed for short boards. portmanteau test for the null of no within-group correlation beyond that induced by the group-specific effect. The approach allows for heteroskedasticity and is applicable to models with exogenous, predetermined, or endogenous regressors.

The coefficients for the lagged dependent variables (ROA) and (NIM) are significant, which is an indication of the dynamic characteristics of the model. δ take values (0.472) and (0.291) When profitability is measured by (ROA) and (NIM) respectively. This indicates that the mechanism for moving away from the competitive structure in Iraqi banking is not significant. Moving on to the explanatory variables. We find that the size of banks is not an obstacle to the expansion of banks' profitability. The Adjusted Lerner Index gives significant positive signals for the ROA and ROE, which is an indicator of the negative impact of competition on the profitability of Iraqi commercial banks, this is consistent with the assumptions of the structure-behavior- performance hypothesis (SCP) and consistent with Rakshit and Bardhan (2022) and Tan (2016). We find that there is a positive significant relationship between risk-taking (Z-score) and the profitability of Iraqi banks. This is meaning a higher risk will push banks to increase the interest rates charged on loans. The results of price cost efficiency indicate its positive impact on the return on assets. This is consistent with the framework proposed by the efficiency structure hypothesis (ESH), which assumes that banks that are more efficient than their competitors can increase their market share and compensate for the decrease in their size, and as a result their profits will increase. This result is consistent with Fang et al. (2019). We find that economic growth is related to a positive significant relationship with return on assets, which indicates that higher growth rates will lead to higher profitability.

Table (4) Empirical results (Cost efficiency, Z-core and Lerner Adjusted as competition indicator)

	(1)	(2)	(3)
	L(0/1).ROA	L(0/1).ROE	L(0/1).NIM
L.ROA	.472***		
	(.084)		
L.ROE		-.37	
		(.452)	
L.NIM			.291**
			(.125)
Bank Size	-.229	4.588	.752
	(.69)	(7.238)	(1.586)
Lerner Adjusted	9.62***	42.525***	-1.874
	(.32)	(9.077)	(1.156)

Zscore Bank	.179***	1.133***	.234***
	(.014)	(.297)	(.021)
CE	4.921***	27.981***	-9.858***
	(1.277)	(6.738)	(.694)
Labor	-.001**	-.001	0.0001
	(0)	(.005)	(.001)
Capital	-.047	.023	-0.300
	(.167)	(.208)	(.267)
Diversification	.002	-.011**	.001
	(.003)	(.005)	(.002)
Liquidity	-.036	4.864	-1.596*
	(1.166)	(5.049)	(.863)
RMSD	-.036	-.918	.051
	(.061)	(.708)	(.125)
Inflation	.033	.072	-.04
	(.032)	(.163)	(.045)
GDPG	.102***	.281*	.057***
	(.012)	(.148)	(.012)
Constant	-9.094**	-32.727	-.262
	(4.502)	(0.0001)	(0.0001)
Sargan – Hansen test ¹	P= 0.1301	P=0.1301	P= 0.5830
AR(1)²	P=0.0059	P= 0.0743	P= 0.1779
AR(2)³	P= 0.1992	P= 0.2655	P= 0.4471
Jochmans portmanteau te	P= 0.4570	P= 0.4639	P= 0.4024
Observations	197	200	200
<i>Standard errors are in parentheses: *** p<.01, ** p<.05, * p<.1</i>			
<i>1 Sargan-Hansen test of the overidentifying restrictions</i>			
<i>2 Arellano-Bond test for autocorrelation of the first-differenced residuals , H0: no autocorrelation of order 1</i>			
<i>3 Arellano-Bond test for autocorrelation of the second -differenced residuals, H0: no autocorrelation of order 2</i>			
<i>4Jochmans portmanteau test, H0: no autocorrelation of any order</i>			

Table 5 shows the results of the impact of competition, price cost efficiency and risk-taking (non-performing loans) on profitability. The size of the bank indicates a negative and significant effect on ROA, while we do not find any effect on ROE and NIM. The Adjusted Lerner Index indicates a positive and significant effect on ROA and ROE. The cost price efficiency of the banks give indicates a positive significant effect on ROA and ROE, which gives an indication of the

importance of price cost efficiency in determining banks' profitability compared to other indicators. This result is consistent with Tan (2016) and Tan et al. (2017).

We find the negative impact of non-performing loans on NIM. These results are consistent with Akter and Roy (2017) and Liyana and Indrayani (2020). Price cost efficiency has a positive impact on ROA and ROE, and the volume of liquidity and bank diversification are significant and negative on ROA.

Table (5) Empirical results (Cost efficiency, non-performing loans and Lerner Adjusted as competition indicator)

	(1)	(2)	(3)
	L(0/1).ROA	L(0/1).ROE	L(0/1).NIM
L.ROA	.652***		
	(.046)		
L.ROE		.13***	
		(.019)	
L.NIM			-.293***
			(.054)
Bank Size	-3.047**	-.743	-.364
	(1.407)	(3.906)	(1.953)
Lerner Adjusted	6.368***	26.87***	2.683
	(.804)	(8.689)	(2.083)
NPL	-.004	-.003	-.026**
	(.007)	(.039)	(.012)
CE	7.226***	21.607***	-2.096
	(1.549)	(3.391)	(1.952)
Labor	-.002***	-.003	-.003*
	(0.001)	(.002)	(.002)
Capital	.006	-.028	-.567
	(.219)	(.248)	(.368)
Diversification	.005	0.001	0.001
	(.006)	(.018)	(.008)
Liquidity	-5.102*	-.363	-.043
	(3.07)	(8.171)	(2.203)
RMSD	.091***	.027	.062
	(.029)	(.492)	(.057)
Inflation	-.034	-.001	-.104
	(.039)	(.144)	(.066)
GDPG	.11***	.552***	.068***
	(.006)	(.116)	(.018)

Constant	15.569	2.978e+11	3.259
	(10.187)	(0)	(13.217)
Sargan – Hansen test ¹	P=0.5830	P= 0.1719	P=0.3556
AR(1) ²	P=0.1779	P=0.1294	P=0.5118
AR(2) ³	P= 0.4471	P= 0.4777	P=0.4631
Jochmans portmanteau te	P= 0.4024	P=	P=0.3109
Observations	197	200	200
<i>Standard errors are in parentheses: *** p<.01, ** p<.05, * p<.1</i>			
<i>1 Sargan-Hansen test of the overidentifying restrictions</i>			
<i>2 Arellano-Bond test for autocorrelation of the first-differenced residuals , H0: no autocorrelation of order 1</i>			
<i>3 Arellano-Bond test for autocorrelation of the second -differenced residuals, H0: no autocorrelation of order 2</i>			
<i>4Jochmans portmanteau test, H0: no autocorrelation of any order</i>			

Table 6 shows the results of the impact of competition, price cost efficiency and risk-taking (Liquidity Risk). The results did not differ far from the results of the previous two models. We find that there is a significant positive effect of price cost efficiency on the ROA and ROE. We find that there is a significant positive effect of market capitalization on the ROA, which is consistent with Shair et al. (2019).

Table (6) Empirical results (Cost efficiency, Liquidity Risk and Lerner Adjusted as competition indicator)

	(1)	(2)	(3)
	L(0/1).ROA	L(0/1).ROE	L(0/1).NIM
L.ROA	.677***		
	(.042)		
L.ROE		.517***	
		(.045)	
L.NIM			.056***
			(.021)
Bank Size	-1.363*	-.935	-2.133***
	(.719)	(.607)	(.589)
Lerner Adjusted	7.368***	24.594***	-2.525***
	(.78)	(.929)	(.789)
Liquidity Risk	.038	-.06	-.238
	(.119)	(.09)	(.247)
CE	5.269***	21.767***	-3.424**

	(.704)	(1.071)	(1.38)
Labor	-.001	-.002	0.001
	(.001)	(.001)	(0.001)
Capital	-.018	-.034	-.007
	(.054)	(.099)	(.083)
Diversification	.001	.002	-.002
	(.002)	(.003)	(.002)
Liquidity	-1.75	-1.067	-1.431**
	(1.168)	(1.615)	(.722)
RMSD	.081***	.081	.123**
	(.019)	(.09)	(.048)
Inflation	0.001	.009	-.005
	(.019)	(.018)	(.039)
GDPG	.117***	.545***	.107***
	(.007)	(.024)	(.007)
Constant	2.649	-14.778***	17.748***
	(3.842)	(3.711)	(3.35)
Sargan – Hansen test ¹	P=0.5830	P= 0.66	P=0.0671
Jochmans portmanteau te	P= 0.4024	P=0.4408	P=0.4442
Observations	197	200	200
<i>Standard errors are in parentheses: *** p<.01, ** p<.05, * p<.1</i>			
<i>1 Sargan-Hansen test of the overidentifying restrictions</i>			
<i>2 Arellano-Bond test for autocorrelation of the first-differenced residuals , H0: no autocorrelation of order 1</i>			
<i>3 Arellano-Bond test for autocorrelation of the second -differenced residuals, H0: no autocorrelation of order 2</i>			
<i>4Jochmans portmanteau test, H0: no autocorrelation of any order</i>			

5 Robustness Check

We conducted further tests to ensure the reliability of our results. We employ the Boone index to represent competition in the Iraqi banking sector. Report Table No. (7) shows the results regarding the impact of efficiency, competition (Boone) and risks taking (Z-score) in the Iraqi banking sector. We find that Boone has a positive and statistically significant effect ROE and negatively on NIM. The cost price efficiency of banks has a significant positive effect on the ROA and ROE and a negative effect on the NIM, which gives an indication of the importance of the cost price efficiency in determining the profitability of banks compared to other indicators. Z-core has a positive and significant effect on ROA, ROE, and NIM. We find the size of the bank gives an indication of the presence of an adverse effect on profitability indicators, and this indicates the absence of the decisive effect of size.

Table (7) Empirical results (Cost efficiency, Z-core and Boone as competition indicator)

	(1)	(2)	(3)
	L(0/1).ROA	L(0/1).ROE	L(0/1).NIM
L.ROA	-.083***		
	(.025)		
L.ROE		.017	
		(.014)	
L.NIM			-.268***
			(.021)
Bank Size	4.756***	27.537***	-3.893***
	(.684)	(.876)	(.763)
Boone	1.604	26.687***	-5.447***
	(1.323)	(1.62)	(.954)
Z-core	.136***	.168***	.058***
	(.022)	(.064)	(.012)
CE	.891**	12.55***	-2.167***
	(.447)	(.324)	(.256)
Labor	.004***	-.009***	.006***
	(.001)	(.002)	(.002)
Capital	-.586***	-.219	-.101
	(.127)	(.229)	(.068)
Diversification	-.011**	-.198***	.013***
	(.004)	(.006)	(.002)
Liquidity	-9.526***	-14.237***	7.971
	(2.008)	(2.562)	(5.011)
RMSD	-.08*	.286***	-.108**
	(.042)	(.109)	(.042)
Inflation	.207***	1.006***	.091***
	(.06)	(.08)	(.026)
GDPG	.12***	.36***	.019***
	(.009)	(.016)	(.005)
Constant	-20.811***	-150.505***	15.745***
	(3.845)	(5.832)	(5.629)
Sargan – Hansen test ¹	P= 0.1301	P= 0.1301	P=0.5830
AR(1)²	P= 0.0041	P=0.0249	P=0.3781
AR(2)³	P= 0.487	P= 0.316	P= 0.3039
Jochmans portmanteau te	P= 0.4575	P= 0.4610	P=0. 0.4052

Observations	197	200	200
<i>Standard errors are in parentheses: *** $p < .01$, ** $p < .05$, * $p < .1$</i>			
<i>1 Sargan-Hansen test of the overidentifying restrictions</i>			
<i>2 Arellano-Bond test for autocorrelation of the first-differenced residuals , H0: no autocorrelation of order 1</i>			
<i>3 Arellano-Bond test for autocorrelation of the second -differenced residuals, H0: no autocorrelation of order 2</i>			
<i>4 Jochmans portmanteau test, H0: no autocorrelation of any order</i>			

We conducted several additional validation tests to verify the robustness of the results. We use C3 with HHI index as an indicator to evaluate competition in the Iraqi banking sector, and we also adopt Z-SCORE to indicate banking safety in the banking sector. Table 8 Shows results of employing the HHI index to capture competition alongside CR3. We discover that HHI significantly and positively affects profitability. It implies that banks impose greater lending costs as a result of increased market concentration. high rates of interest Similarly, excessive market concentration in deposits hurts bank profitability. Banks are looking into alternative ways to raise money and pay higher interest rates because there is less opportunity to mobilize depositor cash in the confined deposit market. We find indicate that CR3 has positive and significant effect on bank profitability. This data backs up the SCP hypothesis, which states that since banks tend to collude in a concentrated financial sector, increased concentration translates into higher profitability. These results are consistent with Rakshit and Bardhan (2022).

Table (8) Empirical results (Cost efficiency, Z-core HHI as competition indicator)

	(1)	(2)	(3)
	L(0/1).roa	L(0/1).roe	L(0/1).nim
L.ROA	-.158***		
	(.021)		
L.ROE		-.199***	
		(.014)	
L.NIM			-.267***
			(.015)
SIZE	5.142***	35.472***	-5.934***
	(.6)	(1.032)	(.878)
HHI	.001***	.003***	.0000585
	(0.00002)	(.001)	(.0001795)
C3	-.027***	-.315***	.02
	(.005)	(.039)	(.013)
Z Core	.091***	-.213	.057
	(.023)	(.158)	(.061)
CE	.111	3.411***	-2.111***

	(.395)	(.995)	(.187)
Labor	.004***	-.005**	.005**
	(.001)	(.002)	(.002)
Capital	-.605***	-.497	.032
	(.163)	(.38)	(.076)
Diversification	.004	-.081***	.01***
	(.005)	(.017)	(.001)
liquidity	-11.471***	-23.89***	1.286
	(2.07)	(2.402)	(4.374)
Rsmid	.023	.427*	.028
	(.044)	(.242)	(.048)
Inflation	.188***	.498***	.082
	(.051)	(.105)	(.066)
GDPG	.111***	.503***	-.005
	(.007)	(.015)	(.004)
_cons	-20.092***	-162.433***	31.132***
	(4.103)	(7.553)	(6.549)
Sargan – Hansen test ¹	P= 0.8929	P=0.8929	P= 0.8929
AR(1)²	P= 0.0012	P=0.0005	P= 0.8197
AR(2)³	P= 0.2259	P= 0.0916	P=0.4258
Jochmans portmanteau test	P=0.4573	P= 0.4758	P= 0.2724
Observations	197	200	200
Pseudo R²	.z	.z	.z
<i>Standard errors are in parentheses</i>			
*** $p < .01$, ** $p < .05$, * $p < .1$			

6 Conclusions

This paper examines the impact of price cost efficiency, competition, and risks on profitability within the framework of investigating the financial performance behavior of Iraqi commercial banks for the period 2010-2020. We analyze the determinants of profitability in banks by employing a set of variables. We use many alternative indicators that represent profitability, ROA, ROE, and NIM. We also employ a set of variables specific to banks and the banking industry, in addition to macroeconomic variables. By applying the generalized method of moments (two-step system -GMM) technique, we estimate the results of several empirical models. Our findings provide significant evidence that the Iraqi banking industry operates within a competitive environment. The estimated values of the Adj-Lerner Index and Boone were given and evidence of the impact of competition regarding the impact of competition on the profitability of banks,

That is, increasing levels of competition will reduce banking profitability, Turning to the results of the impact of price cost efficiency on the profitability of the banking sector, the results gave significant evidence that high cost efficiency will lead to achieving high levels of profitability. We check the robustness of the results using the C3 concentration index and the HHI competition index, in addition to the ZCORE banking stability index. It was noted that the soundness of the Iraqi banking sector is positively associated with banking efficiency and stability. In this study, we provide evidence of consistency with the EHS hypotheses that assumes that higher profitability can be achieved by focusing on efficiency. Regardless of the size of the bank, highly efficient companies strive to reduce expenses in order to increase profits, which in turn leads to increased profitability. The results of the study extract many important implications for the financial policy maker to ensure financial stability on the one hand and the continued profitability of Iraqi banks. First: The financial and monetary policy maker should be taken the necessary measures to regulate the work of the banking sector to create a competitive environment that contributes to enhancing financial and monetary stability. Second: Improving loan monitoring and management procedures will lower credit risk and boost profits for commercial banks in Iraq. Third: Commercial banks should make optimal use of available funds and contribute to strengthening the confidence of the Iraqi citizen in the banking sector.

Declaration of Conflict of Interest

The authors declare that they have no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability Statement

Data used in this research will be available on request. Readers can request data on the following email after publication of paper. b.faraj@ogr.iu.edu.tr

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