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# **Bank Competition and Risk Appetite: Evidence from Tunisia**

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## **ABSTRACT**

In this paper, we investigate whether bank competition increases risk taking for the case of the Tunisian banks. Our data set covers nine Tunisian banks observed during the period from 1980 to 2009 and we conducted an econometric model based on panel data estimations. The econometric results reveal the presence of a positive relationship between competition and bank risk taking. This shows that the functions of Tunisian banks remain based on the basic traditional activities and banks need to diversify their activities in safe functions to keep the banking sector stable and avoid bank failure.

**JEL Codes:** G21; L11.

**Key words:** Bank competition, Tunisian banks, Bank risk taking, Panel data analysis.

## **Introduction**

The relationship between competition and bank risk taking has been analyzed by numerous authors and their results have provided conflicting conclusions. In fact, while some studies found that higher competition decreases risk taking by banks (Schaeck and Cihak (2014), Kick and Prieto (2013), Boyd, De Nicolo, and Jalal (2007), Boyd and De Nicolo (2005)), some other studies affirm the existence of a positive relationship between competition and bank risk-taking. (Soedarmono, *et al* (2013), Repullo (2004), Caminal and Matutes (2002), Marquez (2002), Mishkin (1999), Besanko and Thakor (1992)). Furthermore, some other studies have found a nonlinear relationship between bank competition and the level of risk taking. For example, the studies of Jimenez and Saurina (2013), Tabak B. M., Fazio D., and Cajueiro D. O. (2012), Martinez-Miera and Repullo (2010), concluded that competition affects bank risk-taking in a non-linear way.

These different results show that the relationship between competition and bank risk taking has not been unanimous. Moreover, most of the available studies analyzed this relationship for developed countries only. Therefore, the motivation of our paper is to investigate whether bank competition increases bank risk taking for the case of the Tunisian banks.

Tunisia is an interesting case study as it adopted various policy reforms since the eighties to improve the financial sector. Following the liberalization of finance and trade, Tunisia banking sector has become more attractive to foreign banks and the number of players increased drastically between 1985 and 1998. As a result, competition between banks increased and new financial institutions have been introduced into the market to provide financial, banking and insurance services to Tunisian households. While most of studies on Tunisia have been focused on the consequences of liberalization on the performance of banks, the current paper will focus on a new concern which is the possible relationship between bank competition and risk taking by Tunisian banks. To this end, we collected a data from the nine most important banks operating in Tunisia and we conducted a panel data modelling to test for the validity of this relationship. Our dataset covers the period from 1980 to 2009. Obviously, the empirical results confirm the positive liaison between competitions of risk taking. This could be explained by the fact that when competition increased, profit of banks decreased and these institutions have been forced to look for new activities to compensate the loss from the penetration of new competitors. It appears that the new activities are risky.

The remainder of the paper is organized as follows. In Section 2 we present a literature review on the banking competition and risk taking. In Section 3, we describe our methodology and the model specification. Empirical results and discussion are given in section 4. Finally section 5 concludes the results.

## **2. Literature Review**

The debate on the relationship between competition and risk taking is not conclusive. The academic literature is abundant and the empirical evidence provides a series of contrasting results. Findings on this topic can be divided into three ranges. The first current of literature supports the negative correlation between the level of competition and the bank risk taking. On the contrary, the second current defends the positive association between the two variables while the third line of ideas has been based around the nonlinear relationship between competition and bank risk taking.

The negative effect of bank competition on the level of risk taking has been analyzed by several studies. For example Keely (1990) shows that increasing competition erodes the bank charter values, resulting in a negative trade-off between competition and stability (Keeley, 1990). In another study, Boyd and De Nicolo (2005) show how higher competition among banks might lead to a reduction in the overall level of bank risk taking: Higher competition reduces interest rate costs at the level of the borrowing firm, leading the firm to choose a safer project which ultimately generates safer banks. In another study, Boyd *et al.* (2007), based on two different samples find that less-concentrated banking markets are characterized by lower z-scores, an inverse measure of bank risk.

Kick and Prieto (2013) have used a dataset provided by the Deutsche Bundesbank over the period 1994 to 2010 to test for the liaison between competition and risk taking. The authors have used the Lerner Index as a proxy for bank-specific market power. Their results support the view that market power tends to reduce the default probability and the riskiness of the banks. In contrast, by using the Boone Indicator they found strong support that increased competition lowers the riskiness of banks. More recently, Schaeck and Cihak (2014) have conducted a panel data analysis for some European banks during the period 1995 to 2005 using the Boone indicator to analyze the cost elasticity of performance by capturing the link between competition and efficiency. Their results show that in general, a negative effect of competition on bank risk for European countries.

In the other hand, the positive association between the level of competition and the bank risk taking constituted the major finding of several studies (Boyd and De Nicolo, 2005; Schaeck et al., 2009; Allen et al., 2011). The study of Besanko and Thakor (1992) shows that the more the number of players in the banking system increase the more the deposit rates increases and the more the lending rates decrease. When the lending prices are low; banks count on the quantities of credit. In this line of idea, banks can compensate the lower rate by the higher quantity distributed, which can lead to grant credit with insufficient guarantees. The study of Caminal and Matutes (2002) shows that strong competition reduces credit rationing and increase the distribution of credits. In this case, banks may be engaged in riskier operations which increase the level of risk taking. Another argument presented by Mishkin (1999) shows that a more concentrated banking structure is rewarded by government. This can create problems of moral hazard and encourage banks to take more risk, and consequently increasing bank fragility. Another study conducted by Although, Marquez (2002) showed that an increase in the number of banks in a market disperses the borrower-specific information and results in both higher funding costs and greater access to credit for low-quality borrowers. For Repullo (2004) who made a dynamic model of imperfect banking competition to show that more competition leads to more risk-taking in the absence of regulation, risk-based capital requirements were found to effectively control the risk-shifting incentives in that model.

Based on a sample of commercial banks in Asia during the period from 1994 to 2009, Soedarmono, *et al.*(2013) have found that a higher degree of market power in the banking market is associated with higher capital ratios, higher income volatility and higher insolvency risk of banks. In addition to the negative and positive relationship between competition and bank risk taking, a third association has been revealed in many researches. Using a sample of banks in 10 Latin American countries for the period from 2003 to 2008, Tabak, Fazio and Cajueiro (2012) have found that competition affects risk-taking behavior in a non-linear way as both high and low competition levels enhance financial stability. They concluded that Banks facing both high and low competition are, on average, lower level risk-takers than banks experiencing average competition. Using data for the Spanish banking system over the period 1988 to 2003, Jimenez and Saurina (2013) concluded that reducing competition in banking markets had been seen as promoting banking stability. This finding supports a nonlinear relationship using standard measures of market concentration in both the loan and deposit markets and confirms the results of Tabak, Fazio and Cajueiro (2012) and Martinez-Miera and Repullo (2010). The depended variable which reflects the bank risk taking is the

level of nonperforming loan for the study of Jimenez et al (2013). However many proxies are used to measure bank competition such as the concentration index, the Herfindahl-Hirschman index, the Lerner index, etc.

### 3. Data and Model Specification

Our dataset covers the nine most important retail banks operating in Tunisia and they were observed during the period 1980–2009; hence we have a total of 270 observations. We use annual bank-level balance sheet and income statement data collected from the Tunisian professional association of banks (APTBEF, 2014). In this paper we use the following variables: The Z-Score; Net Interest Margin (NIM); the Herfindahl-Hirschman concentration index (HHI), market share of each bank (MS), Intermediation (ITR); the deposit specialization ratio (DEP); the bank size (SIZE), The credit risk (CR), the liquidity Risk (LR), inflation (Inf) and GDP per capita. The definitions of these variables are displayed in Table 1 below.

**Table1. Definition of the variables**

<b>Z-Score</b>	Defined as the ratio of the return on assets (ROA) plus the capital ratio (CAR) divided by the standard deviation of the return on assets (SDROA)
<b>NIM</b>	Interest Income/Total Assets
<b>HHI</b>	Measured by the Herfindahl-Hirschman concentration index.
<b>MS</b>	Is measured by total assets of the bank (i) to total bank assets of the sample.
<b>DP</b>	The deposit specialization ratio measures the weight of deposits of each bank in the total liabilities.
<b>ITR</b>	Is the ratio of interest expense to interest income
<b>SIZE</b>	Is the bank size measured by natural logarithm of total assets of each bank
<b>CR</b>	Is a measure of credit risk; it's measured by Total Loans/Total Assets.
<b>LR</b>	is a proxy of liquidity risk; it is equal to Total Loans/Total Deposits
<b>INF</b>	The inflation rate measured by the CPI
<b>GDP</b>	In the Gross domestic product per capita

Table 2 presents the descriptive statistics of the variables used. The average net interest margin (NIM) is 2.95% with a maximum of 11.25% and a minimum of 0.37%. The average Z-Score is 3.33% with a maximum value of 8.54% while its minimum value is -1.56%.

Banking concentration (HHI) average is 12.80% with a minimum of 10.95% and a maximum of 16.18%. Despite the small number of institutions in the banking system, the sector has a low level of concentration.

The average level of credit risk (CR) of Tunisian banks is about 60.74% with a higher value equal to 90.36% and 30.29% for the minimum value. The mean value of the Liquidity risk (LIQR) is 100.09%, its minimum value is 48.04% and 259.70% as maximum value. The average market share of Tunisian banks (MS) is 10.41%; with a maximum value is 29.18% while its minimum value is 0.59%. The average value of bank intermediation (ITR) is 53.26%; its maximum value is 97.75% while its minimum value is 27.77%. For macroeconomic variables, the average growth rate of real GDP per capita is 7.58%; its minimum value is 7.30% and 8.03% as maximum value and the average inflation is 5.37% which is relatively high in Tunisia.

**Table2: Descriptive statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
Zscore	270	3.336	1.213	-1.562	8.543
Nim	270	0.0295	0.0130	0.0037	0.112
Crisk	270	0.6070	0.1512	0.0302	0.903
Liqr	270	1.096	0.4019	0.4804	2.597
Size	270	14.634	0.5282	13.626	15.748
Hhi	270	0.1280	0.4256	0.1099	0.1618
Car	270	0.0737	0.0323	0.0109	0.1748
Itr	270	0.5206	0.1314	0.1447	0.9461
Ms	270	0.1041	0.0532	0.0059	0.2918
Dep	270	0.1269	0.1118	-.1540	0.6371
Inf	270	0.0323	0.0082	0.0216	0.0558
Gdp	270	0.0338	0.0168	.01658	0.0631

In the estimation procedure, we apply the panel data analysis. The econometric model can be written as follows:

$$Z - \text{Score}_{i,t} = \beta_0 + \beta_1 \text{PERF}_{i,t} + \beta_2 \text{CR}_{i,t} + \beta_3 \text{LR}_{i,t} + \beta_4 \text{SIZE}_{i,t} + \beta_5 \text{CAR}_{i,t} + \beta_6 \text{ITR}_{i,t} + \beta_7 \text{HHI}_{i,t} + \beta_8 \text{MS}_{i,t} + \beta_9 \text{DP}_{i,t} + \beta_{10} \text{GDP}_{i,t} + \beta_{11} \text{Inf}_{i,t} + \varepsilon_i$$

Following Laeven and Levine (2009); we use the Z-Score to measure the bank risk taking. We decompose the Z-Score in two components. The first component is the return on average (ROA) divided by the standard deviation of ROA as a measure of bank's portfolio risk. The second component is the ratio of total equity divided by total assets over the standard

deviation of ROA as a measures leverage risk. Regarding the bank performance we use the Net Interest Margin (NIM). The later could be the best indicator of bank profitability in Tunisia as it reflects the magnitude of traditional activities in Tunisia during the past three decades and the volume of lending and deposit activities (Hakimi and Hamdi 2012).

#### 4. Empirical Results

The correlation matrix displayed in Table 3 gives information on the level and nature of linkage between the variables. The results reveal a weak correlation between the different variables, and this rejects the existence of multicollinearity problem. The correlation matrix shows that the Z-SCORE is positively linked to most of the variables except the liquidity risk (LR), the bank size (SIZE), the market deposit (DEP) and the inflation rate (INF).

**Table 3: Correlation Matrix**

	Z-SCORE	NIM	CR	LR	SIZE	CAR	ITR	IHH	MS	DEP	INF	GDP
Z-SCORE	1.0000											
NIM	0.0706	1.0000										
CR	0.1053	0.1157	1.0000									
LR	-0.0049	-0.2494	0.5999	1.0000								
SIZE	-0.0821	0.1182	0.0570	0.0905	1.0000							
CAR	0.1057	0.1340	0.2670	0.1865	-0.1552	1.0000						
ITR	0.1105	0.7160	0.0177	0.1852	0.0756	-0.3604	1.0000					
HHI	0.1338	0.1254	0.7167	-0.3910	0.0060	0.1887	0.1019	1.0000				
MS	0.2963	0.3318	0.0340	0.2250	0.1876	0.0565	0.2024	0.0841	1.0000			
DEP	-0.0048	0.1248	0.2672	-0.2069	0.0743	0.0098	0.1729	0.2338	0.1060	1.0000		
INF	-0.0280	0.0343	0.0560	0.0856	0.2855	0.0221	0.0116	0.0502	0.0052	-0.0269	1.0000	
GDP	0.0412	0.0116	0.0091	0.0091	0.4073	0.0357	0.0417	0.0289	0.0084	0.0343	0.3996	1.0000

*Note. This table reveals the correlation matrix between all the variables.*

Table 4 presents the estimation results for the random effect regression on the Tunisian banking sector. The net interest margin (NIM) acts positively on the bank risk taking (6.27) but the effect is not significant. As measured by the interest margin to total assets, this variable can increase the level of risk taking for the Tunisian banks since banks can grant loans to households with insufficient guarantees to search for high revenues.

The credit risk (CR) seems to be positively and significantly correlated with the dependent variable. This association indicates that a higher level of credit risk is associated with a higher



level of bank risk taking. On the other hand, liquidity risk (LR) is negatively and significantly correlated with the dependent variable. This shows that when the liquidity is available, the risk appetite decreases.

The bank size, capital adequacy ratio and the market deposit ratio have no significant effect on the bank risk taking. In this research, bank size is negatively correlated with the bank risk taking. In fact, it was shown in literature that banks with big size take more risk than small-sized banks. However, as Tunisian banks are relatively small sized banks, so these small entities appear not being high risk takers.

Turning now to banking intermediation ratio (ITR); it was shown to be positively and significantly correlated with the dependent variable. Indeed, an increase on the received interests (lending interest rates) or a decrease in interest expenses (deposit rates) is likely to lead to more bank performance. It should be noted that the increase in deposit rates should be roughly proportional to the decrease in lending rates. To search for more profitability, banks may raise the lending interest rates or the amount of distributed credit which reflects a high level of bank risk taking.

The index of concentration (HHI) acts positively but not significantly on the dependent variable while market shares (MS) acts positive and significant at the level of 1 %. This could be explained by the facts that when banks are searching for high market shares, based on the volume of distributed loans, banks may grant credits with insufficient guarantees. In this bank stability becomes a concern. Faced with a higher number of heterogeneous clients, banks cannot collect the necessary information, so the problem of information asymmetry will increase and this can lead banks to pursue riskier projects. This result confirms the finding of Kick and Prieto (2013).

The effect of the two macroeconomic variables is not significant. The growth rate of GDP per capita (GDP) acts positively on the bank risk taking however, the inflation rate affects negatively the level of risk taking. In an inflationary context, banks limit their risks by giving up commitment in medium and long-term contracts, because inflation causes a redistribution of income in favour of borrowers and the detriment of lenders. In the Tunisian case, the increase of the credits is not a fundamental origin of inflation, which is caused by other factors. Therefore, we can conclude that inflation and GDP seem not to have a potential impact on the bank risk taking in the Tunisian context.

Table 4: Results of the Random Effect Model

<b>Zscore</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>Z</b>	<b>P&gt; z </b>
<b>NIM</b>	6.274	13.1422	0.4810	0.6332
<b>CK</b>	1.599	0.9182	1.7404	0.0825*
<b>LR</b>	-0.4493	0.2638	-1.7018	0.0894*
<b>SIZE</b>	-0.1969	0.1646	-1.2021	0.2323
<b>CAR</b>	4.139	2.622	1.581	0.1155
<b>ITR</b>	2.134	0.9949	2.152	0.0321**
<b>IHH</b>	2.442	6.729	0.3611	0.7174
<b>MS</b>	6.810	1.475	4.621	0.000***
<b>DEP</b>	-0.01024	0.8347	-0.0154	0.9904
<b>INF</b>	-2.851	9.333	-0.3186	0.7603
<b>GDP</b>	6.915	4.925	1.404	0.1601
<b>_CONS</b>	3.466	2.853	1.215	0.2241
<b>Hausman test</b>				
Chi2 (10)	=7.98			
Prob > chi 2	= 0.6304			
<b>Breusch and Pagan test</b>				
Chi2 (10)	= 1.27			
Prob > chi 2	= 0.2599			
<b>Wald test</b>				
Wald chi2 (11)	= 47.44			
Prob > chi2	= 0.0000			
<b>Number of observation = 270</b>				

\*\*\*, \*\* and \* significantly respectively at 1%, 5% and 10%.

## 5. Conclusion

The purpose of in this paper is to investigate whether bank competition increases bank risk taking for the case of Tunisia. Our sample included the nine most important banks operating in the country since 1980 and we have performed a panel data regression with random effect specification. Overall results, confirm the idea that there is a positive relationship between competition and bank risk taking. This conclusion supports the findings of Soedarmono, W., Machrouh, F., and Tarazi, A. (2013), Repullo (2004), Caminal and Matutes (2002), Marquez (2002), Mishkin (1999), Besanko and Thakor (1992), etc. In Tunisia, bank suffers from various types of competitions and from market pressure as well. This increased level competition pushes banks to develop risky activities to compensate the loss of revenues. This risk taking by Tunisian banks reveals the reality of the banking system and the nature of banking activities which remain based on the basic activities such as granting loans, collecting credits and managing the payment systems. In this case, revenue of banks is mostly interest revenues. Hence, an increase of the players would automatically affect the performance of the

competitors and would particularly affect their margins. For the case of Tunisia, when the number of banks increase, the level completion increase as well and this will force banks to look for new sources of revenues. However, this policy could harm the stability of the Tunisian banking sector as a whole as it could generate bank failure. Therefore, we recommend Tunisian policy makers to improve the financial infrastructure and to encourage banks to diversify their activities in non-riskier activities that could bring high added value.

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