

The Evolution of Competition of the Tunisian Banking Sector: An Empirical Analysis

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Abstract: This paper analyzes the evolution of competition in the Tunisian banking sector in the period 2000 - 2008, which is a period of deregulation, liberalization and consolidation of the sector. For this purpose, we use two indicators of the competition from the theory of the industrial organization (the Lerner index and the Panzar and Rosse's H-statistic). The empirical evidence does not permit us to reject the existence of monopolistic competition. The evolution of Lerner index over the period of study shows a low tendency to concentration. The movements of the mergers of the banking institutions seem to be slow, as a big effort of cleaning their balance sheets remains to be achieved before banks can merge.

Keywords: Banking Competition, Concentration, Market power, Panzar and Rosse Methodology, Lerner index.

JEL Classification: G28

Introduction

The importance of the credit as a means of financing companies in most of the developing countries has led to wonder about the effects of the financial liberalization on the increase of the banking competition. In Tunisia, like in many other countries, the liberalization of financial services in general and the activities of banks haven't stopped evolving. The implementation of the Structural Adjustment Plan in Tunisia (1987) was expressed, in its financial and monetary component, by reforms aiming at the liberalization of the Tunisian banking system. The latter had to adapt itself to the imperatives of a financial liberalization assimilating the competition as the main explanatory element of the efficiency in the financial institutions.

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An important factor to take into consideration when we evaluate efficiency is competition. A more competitive market is generally tightly associated with higher efficiency. An increased competition on the market of credit implies a decrease of the monopoly rents in banks, and a reduction in the costs of financing companies. The productive investment is favored and the growth is stimulated. However, the progressive liberalization of the banking services has led banks to adopt strategies of merger and concentration. These strategies would possibly be the most adapted solutions to exploit the opportunities of synergy ruined by fragmentation and subdivision of the sector. They would also allow the Tunisian economy to be equipped with solid and powerful banks capable of facing competition from foreign banks which would probably establish themselves on the Tunisian territory.

The analysis of banks' expansion strategies and the development of the range of their activities oblige us to take into account the banking market structures. Precisely, we can examine the concentration in relation to the market power. This issue is one of the most acute problems which is raised by the presence of large-sized banks. Linking mergers and acquisitions to the strategies of market power, implies having opposite price policies in the interests of the consumers of the banking services. This would lead to envisage their unfavorable impact on the financing process of productive investment, which in itself is the source of economic growth.

The empirical researches dedicated to this question have given contrasted results. In fact, a study by Bikker and Haaf (2002) on 23 European countries tends to confirm the classical opinion: "concentration harms competition". However, in another study which is based on a sample including around 4,000 banking institutions in about fifty countries, Claessens and Laeven (2005) conclude that the competition is not negatively associated with concentration. In addition, these authors establish in addition a clear relationship between the increased competition in the sector of financial services and the lack of entry barriers (including the barriers applied to foreign banks), accompanied by few governmental restrictions imposed on the activities of financial services.

The study of Claessens and Laeven (2005) advocates the notion of contestability [Baumol et.al. (1982)], which deals with the capacity of companies to enter a banking market and to compete with the already established ones. A market is considered contestable if barriers in access are not excessive and if the conditions of exit are not too penalizing. Thus, companies are not dissuaded from entering this market from the beginning. The basic idea is that the already present company on a market will feel obliged to increase its competitiveness and its efficiency to face potential competitors. So, instead of relying only on the measures of the concentration of the market to estimate the degree of competition in a given sector, we are inclined to favor the market actors' behavior to gauge the degree of contestability of a sector.

The notion of the contestability has also contributed to the study of both the competition between banks and to the behavior of banks on the market. Indeed, this notion leads to a conclusion contrary to the Structure-Conduct-Performance (SCP)

approach. The latter concludes that an oligopoly characterized by the existence of economies of scale cannot behave in a competitive way and generates high profits. The theory of the *contestable markets* states that if this oligopoly behaves as a contestable market, its price will be close to the marginal cost. Thus the contestability of a market leads the industry to an efficient configuration. This result is worth, especially, in the case of a bank with a multi-product production [Dietsch (1991)].

Consequently, it is not necessary for a sector to be in a situation of effective competition so that the price equals the marginal cost: it is enough to be in a situation of potential competition. So, the number of firms on the market is not necessarily an indicator of competition.

Our research will use measures of competition and not concentration to describe the competitive dynamics of the Tunisian banking sector. We will use two measures of bank market power: a first approach will consist in calculating Lerner index and a second approach will deal with the calculation of the H-statistic of Panzar and Rosse (hereafter P-R) (1977; 1982 and 1987) appropriate for the Tunisian banking sector.

The remaining part of our paper is organized as follows: In the section 1, we briefly present the evolution of the Tunisian banking sector during the period 2000 - 2008. In section 3, we present the methodology: the approaches used to measure the degree of competition in the banking industry, namely the approach of Panzar and Rosse and that of Lerner. Section 4 includes the empirical analysis and the results. Finally, section 5 represents the conclusion.

The Evolution of the Tunisian Banking Sector

In 2007, the Tunisian banking sector consisted of 4 big banks running 51% of the sector's assets and each holding a part of the assets exceeding 10%, 5 average banks monopolizing together 34% of the total assets in this sector and 11 small banks sharing the remaining 15% of total assets.

Indeed, the Tunisian banking sector presents a relatively low concentration when compared internationally. The Herfindahl-Hirschmann Index (HHI) of the industry concentration confirms the fragmentation of the Tunisian banking sector.

Table 1: The evolution of the Herfindahl-Hirschmann index (HHI)

	2007	2008	2009	2009*
Total assets	0.1171	0.1157	0.1131	0.2035
Customer loan	0.1200	0.1198	0.1165	0.15780
Customer deposit	0.1164	0.1157	0.1139	0.1780
Net banking income	0.1148	0.1129	0.1122	0.1445

(*) Estimated value, in case of merger between the STB and BH

Source : Maxula BOURSE (2010)

We notice that the HHI is widely below 1. So the weakness of this index gives evidence that the banking sector is fairly fragmented. With such a fragmented banking sector, the Tunisian economy can not be exempt from the negative impact of globalization.

The Tunisian banks are of average sizes with regard to their African and Arabic counterparts. Table 2 indicates Algeria as the country having the most concentrated banking sector with 95 % of assets held by the first five banks against 75 % in Morocco, 65 % in Tunisia and 63 % in Egypt.

Table 2: The rate of banking concentration in Northern Africa region

	Algeria	Morocco	Tunisia	Egypt
The rate of deposits held by the first 5 banks	94	75,00	64,5	63,10
The rate of assets held by the first 5 banks	95	66,48	64,8	61,80

Source: Barth and al. (2003)

In terms of financial reforms, the Tunisian experience seems to be paradoxical since the process of financial liberalization did not incite banks to restructure and strengthen themselves. The Fitch Ratings notation agency which considers that the rhythm of privatization in the banking sector is slow. This can be accounted for by the big efforts that the public banks should make to clean the balance sheets and therefore to be able to provide attractive opportunities for private investments “.

Indeed, the Tunisian banks face several problems today: a high level of bad debts, an insufficient capitalization, a bad quality of their assets, and an unsatisfactory profitability. Concerning this crucial point of portfolio quality of the Tunisian banks, Fitch Ratings indicates that the part of the classified debts, with regard to the total of bank commitments, amounts to 21 % for commercial banks and 28 % for development banks. However, this presentation of figures tends to overvalue the quality of the bank assets, by including the off balance sheet items in the denominator of the ratio and then it reduces the possibility of being internationally compared. Besides, the cover of these bad debts classified at 44 % for the commercial banks and 66 % for development banks allows us to conclude that “the Tunisian banking system as a whole is insufficiently funded”.

Being fragmented, badly structured, and incapable of rising to the international standards, the Tunisian banking sector can not serve the national economy. The Tunisian banks cannot finance megaprojects. In a country that is renowned for its foreign investment promotion, the Tunisian banks are expected to study the possibilities of increasing their financial potential via well-studied mergers. This is likely to strengthen the Tunisian banks and make them capable of financing megaprojects. For example, Orascom Telecom Tunisie (Tunisiana) resorted to foreign funds to finance its implantation in Tunisia. Because of the limited reserves in foreign currencies, deposits and guarantees are considered insufficient in terms of volume and

especially the problems of important unpaid loans which characterize the Tunisian domestic banks. The fact of creating banking groups through mergers will lead to improve their margin of progress and the availability of funds. Moreover, the financial groups which acquired Tunisian banks were able to overcome hardships to assure important returns on their investments. We note cases such as The Tuniso-Kuwaiti Bank (Caisse d'épargne Group), The International Banking Union (Société Générale Group) and Attijari Bank (Attijariwafa Bank Group). These alliances are regarded as the major response to the fragmentation of the Tunisian banking sector and these mergers remain a solution to several other troubles: the basic problem is to face the competition from foreign banks on the Tunisian local banking market. This might allow the merged Tunisian banks to expand and eventually be able to open up subsidiaries beyond the Tunisian borders.

The search for a better efficiency, for a critical size and for a market power are so many factors which urged the Tunisian monetary authorities to set up reforms to restructure the financial and banking system. The strategy of concentration, generally by merger - acquisition, is indispensable because, in addition to the fact that it strengthens stockholders' equity and safety of banks, it serves as a protection against OPA unfriendly foreigners which weaken the monetary sovereignty and exclude priority social projects (housing, farming, etc.) from being financed. It also allows us to respond better to the increasing needs of financing. These mergers also strengthen the oligopolistic competition between major actors and improve the quality of the services and encourage innovation. However, the concentration indices are little reliable to measure the intensity of competition in the small economies where the number of banks is small [Bikker (2004)].

Methodology: The Approaches Used to Measure the Degree of Competition

The studies which analyzed the effects of the concentration on the efficiency by using various indices of concentration as that of Herfindahl-Hirshman and the market share held by the three or five bigger banks [Gondal-Larralde and Lepetit (2001), Fries and Taci (2005), Lensink and al. (2008)], do not allow us to describe its competitive dynamics suitably. Indeed, the fact that the market is concentrated does not necessarily imply a weak competition. Cetorelli (1999) shows that, generally, the relation between concentration and competition is not obvious especially on the contestable markets. Consequently, the competition cannot be measured by indicators of structure such as the number of institutions, the Herfindahl-Hirshman index and the other measures of concentration. This aspect was also empirically demonstrated by some studies. For example, Pruteanu-Podpiera and al. (2008) on the Czech banking system or that of Gutiérrez de Rozas (2007) on the Spanish banking system, did not find a negative relation between the measures of concentration and the measures of

competition estimated by the Lerner index in the first study and by the H-statistic of Panzar-Rosse in the second).

1. The P-R approach

In order to assess the contestability of banking markets in Tunisia, we carry out tests derived from the New Industrial Organization literature, in particular Panzar and Rosse (1987), based on reduced form revenue functions. Market power is measured by the extent to which changes in input prices are reflected in revenues.

The equation for the reduced form of revenue i over a period t is shown in the following specification:

$$TRit = f(W_{it}, S_{it}, \varepsilon_{it}) \quad (1)$$

Where i denotes banks and t denotes years. TR is the ratio of gross revenues to total assets, W is a vector of the price of factors; S is a vector of variables of structure; and ε is an error term.

With perfect competition, and when banks operate at their long-run equilibrium, a proportional increase in factor prices (including the interest rate on liabilities) induces an equiproportional change in gross revenues, output does not change in volume terms, while the output price rises to the same extent as the input price (i.e. demand is perfectly elastic). On the other hand, under monopolistic competition, revenues will increase less proportionally than the changes in input prices as the demand for banking products facing individual banks is inelastic [Tirole (1987)]. In the case of monopoly there may be no response or even a negative response of gross revenues to changes in input prices.

To assess the degree of competition in banking markets, the empirical strategy adopted by P-R (1982; 1987) implies therefore to compute an index defined as the sum of the elasticities of gross revenues to unit factor cost in a reduced form revenue equation (the H-statistic). This index is negative in the case of monopoly, positive but smaller than 1 with monopolistic competition or equal to 1 if perfect competition prevails.

In this case, $\delta R_{it} / \delta W_{itk}$ is a derived total revenue in relation to k^{th} input price. The H-statistic of the P-R model is defined by the sum of the elasticities of the reduced form revenue, knowing the input prices.

$$H = \sum [(\delta TR_{it} / \delta W_{itk}) * (W_{itk} / TR_{it})] \quad (2)$$

The conclusions of this approach crucially suppose, that banks are in their long-run equilibrium [Shaffer (1982)]. This hypothesis is strong, particularly if we try to

observe the evolutions of the macroeconomic, institutional, and regulatory contexts following the implementation of the financial reforms in Tunisia.

2. The Lerner index

The second approach to assess the degree of competition is to examine the differential between the prices that banks charge for their services and the marginal costs they incur to provide these services. A high margin would suggest a high level of market power and hence, a lower degree of competition in the banking sector.

By noting P_{it} the average price proposed by a bank i at the time t for its products, and by MC_{it} , its marginal cost, the Lerner index is determined in the following way:

$$\frac{P_{it} - MC_{it}}{P_{it}} = \frac{1}{\epsilon} \quad (3)$$

Where $\frac{P_{it} - MC_{it}}{P_{it}}$ defines the Lerner monopoly power index evaluating the degree with which the market power of a monopoly allows it to set a price higher than the marginal cost of production. The index value will characterize the competitive situation with the following interpretations:

- In a situation of perfect competition (elasticity of the demand (ϵ) is very big or infinite), the value of the index would get closer to zero;
- In a situation of real monopoly (elasticity of the demand (ϵ) is null or close to zero), the value of the ratio would move towards the infinity;
- Finally, between these two extremes, the elasticity of the demand (ϵ) varies in an inverse way of the monopoly power, so we find intermediate competitive situations.

Empirical Analyses

The subject of this section is to test the level of competition in the Tunisian banking system. To this end, we establish the function of cost by adopting the approach of intermediation where the banking products are the credits and the other remunerative assets. Such a function allows us to define the two measuring instruments taken from the new theory of the industrial organization: the H-statistic of Panzar and Rosse and the Lerner index.

1. Sample and variables selected

To achieve this empirical study, we use the method of data belonging to the statistical panel of a sample which contains 18 Tunisian banks, the list which appears in the ap-

pendix 1, for the period which spreads out between 2000 and 2008. The Professional Association of Tunisian Banks is our principal source of data through its annual reports.

To estimate the indicators of market power, we will need to estimate the functions of profitability, revenue and costs, of the banking firm. For that purpose, we define the variables indicated in the tables below:

Table 3 : Definition of dependent variables

Designation of variables	Description	Authors
ROA = Profitability	The pre-tax Return on Total assets	Shaffer S. (1982); Molyneux <i>and al.</i> (1994; 1996); Claessens and Laeven (2004)
TR = Total Revenue	Interests and Revenues assimilated on Total assets	De Bandt and Davis (2000)
TC = Total Costs	Financial and Operational costs	Boutillier M. <i>and al.</i> (2004)
P = Banks' output price	TR = Interests and Revenues assimilated on Total assets	Classes and Laeven (2004)

Table 4: Definition of the independent variables

Designation of variables	Description	Authors
W1 = The price of labor	Ratio of Personnel expenses to Total assets	Molyneux <i>and al.</i> (1994) Bikker and Groeneveld (2000)
W2 = The proxy of input price of deposits	Ratio of Interest expenses to Total deposits	Boutillier M. <i>and al.</i> (2004)
W3 = The proxy for input price of equipment / fixed capital	Ratio of the Operating and Administrative expenses to Total assets	De Bandt and Davis (2000)
TA = The proxy of bank output	Total Assets	Berger, Klapper and Turk-Ariss (2008)
S₁ = Variable of structure	Total net loans to Total Assets	Boutillier M. <i>and al.</i> (2004)
S₂ = Variable of structure	Total banking Deposit to Total Assets	Boutillier M. <i>and al.</i> (2004)

2. The empirical specification of P-R Model

Step 1: The checking of the hypothesis of long-term equilibrium

For accurate identification of the H-statistic using an estimated revenue equation based on a static equilibrium model, it is necessary to assume that markets are in a long-run equilibrium state at each point in time when the data are observed. Shaffer (1982) proposed a test of the market equilibrium assumption. Competitive

capital markets should equalize risk-adjusted returns across banks in equilibrium. Accordingly, the equilibrium profit rate should be uncorrelated with the input prices. This test is commonly implemented through estimation of the following regression:

$$\ln(1 + \text{ROA}_{it}) = \hat{\alpha}_i + \sum_{j=1}^3 \hat{\alpha}_j \ln(W_{jt}) + \sum_{k=1}^2 \hat{\alpha}_k \ln(S_{it}) + \hat{\alpha}_{it} \quad (4)$$

where i denotes banks and t denotes years, \ln = The natural operating logarithm, W_j is the vector of the input prices, S is the vector of structure variables, α denotes bank-level fixed effects and ε is an error term.

Because ROA can take on negative values, we compute the dependent variable as $\ln(1+\text{ROA})$. We define the equilibrium E-statistic as $\beta_1+\beta_2+\beta_3$ from equation (4). The test of the long-run equilibrium involves testing whether E-statistic equals zero. In other words, the market is in equilibrium if the return on assets is not related to input prices.

By estimating a sample of panel data, the first thing which is worth checking is the homogeneous or heterogeneous specification of the generative process of data. Econometrically speaking, we should test the equality of the coefficients of the model studied in the individual bases. The tests of specification consist in determining if we are entitled to suppose that the studied theoretical model is perfectly identical for all banks, or on the contrary there are specificities appropriate for each bank.

The presence of specific effects for every individual bank makes the least ordinary squares (OLS) estimators not convergent. In these conditions, we have to refer to the estimation by the within method if these effects are fixed, or the method of the generalized least squares (GLS) if these effects are at random.

The application of the test pertaining to the existence of the individual specificities shows that the statistics of Fisher associated with the test of homogeneity are superior to the values of Fisher indicated on the statistical table [$2.56 > F(N-1; NT-N-K-1) = F(17; 138) = 1.69$] or (prob of the test = $0 < 5\%$), with $N=18$, is the banks' number, $T = 9$, the number of periods, an K is the number of explanatory variables. We then reject the hypothesis of homogeneity of variables.

Once the heterogeneity of variables is detected, we have to move to the choice between the regression by the within method or by the method of the least generalized squares (GLS). To select the best method, we apply the test of specification of Hausman (1978). By referring to the statistics of this test at 10 % level: $10.95 > 9.23$ or ($0.0522 < 10\%$). We accept the hypothesis of correlation between the effects appropriate for banks and the explanatory variables. Thus, the appropriate effects are fixed and consequently, it is the within method that will be used. The model with fixed effects is convergent and effective.

Table 5: Equilibrium test results for Tunisian banks (Fixed Effect estimation of $\ln(1+ROA)$ equation)

Variables	Coefficients
α	0.031 (1.399)
Ln W1	0.009** (2.217)
Ln W2	-0.001 (-0.647)
Ln W3	-0.005** (-3.954)
Ln S1	0.008*** (1.683)
Ln S2	-0.002 (-0.650)
R ²	0,672
F-statistic	8.967
P value	0.000
Hausman test	10.957** (0.0522)
E-statistic	0.003 (4.579)
Equilibrium : E = 0	0.00

Notes: Figures in parentheses are t-statistics

*, **, *** indicate significance levels of 1 %, 5% and 10 %, respectively.

The results presented on table 5 show that E-statistic = 0.003. This statistic is significantly null at 5% level. We then accept the hypothesis of the existence of a long-run equilibrium of the Tunisian banking system. So, the P-R model can be applied to study the nature of the competition and the existence of a market power in the banking sector.

Step 2: The estimation of the H- statistic

After checking the existence of a long-run equilibrium for the Tunisian banking market, we move to the calculation of the H-statistic to identify its competitive dynamics.

Based on the P-R methodology and following the empirical strategy pursued by Claessens and Laeven (2005), we obtain the H-statistic by estimating the equation (5) below:

$$\ln(\text{TR}_{it}) = \hat{\alpha}_i + \tilde{\alpha}_1 \ln(\text{W1}_{it}) + \tilde{\alpha}_2 \ln(\text{W2}_{it}) + \tilde{\alpha}_3 \ln(\text{W3}_{it}) + \tilde{\alpha}_4 \ln(\text{S1}_{it}) + \tilde{\alpha}_5 \ln(\text{S2}_{it}) + \hat{\alpha}_{it} \quad (5)$$

Where i denotes banks and t denotes years. TR is the ratio of gross revenues to total assets, W1 is the input price of labor, W2 is the input price of deposits and W3 is the input price of fixed capital, S1 and S2 are the variables of structure, Finally, α denotes bank-level fixed effects and ε is an error term.

The estimation of the previous expression offers us the degree of competition of a given banking sector by considering partial by-products of the function revenue with regard to every input price. The application of the “panel data method” provides us with the following results: the statistics of Fisher relative to the total test of homogeneity are superior to those of the table of Fisher (prob of the test = 0 < 5 %), we then reject this hypothesis and we accept that of the heterogeneity of variables.

The probability of the test of Hausman (0.0001) is lower than 5 %, which allows us to accept the hypothesis with fixed effect and to use the within method. The results of estimation according to this model are indicated in table 6.

Table 6: The Competitive Conditions test for Tunisian banks (Fixed Effects estimation of $\ln(\text{TR})$ equation)

Variables	Coefficients
C	-1.920 (-4.936)
W1	0.362* (4.612)
W2	-0.206* (-3.887)
W3	0.101* (4.202)
S1	0.211** (2.326)
S2	-0.175** (-2.922)
R ²	0.821
F-statistic	29.035
P value	0.0000
Hausman test	26.123 (0.0001)
H-statistic	0.258 (0.098)
Competition: H = 1	7.53
Monopoly: H = 0	2.63

Notes: Figures in parentheses are t-statistics

* ; ** indicate significance levels of 1% and 5% , respectively.

From this estimated model, we establish the sum of the parameters which are considered associated with the input prices of the function of revenue in order to calculate the H-statistic. Since the variables are expressed in logarithms, the coefficients measure directly the elasticities. This allows us to deduce that an H-statistic equals to $\gamma_1 + \gamma_2 + \gamma_3$, which measures the sum of the elasticities of the total revenue with respect to the input prices.

The estimations on the sample of all the banks thus show a value of H-statistic = 0.257. The latter lies between 0 and 1 and it is significantly different from 0 and from 1 at 5% level. This result indicates that banks in Tunisia are operating as a whole under conditions of monopolistic competition. A monopolistic competition structure means the existence of product differentiation in banking and that banks tend to differ with respect to the product quality and advertising.

Let us note finally that this result is in compliance with the results generally obtained in the previous studies directed to the estimation of a P-R model applied to the banking industry in certain emerging countries. These previous studies generally converged and pleaded in favor of a situation of a monopolistic competition as the following table suggests.

Table 7: The P-R Model Results in the Recent Studies on Emerging Countries

Authors	Sample	Period	Results
Turk – Ariss (2009)	12 countries in the area MENA	2000 - 2006	PC : Bahrain and Turkey M : North African countries MC : Other countries
Mensi S. (2009)	10 Tunisian deposit banks	1990 - 2007	Oligopolistic competition, in a contestable market which confirms the presence of a competitive environment.
Masood O- Chichti J.E. – Mansour W. (2009)	12 Saudi Arabian banks	1999 - 2007	conjectural variations short run oligopoly
Lapteacru I and Nus E. (2011)	9 countries of PECO	1999 - 2006	MC with an increase market power in Hungary.
Rajhi T. and Salah H. (2011)	15 Algerian banks	2000 - 2007	MC : The Algerian banking sector would be less competitive if there were no foreign banks

Notes: PC: Perfect competition; M: Monopoly; MC: Monopolistic competition

3. The Lerner index

i. The calculation of Lerner index

The Lerner index is computed using the formula $(P-MC) / P$, where P is the price of banking outputs and MC is the marginal cost. Following the approach in Fernandez de Guevara, Maudos and Perez (2005 ; 2007) and Berger, Klapper and Turk-Ariss (2008), we proxy bank output by using Total assets, P is calculated as total bank revenues over assets, and MC is calculated by taking the derivative from a translog cost function shown in equation (6):

$$\ln TC_{it} = c_i + \hat{\alpha}_t + \sum_{j=1}^3 \hat{\alpha}_j \ln w_{j,it} + \hat{\alpha}_4 \ln TA_{it} + \frac{1}{2} \sum_{k=1}^3 \sum_{l=1}^3 \hat{\alpha}_{kl} \ln w_{k,it} \ln w_{l,it} + \frac{1}{2} \hat{\alpha}_1 (\ln TA_{it})^2 + \sum_{k=1}^3 \hat{\alpha}_k \ln w_{k,it} \ln TA_{it} + u_{it} + \hat{\alpha}_{it} \tag{6}$$

Where TC is the total operating plus financial costs; TA (ie. Total assets) is a measure of bank production. W_1 , W_2 , and W_3 are the same input prices used in equations (4) and (5) and defined above. Finally, i denotes banks and t denotes years, α denotes bank-level fixed effects and ε is an error term.

The estimated coefficients of the cost function are then used for computing the marginal cost. Indeed, as the marginal cost is the derivative of total cost to output (here total assets), it can be derived that the derivative of the logarithm of total cost to logarithm of output is the ratio of marginal cost to total cost multiplied by output. As a consequence, marginal cost is equal to the product of the derivative of the logarithm of total cost to output (i.e. the derivative of equation to total assets TA) multiplied by the ratio of total cost to output).

$$MC_{it} = \frac{\partial TC_{it}}{\partial TA_{it}} = \left[\hat{\alpha}_4 + \hat{\alpha}_1 \ln TA_{it} + \sum_{k=1}^3 \hat{\alpha}_k \ln w_{k,it} \right] \cdot \frac{TC_{it}}{TA_{it}} \tag{7}$$

The application of the panel data method provides us with the following results: the statistics of Fisher relative to the total test of homogeneity are superior to those in the Fisher’ table (prob of the test = 0 < 5 %), we then reject this hypothesis and we accept that of the heterogeneity of variables. The probability of the test of Hausman (0.0001) is lower than 5%, which allows us to accept the hypothesis with fixed effects and to use the “Within method”.

Table 8: Fixed effects estimation of translog total cost function

Variables	Coefficients
C	2.605 (1.446)
W1	0.461 (0.637)
W2	0.297 (1.558)
W3	0.682** (2.640)
TA	0.7861** (2.813)
0,5 * lnW ₁ ²	-0.038** (-3.527)

$\ln w_1 * \ln W_2$	0.032 (0.600)
$\ln w_1 * \ln W_3$	-0.023** (-2.372)
$0,5 * W_2^2$	-0.003 (-0.019)
$\ln W_2 * \ln W_3$	-0.139** (-2.706)
$0,5 * \ln W_3^2$	0.207* (10.502)
$0,5 * \ln AT^2$	-0.009 (-0.310)
$\ln W_1 * \ln AT$	-0.020 (-0.843)
$\ln W_2 * \ln AT$	-0.056 (-1.014)
$\ln W_3 * \ln AT$	-0.011 (-0.754)
R²	0.997
F-statistic	1799.966
P value	0.000000
Hausman test	168.604 (0.0000)

Notes: Figures in parentheses are t-statistics

* ; ** indicate significance levels of 1% and 5% , respectively.

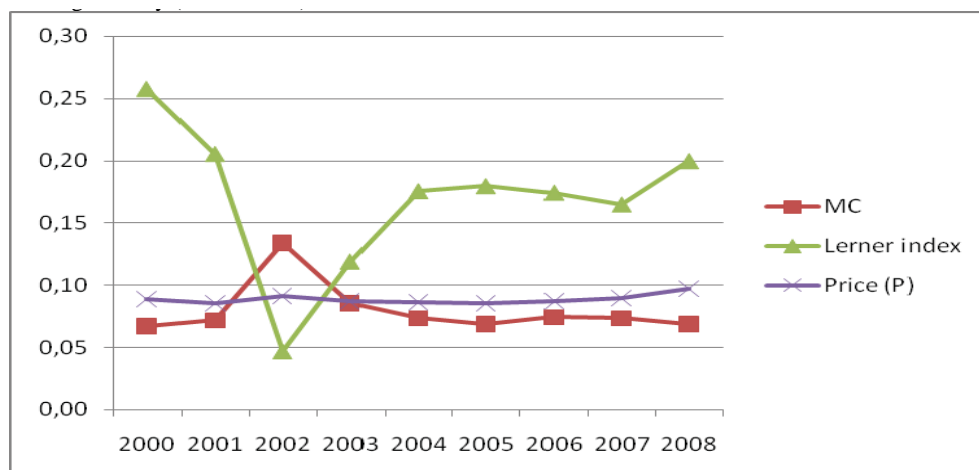
Having estimated the function cost, we calculate the marginal cost for the 18 banks of our sample, to determine the Lerner average index for all the banks of our sample for every year. The results are recapitulated in the following table:

Table 9: Evolution of the marginal cost, Price and the average Lerner index

Year	Average MC	Average Price	Average Lerner index
2000	0.06688221	0.0889482	0.257809999
2001	0.07164896	0,08574318	0.205499563
2002	0.13386575	0.09127189	0.046964486
2003	0.08517818	0.08720437	0.119101864
2004	0.07340018	0.08663157	0.175604805
2005	0.06894103	0.08542214	0.179663395
2006	0.07426408	0.08737832	0.174411082
2007	0.07325958	0.08960829	0.164976058
2008	0.06862107	0.09745207	0.199790358

We represent graphically the evolution of these variables over the period 2000 – 2008:

Figure 1: The evolution of the average Lerner index, the price and the marginal cost for banking industry (2000 – 2008)



As a whole, the results appearing in figure 1 show a certain stability of the average price of the banking output, due largely to the stability of the level of the interest rates observed in Tunisia over the considered period. At the same time, the level of the marginal costs has followed a downward trend stimulated by banks' concern to reduce the levels of the banking, financial and operational costs.

As we can see, the Lerner index had a fluctuating evolution during the period of study. Between 2000 and 2002, it fell considerably mainly in 2002 when it dropped to its lowest level. This change in the behavior of the Tunisian banks is indeed understandable in time of hardships.

ii. Discussion: The behavior of competition in the Tunisian Banking sector

The decrease of the competition which could result from the process of concentration (by mergers and acquisitions, alliances, etc.) is all in all compensated for by the decrease of barriers in the entry. The results appearing in the figure 1 show a certain stability of the average price of the banking output, due largely to the stability of the level of the interest rates observed in Tunisia over the considered period. At the same time, the level of the marginal costs has followed the same trend within the Tunisian banking sector since 2002, stimulated by a concern of reduction the levels of financial and operational costs. For a deeper analysis of the results, we distinguish four under periods: 2000 – 2002 ; 2003 – 2004 ; 2005 – 2006 and 2007 – 2008:

The period 2000 - 2002 is characterized by the rise of the competition and the degradation of banks' market power. In fact, we notice a great decline in Lerner index whose values are already very low. In theory, the Lerner index has to take only positive values. A null value means only a perfect competitive behavior. The values close to zero are the evidence of an increased competition where banks have on average no market power. Such a behavior of banks within the framework of pricing in the marginal cost is considered as "super-competitive" by Shaffer S. (1989; 1993). It is about a short-term behavior of struggle to keep market shares.

Indeed, during this period, the profitability of most of the Tunisian banks was low (see appendix 2). In difficult situations characterized by margin losses, the competition gets tougher and tougher to manage to survive. This competition grew more acute for the activities bringing interests such as granting credits, traditional activities of the Tunisian banks which represented the most important activities of Tunisian banks. The table in appendix 2 shows that the general trend of the banks profitability is in decline except for the BT Bank which tries to align itself with the European standards (2 %).

The period 2003 – 2004: The restructuring of certain banks in Tunisia revived takeovers within the sector. The participation of the foreign investors was strongly encouraged by the authorities. In this respect, we can note the acquisition of the "Société Générale Group" of 52.34 % of the capital of one of the first private banks in Tunisia known as the International Union of Banks (UIB). In addition to this strategic purchase, the Economic Development Bank of Tunisia and the National Tourism Development Bank have been taken over by the STB. These two operations were expressed by a regular increase of the Lerner Index from 0.046 to 0.175 with a decreasing of the marginal cost. Figure 1 shows that during this period, the price P remains relatively stable and the Lerner index has increased because of the decrease in the marginal cost. This implies that trends to the concentration have not affected the banking service prices.

The period 2005 – 2006: During this period, the Tunisian banking sector knew an exceptional dynamics with, first of all, the creation of a new bank: the Bank of Financing of Small and Medium-Sized Enterprises (BFPME) in March, 2005. Then, the conversion of STUSID Bank and the BTL Bank into universal banks respectively in April and October, 2005. Finally, the privatization of the Banque du Sud (ie. Bank of the South) in November, 2005. Besides, the deposit banks continued to develop thanks to the extension of their network of agencies making their banking services more accessible. Consequently, the performance of deposit banks knew an increase of the ROE which rose from 6.5 % in 2005 to 8.8 % in 2007. As for the ROA, it increased from 0.5 % in 2005 to 0.9 % in 2007.

Further to these evolutions, the Tunisian banking system is subjected to two pressures: on the one hand, the rise of the competition with the entry of new banks to the sector and on the other hand, the strategies of merger and implemented consolidation

by certain banks to face this competition. As we can see in the figure 1, the slight decrease of the Lerner index (reduction at 6 %) shows that the bank market power is declining.

The period 2007-2008: the low values of the Lerner index witnessed an increase. This implies that the competition within the bank sector remained intense. This situation can be explained by the existence of an important number of banks with regard to the size of the Tunisian economy _ in spite of the few operations of merger and consolidations. Indeed, the banking sector consisted of 20 banks in 2007.

The reforms are going to set up the necessary mechanisms and put together the favorable conditions for the strengthening of projection achieved in the economic development. These reforms should lead to reduce the fragmentation of the sector, to increase the rate of banking, and, finally to endow the Tunisian credit institutions with a critical size. Such a size would allow them to keep their shares on the local market and to set off, in the second stage, to the conquest of new markets. We observe on figure 1 an improvement of the Lerner index with an increasing price P and a decreasing marginal cost. This evolution indicates an increase of the Tunisian banks market power. This can indicate also that the Tunisian banking sector is changing with the mergers and acquisitions of small as well as big banks which were already accomplished at the beginning of 2000's.

Conclusion

The banking movements of restructuring in Tunisia are considered as the major response to the fragmentation of the sector. The merger between banks allows them to keep market shares and to face the competition of the foreign banks which could penetrate into the national market because of the financial liberalization.

By examining the ratios of banking concentration, we cannot reach a conclusion concerning the market evolution. The empirical examination on the conditions of the Tunisian banking sector competition from 2000 to 2008, by applying the P-R method and that of Lerner index, allows us to test the contestability of the banking sector. All in all, our application of the non structural measure of P-R to the Tunisian banking system does not enable us to confirm the hypothesis based on Structure-Conduct-Performance (SCP) paradigm, according to which the concentration trends in the Tunisian banking sector will make banks have a greater market power. The empirical results of our study suggest that the banking market in Tunisia was neither monopolistic nor perfectly competitive. The value of P-R H-statistic estimated from 2000 to 2008 really indicates that the banking revenues are acquired by virtue of monopolistic competition.

Besides, the Lerner index values calculated over the period are characterized by relatively low levels on the one hand and by big adequacy with the results of the

analysis based on P-R H-statistic on the other hand. Indeed, those values, which are generally low, plead for a quite competitive state of the banking markets. The movements of mergers of banking institutions seem to be slow as a big effort of cleaning their balance sheets remains to be carried out before banks can merge. The Tunisian monetary authorities aim to reach a situation in which the ratio of banks' bad debts does not exceed 7% by 2014. We notice, however, that the Tunisian banks' market power has gradually taken place since 2002. Indeed, from this date, the Tunisian banking sector has seen a few waves of consolidations and privatizations.

The lessons to be drawn on the level of economic policy are so clear: if we consider that the intensification of the competition between banks improves their efficiency, increases the financial stability and widens the range of their products, we must also explore other dimensions, particularly the regulatory framework, the supervision as well as the development of the other financing sources.

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