

# Competition and financial stability: a new paradigm

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## **Abstract**

From the Nineties, the Moroccan banking system knew several reforms which contributed to the liberalization and the deregulation of banks. The objective is to arrive to a banking sector resilient, competitive, developed and making it possible to increase the surplus of the borrowers and the depositors. Although the relation between competition and financial stability is discussed, this paper proposes to formulate a new explanation of this relation while being based on the trilogy: competition, concentration and stability (CCS). Initially we develop the model of Panzar and Rose (1982,1987) to measure the competition of the dynamic banking system since 1993. Then, a data model of panel was estimated, highlighting the nonlinear relation between financial stability and banking competition. The checking of this relation made it possible to propose a new design concerning the relation between financial stability and competition. Indeed, the results obtained with through an optimization model affirm that this relation is cyclic, in the direction where, a stronger competition supports financial stability in situation of strong impact strength, on the other hand, in a situation of financial instability, more competition worsens the situation of the banking system.

**Keywords:** financial stability, competition, concentration and banking system.

**JEL Classification:** E40, E42

## 1. Introduction

The analysis of competition in the banking system is of a crucial importance for the installation of the prudential policies and the formulation of the laws governing the activity of financial intermediation. Indeed, the financial regulation aims at guaranteeing the solvency of the banks in order to ensure the interests of the consumers and the depositors against the irrational behaviors of the banks. Thus, to achieve these goals, the authorities must manage to analyze in-depth the structure, the behaviors and the performances of the banks to ensure a competition making it possible to increase the consumer's surplus and to reduce the differences between the banking set prices and the incremental costs of their production.

In addition, the interest growing of the analysis of competition is justified by the increase in restructuration's within banking industries and their implication as regards financial stability.

Although the relation between the stability of the banking system and competition is still far from being identified, this question starts right now to arouse the interest of the theorists, the academics and the regulatory agencies. The objective is to manage to identify the optimal structure of competition which can ensure a financial stability of the banking system.

The measurement of competition thus makes it possible to identify the behaviors of the banks and their capacities to determine tariffings on the market like explaining their performances. Indeed, a competitive structure finds its interest in the equality between the prices and incremental costs, while, the structures of imperfect competition support the formation of monopolistic prices. Thus, the regulators and the authorities of competition take care that banking industry is of competitive nature, to allow the borrowers and the depositors to profit from competitive interest rates and finance departments facilitating the optimal allowance of the resources.

The relation between competition and the banking performance is thus justified. Consequently, to be interested in the performance of banking industry amounts analyzing and studying the degree of its competition. The banking theory advances two great explanations to the evolution of the banking performance in relation to competition. The first considers that this performance depends mainly on the structure of industry. Thus, a concentrated structure is less competitive and implies profits and profitabilities superiors with those of the pure competition and perfect. This supports the surplus of the producers or the managers to the detriment of the borrowers and the depositors. The second approaches nonstructural rejects the dependence between the structure and the banking performance and gives more weight to the concept of being able of market. Indeed, a competitive structure gets the same capacity at the firms involved and the prices are determined by the market (price taker). On the other hand, in an imperfect competition, the firms with capacities on the market impose their prices and often manage to create agreements approaching the prices of the monopolistic level (price maker).

The structural approaches were based on work founders of Mason (1939) and Bath (1956) bearing on the paradigm of Structure-Behavior-Performance (SCP)<sup>1</sup>. This last stipulates that the structure of an industry mainly determines the behavior of the involved firms. Thus, an industrial structure, of which the degree of concentration is high, is a structure whose behaviors of the actors tend to be anti-competitive and collusive. According to Reid (1987) paradigm SCP suggests that a very concentrated structure is a structure whose competition is very weak and the rates of profit are

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<sup>1</sup>Marshall (1890) indicates that the firms in an competitive environment tend to have noncompetitive practices which increase the concentration of industry and reduces the consumer's surplus

higher than those of the pure competition and perfect.

In model SCP in fact the basic conditions (of supply and demand) determine the behaviors of the banks and which influence on their performance levels. Thus the existence of barriers at the entry of banking industry maintenance the advantage of the involved firms and supports the probability of having firms which apply tariffings of monopoly to release from the monopolistic profits. In addition, paradigm SCP suggests that the firms tend to choose a monopolistic balance either via agreements or aggressive strategies of restructuring.

All in all, paradigm SCP stresses the role of the basic conditions of the structure in the determination of the degree of concentration and thereafter on its influence on competition. The barriers at the entry are regarded as being the most important basic conditions which influence the behaviors of the banking firms. Indeed, their existence supports the positioning of the banks in place and limit the access to entering potential. Among these barriers, one can quote the barriers lawful, legal and economic. The barriers at the entry support the existence of an imperfect competition since the firms in place can profit from their positions by imposing monopoly prices or higher than their incremental costs. This situation implies that the degree of concentration is often high in banking industries<sup>2</sup>.

Into the same current, other work rejected the negotiable instruments of the structure on the behaviors of the banks and their performances. For Demsetz (1973) and Peltzman (1977), it is the productive effectiveness of the banks which impacts the evolution of their market shares and explain the degree of concentration and competition. This current of efficiency thus allots the difference in the performances to a difference in effectiveness (Goldberg and Al (1996), Smirlock (1985)). Thus, instead of considering that the structure explains the surplus of performance (gap price compared to the optimal price), it is the effectiveness of the production of the services which intervenes in the explanations.

With regard to the nonstructural approaches, they learn their lessons from the new economy of the industrial engineering (NEIO) which considers that the degree of competition and the performance level are independent of the nature of the involved structure. Thus, the evaluation of competition in an industry does not require the use of a measurement of the structure or efficiency<sup>3</sup>. Indeed, the variables which are commonly used in the structural approach are of any utility within the new industrial economy. This is explained mainly by the incapacity of recent work to corroborate the structuralist approach when the number of the firms is weak and the barriers at the entry are less and less constraining (Dietsch (1992) and Molyneux (1993)).

According to the NEIO, the competition and the performance of the banks depend on the capacity of market which they hold. It is their capacity to determine the prices of the outputs which get more profitability to them. With the difference of the structuralist approach, these approaches consider that the prices and the costs are nonobservable variables whose estimate is necessary in order to test the capacity of market (Vesala (2004) and Samuelson (1988)). In this direction, the pure competition and perfect is not any more one subjacent assumption of the models of competition, but an alternative like the others since no assumption is formulated concerning the

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<sup>2</sup>The most important barriers at the entry on the level of banking industry are economic and relating to the optimal size of a bank and the nature of the relation bank-customer (see work of Dietsch (1992)).

<sup>3</sup>Measurements which were used within the structural approach are often derived from the ideal models of optimization of the function of production of the banks where the indicators of the concentration are regarded as advanced indicators of competition.

prices. Thus, the difference between the marginal prices and the incremental costs determine the behaviors of the banks and their capacity to determine the prices. Against the structural approach the analysis is not focused any more on one study of the banking profits in an incorporated way, but rather on a modeling of the equations of incomes or price in order to measure the capacity of market (Bikker; 2000).

With through these theoretical and empirical analyzes, it arises that competition makes it possible to support the good being of the economic agents, however, nothing does not guarantee that this competition will make it possible to support financial stability. After the crisis of the subprimes, one of the key questions is to identify the relation between financial stability and competition. This revêt an growing interest for the regulators for two reasons. Firstly, in order to identify the structure of the competition most favorable to financial impact strength and secondly to allow a better adaptation of the capable regulatory device to guide and to rationalize the policy of diversification of the banks.

The remainder of this paper is structured in the following way. Initially, some stylized facts of the banking system are presented, then an empirical analysis of banking competition is carried out to extract its dynamics over the ten last years. Lastly, an identification of the relation between competition and financial stability are approximate through the models as a panel and mathematics.

## **2. Moroccan banking system: some stylized facts**

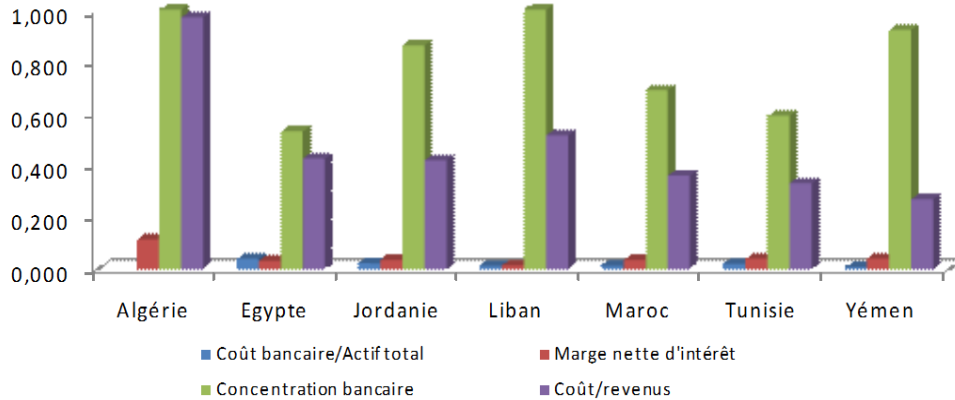
The Moroccan banking system knew several structural reforms which contributed to its development and the reinforcement of its degree of competitiveness. Following the example reforms of the Nineties, it fell under a modernization process and of liberalization in order to support the investment and to increase the quality of the finance departments. The banking laws of 1993 and 2006 which made it possible to achieve these various goals also reinforced the capacities of the regulatory agencies and control. These two laws related mainly to the reorganization and the redefinition of the institutional framework, the deregulation, the desintermediation and the decompartmentalization of the activities.

The first series of reforms undertaken with the adoption of the law of 1993 aimed at the recasting of the legislative framework governing the activity of the banking system, the reinforcement of the prudential regulation, the deregulation of bankings and the modernization of the instruments of monetary policy (abolition of the credit rationing). Thus, of new names were adopted being the finance companies and of the universal bank and several institutions of governorship were instituted, such as the National council of the Currency and the Saving (CNME) and the Committee of Finance companies (CEC). The law of 2006, as for it, aimed at the deepening of the already engaged reforms, by reinforcing the role of the monetary authorities and of control of the Moroccan financial system. In this direction, Bank Al Maghrib obtained being able widened on the finance companies and the whole of their activity.

These reforms contributed to instigate banking and to reduce the costs of the finance departments, which was translated positively on the borrowers and the depositors.

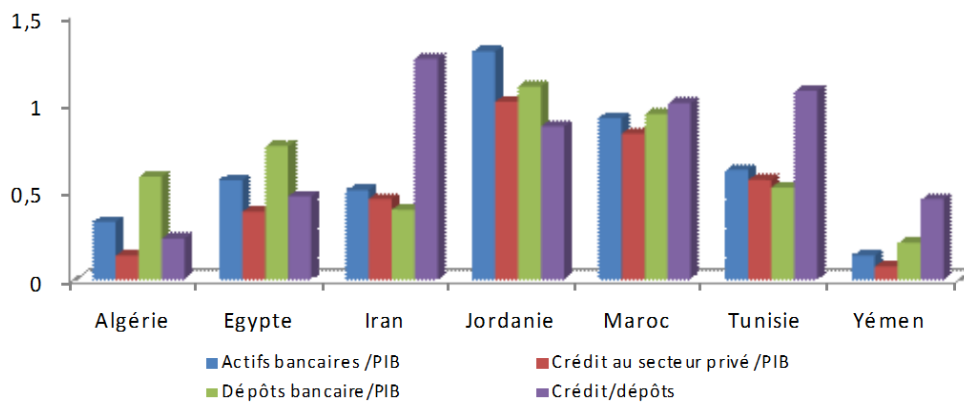
On the level of its structure, the Moroccan banking system currently consists of 19 banks of which seven are with foreign assets and six are held by the public authorities. The banks offshore oil rigs form also part of the Moroccan banking system and contribute actively to the dynamization of the financial sector. Indeed, their deposits accounted for almost 8% of the deposits of the banking system in 2009.

**Figure 1. Some ratios of MENA Banking system**



The Moroccan banking system constitutes today one of the most important banking systems of the MENA area. Its establishment in several countries of the area confirms its capacity to produce high quality services and its potential of financial penetration. Banking in Morocco east in the middle of the financial intermediation, since the banking sector is the first finance mechanism and of allocation of resource within the financial system. The relationship between banking assets and the GDP indicate that the Moroccan banking system compared constitutes the first finance mechanism in Morocco to the other countries of the MENA zone. Moreover, the Moroccan banking system enjoys a comfortable position compared to the other countries of the area with regard to its capacity to collect the deposits and to grant the appropriations. As regards effectiveness of banking, the Moroccan banking system records a rather weak cost-income ratio compared to the country of the MENA zone with a rather satisfactory degree of concentration.

**Figure 2. Development indicators of MENA banking system**



The contribution of the banking system to the development of the financial system of the country is important since the assets of the banks reported to the GDP, largely exceed the level of 95%. This is explained mainly by the prevalence of the banking assets on the other assets of the financial institutions (central bank and other financial institutions except banks). Indeed, the assets of the banks represent almost the totality of the assets (see table 1).

With regard to the degree of concentration, it is necessary to note that the Moroccan banking system is strongly concentrated considering the reduced number of the actors who composes it.

Thus, the ratio of concentration (for eight banks) did not cease growing during the 10 last years to reach a threshold of 69%. This implies, that eight banks hold more 1a half of the market with a dominant position for the first two banks of the place, which let's predict that competition in the banking system is far from being a pure competition and perfect.

The reforms undertaken since the Nineties by Morocco, aiming at instigating the financial system, positively contributed to increase the potential of the banking system. Thus banking industry with recorded a strong development during the last years with growth rates of the appropriations with two digits and rates of return very attractive. Thus, the appropriations with the private sector reported to the GDP exceeded the 80% in 2009 and the deposits compared to the added-value was neighborly the 70% in 2009.

The current structure of the Moroccan banking system made it possible to increase its effectiveness in terms of production of services intended to satisfy the borrowers and the depositors. Indeed, the banking costs recorded a significant decrease between the periods 1995 and 2009 while passing from 3% to 1% compared to the active total. In the same way, the banking ratio of exploitation<sup>4</sup> regressed during the same period to stabilize itself on a level of 0.36, this being able to be explained by a greater cost containment and an increasingly effective management of the Moroccan banks. In addition, the margin of interest recorded a fall during the same period while passing from 6% to 3%, thus translating, mainly, the fall of the mark-up of the Moroccan banking system and the difference between the debtor and creditor rates (see table 1).

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<sup>4</sup>The relationship between the overhead costs and the GNP.

Typologie	Indicateurs	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	1995-2000	2000-09	
Structure	<i>Nombre de Banques</i>	19	20	21	21	21	21	19	18	18	17	16	16	16	18	19	-	-	
	<i>Etrangères</i>											5	5	5	7	7	-	-	
	<i>Publiques</i>	4	4	5	5	5	5	5	5	5	5	5	5	5	5	6	-	-	
	<i>Dépôts des banques offshore<sup>5</sup></i>	0.16	0.14	0.14	0.11	0.1	0.09	0.09	0.09	0.09	0.09	0.08	0.07	0.07	0.07	0.08	0.08	0.13	0.08
	<i>Indice de concentration (IC 8)</i>	-	-	-	-	-	-	-	0.57	0.58	0.61	0.63	0.66	0.68	0.69	0.69	0.69	-	0.64
	<i>Indice HHI</i>	-	-	-	-	-	-	-	0.12	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.16	-	0.14
Développement	<i>Actifs des banques/ Total Actifs</i>	0.827	0.833	0.883	0.891	0.918	0.915	0.945	0.946	0.945	0.945	0.962	0.965	0.974	0.985	0.998	0.88	0.96	
	<i>Actifs des banques/ PIB</i>	0.46	0.43	0.55	0.57	0.59	0.64	0.63	0.65	0.63	0.62	0.64	0.66	0.73	0.81	0.91	0.54	0.70	
	<i>Actifs BAM / PIB</i>	0.08	0.09	0.09	0.07	0.06	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.07	0.03	
	<i>Crédits au secteur privé / PIB</i>	0.28	0.27	0.38	0.42	0.45	0.49	0.47	0.48	0.47	0.48	0.50	0.53	0.61	0.70	0.83	0.38	0.56	
	<i>Dépôts/ PIB</i>	0.59	0.56	0.58	0.50	0.51	0.56	0.58	0.62	0.62	0.64	0.68	0.72	0.78	0.86	0.95	0.55	0.72	
Efficience	<i>Crédits/Dépôts</i>	0.58	0.60	0.80	0.87	0.87	0.86	0.78	0.76	0.75	0.74	0.73	0.74	0.81	0.89	1.00	0.76	0.80	
	<i>Coûts bancaires/Total Actifs</i>	0.02	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.03	0.02	
	<i>Marge nette d'intérêt</i>	0.06	0.08	0.07	0.06	0.05	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.06	0.04	
	<i>ROA</i>	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	<i>ROE</i>	0.09	0.09	0.08	0.07	-0.03	0.11	0.10	0.07	0.07	0.09	0.09	-0.28	0.16	0.18	0.20	0.22	0.07	0.09
	<i>Coefficient d'exploitation</i>	0.51	0.54	0.58	0.52	0.56	0.70	0.62	0.63	0.63	0.64	0.59	0.66	0.55	0.48	0.42	0.36	0.57	0.55
	<i>Z-SCORE</i>	11.02	11.08	11.80	9.62	7.08	9.51	8.15	-	-	10.29	18.21	24.84	24.50	9.70	22.00	-	10.02	16.81

Source : Banque Mondiale

<sup>5</sup> compared to the deposits of the Moroccan banking system.

### 3. Empirical review

One of the great difficulties of evaluation of the relation between competition and financial stability is to measure these two phenomena. Although competition has more or less reliable measurements, financial stability remains a multidimensional concept whose quantitative perception is difficult.

The first empirical studies relating to competition took as a starting point the structuralist approach of competition and were based on the opposite relation between competition and the concentration. The two great paradigms which govern this work are paradigm SCP and the assumption of efficiency.

The application of SCP in the banking sector proved to be convincing since the majority of the studies confirmed the negative relation between the concentration and competition and the strong correlation between the concentration and the performance, though it remains sometimes nonsignificant. These studies were applied in majority to the American banking system. Gilbert (1984) presents a study on the US market over one period of 1964 to 1983 and manages to confirm that the variation of the concentration has an impact on the profitability and the performance of the American banking system. Shepherd and Al (1989) by analyzing the market of the deposits, affirm that there exists a certain capacity of market following the high degree of concentration which impact positively creditor rates and profits of the banks. Hannan and Al (1993) establish that the concentration of the market east in close relationship with the banking product pricing of loan and placement. In addition, Calem and Al (1991) confirm that the gaps of the prices with the competitive price in the US market of the deposits are explained mainly by the concentration of the market.

For the European market, the studies having applied paradigm SCP are more or less rare. Molyneux and Al (1992) analyze the banking sectors several European countries and affirm that there exists a correlation between the banking incomes and the degree of concentration. In the same wake, work of Bourke (1989) corroborates these results on a panel of country including/understanding the European countries, the States Unies and Australia. Ruthenberg (1991) as tested SCP on several countries during the years 1984 to 1988 and manages to conclude as the rates of profit are positively correlated with the degree of concentration (HHI).

In addition, other more recent studies advance opposite results affirming than the relation between the concentration, competition and the performance is insupportable since she neglects the effective behaviors of the banks and the inobservable variables such as the reforms legal and institutional<sup>6</sup>. Bikker (2004) indicates that the degrees of concentration which are used in models SCP are not very reliable when the number of bank is weak and often tend to exaggerate the level of competition in the small countries. Molyneux (1993) in this work on the European banking system, rejects assumption SCP in favor of the paradigm of efficiency. The first work on the assumption of efficiency used proxys indicating the efficient behaviors in banking industry<sup>7</sup> (Molyneux (1996) and Forbes (1995)). Other direct measurements of the effectiveness were introduced by Berger and Al (1995) and could validate the significant impact of the efficient behaviors on the performance of the banking firms. Same methodology at summer adopted by Heffernan and Al (2005) on the Chinese banking system and they confirmed that the indicators of the effectiveness have an positive

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<sup>6</sup>In SCP approach the surplus of profit is function of a variable of incorporated structure, no other individual variable is not taken into account.

<sup>7</sup>Generally, the market share of each bank is used in the model of performance. Other work suggests using the border of efficiency to determine the effectiveness of the banking productivity (Bikker (2008), Of Young and Al (1998)).



impact on the performance of the banking system. In the same wake, Yu and Al (2005) arrive at the same result in favor of the assumption of efficiency which admits that the banks can improve their performances by having an optimal operation and a behavior which improve their market share and supporting the concentration of the market.

Other research tasks were based on advanced new theory of the industrial engineering and reject the relevance to use indicators of the concentration like measurements of competition and determinants of profitability. These studies used, in majority, the two models of Bresnahan and Al (1982) and of Panzar and Al (1977,1982,1987). However, the second methodology remains most effective for two reasons, namely: its recourse to individual data of the banks allowing to extract heterogeneity from the banking behaviors, as well as the use of a function of incomes and not of prices (or costs) marginal which are often inobservable. Several series of work applied this test for various countries and geographical areas. One notes, as example, work of Shaffer (1982) and Nathan and Al (1989) on Canada, Vesala, (1995) Finland, Molyneux and Al, (1996) for Japan and Hondroyiannis and Al (1999) for Greece. Other series of work studied the European banking system as a whole of which most important are those of Bikker and Al (2000, 2002,2009,2010) and De Bandt and Al (2000). Work which used the approach of Panzar and Rose (1982,1987) is numerous and their results depend on the specificity of the countries and the geographical areas. To simplify the reading of the results of work, table (2) gathers the most important studies which applied this test.

Of ambivalent form, the relation between competition and stability continue to make run much ink. In the traditional theoretical design, this relation is negative direction. Indeed, competition induces a fall of stability, in the direction where the environment of competition encourages the banks to take more risk and thus weakens the impact strength of the financial actors. This design was criticized by new the theory of financial stability which considered that competition increases the stability of the financial system because of the diversification of the risk and the profits there related. Also, the analysis of this relation is increasingly difficult because of the emergence of the concept of risk systemic. Indeed, the risk of contagion is increasingly strong that the interconnections between the financial actors are strong, then more diversification and from competition can feed this family of risk and consequently reduce its stability.

Several empirical work tried to evaluate the relation between competition and financial stability. However, this work is confronted with several difficulties in particular, the difficulty in measuring competition in the financial system and specificities of this sector regulation exhibition of risk. Normally, the partisans of the theory of the positive negotiable instruments on stability consider that competition involves more efficiency and supports the financial innovation, which induces a better allocation of resource then more stability.

The theoretical bond between stability and competition thus remains unsolved in the empirical studies (Carletti (2008)). Indeed, until end of the year 80 the relation between competition and stability was considered negative. Thus, He was considered qu`an increased competition supported a taking risk excessive and increased in fact the probability of failure of the financial system. In addition, according to the theory of the “Charter Been worth” the financial institutions seek to maintain their profit at the highest level by avoiding the taking risk and engagement in activities with strong risk exposures. Competition also exerts pressures on the rates of profit of the banks, for this reason, the banks while acting to obtain E market share more are encouraged to take more risk.

In the same way, the analysis of the relation competition-stability by the means of the liabilities appears also ambiguous. The rush towards the bank is generally one of the sources of brittleness

of the banks and is caused by a loss of confidence on the level of the depositors or a dysfunction in coordination between the financial institutions and the depositors. All the banking models of failures by the rush were elaborate in a context of competition, then no theoretical analysis of this phenomenon was not elaborate in another competitive context. However, some empirical work proved that competition influences banking panics positively, in the direction where the banks tend to increase the rates to attract more depositor without to have sufficient profit on the level of the debtor rates (Matutes and Vives (1996)).

The relation between competition and stability also appears on the interbank market where the banks are exposed to the risk of contagion. Thus, more competition on this market makes than the banks are not any more “price-maker”, but the prices are imposed to them what limits the possibility of failure of the banks. On the other hand, in a noncompetitive market, some banks can control the prices and caused the failure of other banks (Acharya, Gromb and Yorulmazer (2009)).

Some recent travails made it possible to provide a comprehensive view of the relation competes with and financial stability, in the direction where competition is positively related to stability with a certain threshold, then it can tend to have negative negotiable instruments (Carletti and Vives (2008)). This way of seeing the relation with two cycles implies the acceptance of a nonlinear bond between financial stability and banking competition.

Beyond these difficulties in apprehending on the theoretical level the relation between competition and stability, one of the large obstacles is to measure these two phenomena. Indeed, there exist several measurements of competition and it is often difficult to measure stability. However, the empirical studies used some approximate indicators such as: degrees of concentration, the index of Lerner and H statistical for competition and the Z-score and the rate of amounts receivable in suffering to approach financial stability.

Empirical work on the relation between competition and stability is rather numerous and with heterogeneous results. Those old affirmed the Been worth theory of the “Charter”. Indeed, on 85 American banking groups, the results of work of Keely (1990) confirmed that a very weak capacity of market encourages the banks to slow down their policy of capitalization inducing a great financial instability. Other similar studies affirmed the same results (Jeménez, Lopez and Saurina (2007)). The banking sector Spanish is characterized by a negative correlation between the competition, measured by the index of Lerner, and financial stability (Jeménez, Lopez and Saurina (2007)). The characteristic of this study is the checking of the absence of relation between the concentration and financial stability. In the same way, a work being interested in the Russian banking market showed that financial stability was negatively correlated with competition, lasting the period 2001 and 2007 (Fungacova and Weill (2009)).

Authors	Studied countries	Study period	Results <sup>8</sup>
Shaffer (1982)	The USA	1979	CM

<sup>8</sup> CM: monopolistic competition, M: monopoly, CP: perfect competition

Nathan et al. (1991)	Canada	1982-1984	CP(1982) et CM (1983-1984)
Liyod et al. (1991)	Japan	1986-1988	M
Molyneux et al. (1999)	Germany, England, France, Italy and Spain	1986-1989	M (Italy), CM (England, France, Germany and France)
Rime (1999)	Switzerland	1987-1994	CM
Hondroyiannis et al. (1999)	Greece	1993-1995	CM
Bikker et al. (2000)	15 European banking systems	1989-1996	CM
De bandt et al. (2000)	France, allamagne and Italy	1992-1996	CM (Italy) and M (France and Germany)
Murjan et al. (2001)	HEART	1993-1997	CM
Smith et al. (2001)	Zealand news	1996-1999	CM
Haffani (2002)	Tunisia	1980-1999	M
Belaisch (2003)	Brazil	1997-2000	CM
Jiang et al. (2004)	HongKong	1992-2002	CP
Lee et al. (2005)	South Korea	1992-2002	CM
Yildirim et al. (2005)	15 country of the Latin America	1993-2000	CM
Bikker et al. (2006)	101 countries	1987-2004	CP (38%) M (28%) and CM (34%)
Al Mouharrami et al. (2006)	GCC	1993-2002	CP (50%) and CM (30%)
Karasulu (2007)	Chile	1995-2004	CM
Turk-Ariss (2008)	12 countries of the area CARRIED OUT	2000-2006	CM (country of North Africa) and M (for the remainder)
Rezitis	Greece	1994-2004	CP (1995-1998) and CM (1998-2004)

#### 4. Methodology and empirical approach

The approach adopted in this paper is in two stages: initially, we will estimate the level of competition in Morocco via the model of Panzar and Rose and in the second time, we will put to estimate the relation between competition and stability while controlling the banking concentration. The majority of recent work on competition takes as a starting point the advanced new theory of the industrial engineering which gives importance to the assumption of contestableness of the banking market and on the possibility of detecting the behaviors of the banking firms through the identification of the relation between the incomes and the production costs. Indeed, competition is approximate by the means being able it of market and by the possibility that a reduced number of banks have a positive influence on the prices of the banking products. On the basis of model of Panzar and Rose (1982 and 1987) and while taking as a starting point the empirical work of Bikker (2000, 2005 and 2008) one proposes to estimate the index H in order to determine the competitive structure of the Moroccan banking system.

$$H = \sum_i^n d(p \times y_i) / dw_i$$

Thus, a decision table concerning the competitive structure of the banking system is proposed according to the securities taken by the index H:

Test de la structure concurrentielle	
Valeur de H	Structure du marché
	Concurrence parfaite ou monopole dans un marché contestable

	Concurrence monopolistique
	Monopole ou oligopole collusoire
<b>Test d'équilibre</b>	
	Déséquilibre
	Equilibre

Source : Panzar and Rosse (1977,1982,1987), Molyneux et al. (1994) et Vasala (1995)

Thus,  $H$  is negative when the structure monopolistic or is characterized by the existence of a collusive oligopoly. In this situation the rise in the prices of the factors of production increases the incremental costs of production what results in a fall of the production and, consequently, level of income of the firms. In the contrary case, when  $H$  is equal to the unit each raising of prices of the inputs results in an adjustment of the prices to ensure the equality between the price and the incremental costs. This indicates the presence of a state of balance of long run where the production is adjusted as the prices of the inputs vary. In this situation the structure of banking industry is competitive. In the median situation, when  $H$  is positive but lower than 1, the existence of a structure of monopolistic competition, where the banks react gradually to the variation of the prices of the factors of production, by a rise of the production and an increase in the price less important than that of the individual optimum, is assumed (Vesala (1995)).

The estimate of the statistics  $H$  requires that the banking market functions under equilibrium conditions of long run. What means that the profitability of the sector does not depend on the trend of prices on the factors of production. This is checked through the use of the test of balance suggested by Shaffer (1982) where the returns on assets (ROA) do not depend on the trends of the prices of the inputs.

The determination of the statistics  $H$  is based on the estimate of a reduced form of the banking incomes. This methodology was developed by Panzar and Rose (1982, 1987) and consists in estimating equivalence between the banking income and the costs of the various and other variable factors of production of control. Three specifications of the model are used in empirical work. Initially the first applications of the model chose to use an equation of income by including the total assets like variable of control (Shaffer (1982a, 2004a), Nathan and Al (1989), Molyneux and Al (1996), Coccoresse (2009), Carbo and Al (2009), Ashenfelter and Al (1987) and Tsutsui and Al (2005)). Then, other specifications use the function of the prices by excluding from the explanatory variables the variable of control (De Bandt and Al (2000), Koutsomanoli-Fillipaki and Al (2005) and Mamatzakis and Al (2005)). The last specification uses the function of the prices by including the variable of control and this approach was chosen by Molyneux and Al (1994), Bikker and Al (2000, 2002), Claessens and Al (2004), Philippatos and Al (2007) and Schaeck and Al (2009). Bikker (2008,2009), after an analysis of the three specifications, affirms that the equation of income is the form which makes it possible to obtain not skewed estimates of the indicator of competition. Thus, the form adopted for the case of Morocco consists in estimating a function of reduced form of the income of the banks by introducing the variable of control (Molyneux and Al (1994), Vesala (1995), Carbo and Al (2009), Bikker (2008,2009)) and other variables which can influence the banking income. The following specification was retained after having tested several variables commonly used in empirical work.

$$\ln(ri)_{it} = \beta_1 \ln(ft)_{it} + \beta_2 \ln(fk)_{it} + \beta_3 \ln(ff)_{it} + \beta_4 \ln(size)_{it} + \beta_5 \ln(share)_{it} + \beta_6 \ln(scal)_{it} + v_{it}$$

With:

- : logarithm of the incomes from interest of bank I at the moment T
- : logarithm of the relationship between the charges of the personnel and the active total of bank I at the moment T (factor work)
- : logarithm of the ratio of the operating costs of bank I at the moment T (factor exploitation)
- : logarithm of the relationship between the charges of interest and the active total of bank I at the moment T (capital factor)
- : logarithm of the variable of control (total assets) of bank I at the moment T
- : logarithm on behalf of market of bank I at the moment T
- : logarithm on behalf of the appropriations in the assets of bank I at the moment T
- $v_{it}$  : specific instrument and error

With regard to the test of balance of long run, it is a question of considering the equation following:

$$\ln(1 + roa)_{it} = \beta_1 \ln(ft)_{it} + \beta_2 \ln(fk)_{it} + \beta_3 \ln(ff)_{it} + \beta_4 \ln(size)_{it} + \beta_5 \ln(share)_{it} + \beta_6 \ln(scal)_{it} + v_{it}$$

With :

- : the return to assets

The evaluation of the competition of the Moroccan banking system is carried out over the period going from 2001 to 2010 in semi-annual frequency on a sample of eight banks which add up more than 90% of the sector. The statistical characteristics of the data which were used are reproduced in the following table:

Variables	Averages	Min	Max
Banking income ( $\ln(ri)$ )	13.62	12.01	15.05
First factor of production ( $ft$ )	0.005	0.002	0.009
Second factor of production ( $fk$ )	0.017	0.006	0.07
Third factor of production	0.011	0.004	0.10
Market share ( $size$ )	0.105	0.041	0.251
Logarithm of the active total	17.7	16.5	19.25
Leaves the appropriations in the assets ( $share$ )	0.575	0.334	0.922
Logarithm of the return on investment	0.003	0.000	0.03

The second methodological approach aims at estimating the relation between competition, stability and the concentration. With resulting from elaborate empirical work until now it arises that the relation between these three phenomena is nonlinear. For the examination of the paradigm of this trilogy a nonlinear regression is adopted.

Stability = f(Competition ; Concentration ; banking control variables)

In this form of specification, the objective is to collect the nonlinear character between competition and financial stability. In order to estimate this function, we have resort to the data of panel. The general form used in this estimate is :

$$RISK_{it} = \beta_1 Scal_{it} + \beta_2 Size_{it} + \beta_3 PIB_t + \beta_4 H^2_{it} + \beta_5 HHI^2 + v_{it}$$

The endogenous variable, RISK, represent an indicator measuring financial stability in Morocco with knowing the risk of the Moroccan banking wallet (NPL). Competition was approached by the index H according to a polynomial approximation. In the same way, the concentration was taken into account to cancel or affirm advanced theory of the contestable markets. Two other banking specific variables were considered, it is about the size (Scal) measured by the banking size of the balance-sheet and the variable (Size) which measures the share of each bank in the credit market<sup>9</sup>.

## 5. Results and interpretations

In the present section, we have the results obtained during the checking of the relation between competition and stability. From this point of view, we analyze the results relating to the estimates of the degree of competition and thereafter we will highlight the results of the estimates nonlinear of the bond between financial stability and banking competition.

The estimates of the model of the banking income for the determination of the degree of the competition of the Moroccan banking system are carried out in data of panel. The results obtained make it possible to confirm that the model for fixed purposes is adapted the most for the two specifications. The test of Hausman attests existence of a weak problem of exogeneity and thus of a dependence between the specific negotiable instruments and the exogenous variables. The estimate of the various parameters seems to be convincing and their critical probabilities are largely lower than 5%. The table below has the various results obtained (see appendix 1).

The coefficients of the factors of production are all significant with the threshold of 1%, which makes it possible to confirm that the banking incomes are determined by the evolution of the three factors of production. Thus, the statistics of Panzar and Rose are determined by the addition of the coefficients of these three factors (FT, FK and FF). The value of H is thus 0.18 what implies the existence of a comparable situation to a monopolistic competition with free entry in the banking sector (see Vesala (1995)).

The tests of validation of the statistics H reject the assumptions of structure of pure competition and perfect and monopoly. The monopolistic competition thus characterizes the Moroccan banking sector. Indeed, each modification of the prices of the inputs results in a gradual change of the prices of the production. In this type of structure, the banks endeavor to gain more market shares by using mechanisms of competition other than the prices and the quantities. They use primarily specific factors which distinguish them from their competitors, as example publicity, the innovations in terms of services and the quality of their relationships to the customers (Chamberlin (1933))<sup>10</sup>.

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<sup>9</sup> All the variables are logarithmic curves.

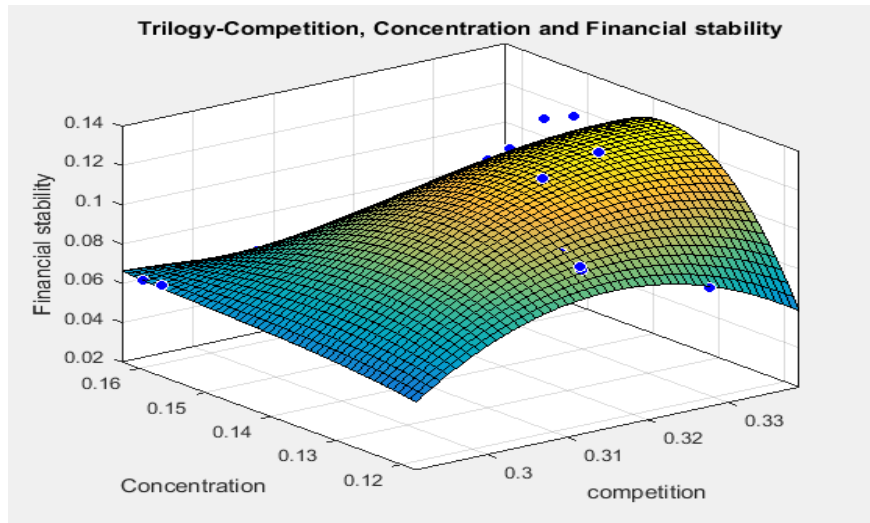
<sup>10</sup> With regard to the test of balance, the results affirm that the equation of income is estimated in situation of balance of long run. Thus, the test of Wald rejects the assumption of an imbalance (H different from 0) and thus one is in the presence of a balance of long run.

During the period going from 2000 to 2010, the banking system knew a development and an important opening on the regional markets. Indeed, its contribution to the economic growth increased and the appropriations with the economy recorded growth rates in two digits. This was reflected positively on the degree of competition, since one attends the emergence of a certain competition. The evolution of the index of competition during this period confirms this conclusion. Thus, the index H recorded during the period a 2000-2003 level of 0.02, which means that the banking system was characterized by a quasi-monopolistic structure. Between 2003 and 2006 and right before the coming into effect of the banking law of 2006, this index improved to reach a level of 0.05. In addition, the five last years (2006-2010) were remembered by an increase in the level of the competition of the banking system. The index H is from now on in the neighborhoods of 0.2 to define a structure of monopolistic competition.

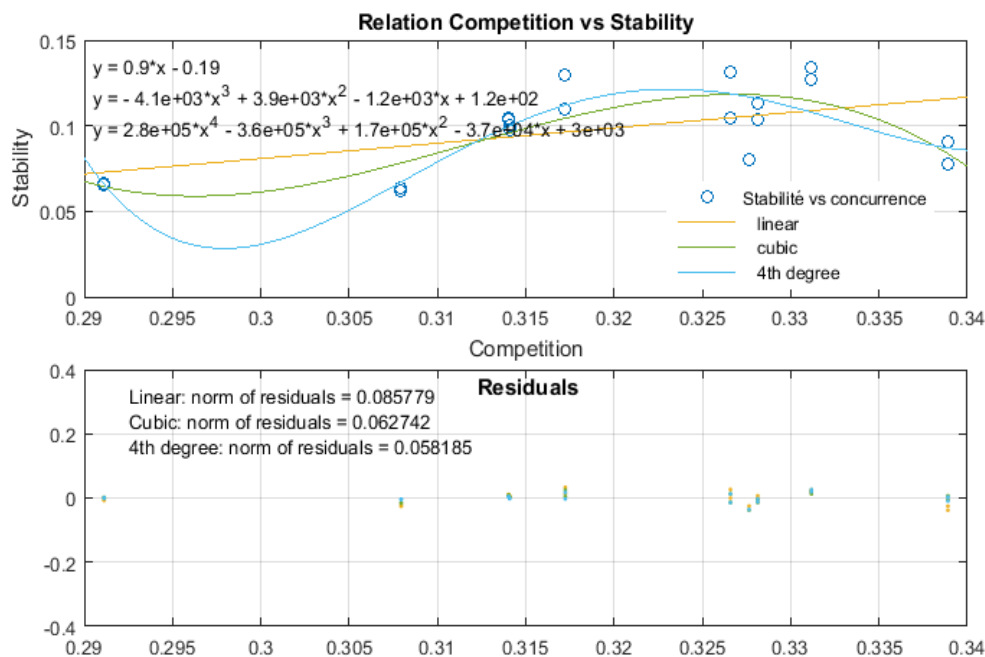
The estimate of the relation between financial stability and competition was carried out on the basis of model for fixed purpose. The choice of this model is justified by the fact that the negotiable instruments specific, relating to inobservable specificities to the banks can affect the degree of financial stability significantly (risk aversion of the manager, the choice of the activities to be financed, managerial decisions and management techniques of the risks, etc...) and to cause the non-observance of the weak condition of exogeneity.

Coefficients estimated in the model without all significant except that relating to the economic growth (see appendix 2). It appears that the bond between stability and competition is nonlinear with a plus coefficient. In the same way, the concentration of the banks is positively related to financial stability what makes it possible to affirm that more the concentration is important plus the system is stable. This can be explained by made that a system with high concentration is a system where the risk of contagion is weak and consequently the probability of having an instability is tiny. The introduction of nonthe linearity of the relation between financial stability and competition confirms, according to the estimates carried out, that this relation is convex. Indeed, when competition increases that produced a fall of stability and an increase in risks, up to a certain point of optimality where the relation is reversed.

We used the polynomial form to be able to graphically present the true relation between competition, stability and the concentration. The figure with three dimensions below clearly shows this relation between stability and competition in Morocco. Thus, there exists an optimum which makes it possible to define the level of competition which gets the level of the highest risk where instability is stronger.



From this result, we tried to model in polynomial form the relation between the competition and stability by neglecting the level of concentration. It arises that the relation between the two phenomena is rather cyclic. Indeed, with the increase in competition, financial stability attenuates in a first phase and thereafter it starts to increase as competition gallops.

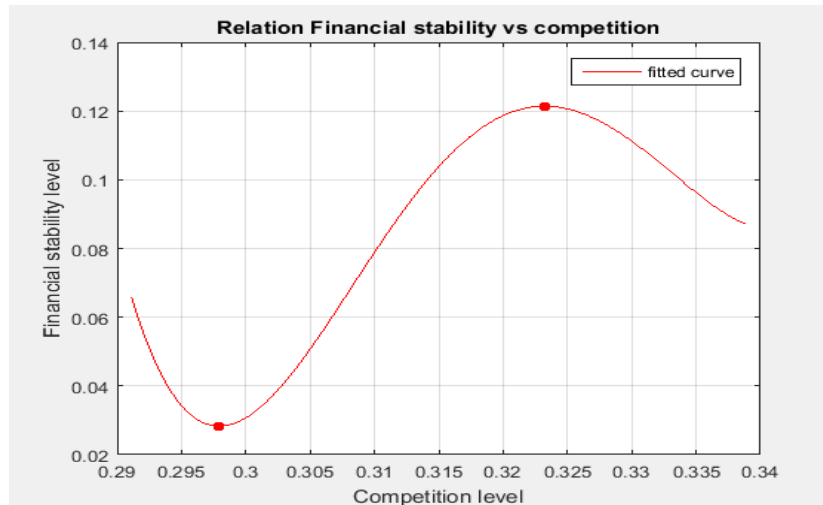


Thus, we highlighted the cyclic relation between competition and financial stability. From this point of view, we can propose a mathematical resolution in order to determine the levels of optimality of the estimated polynomial curve. For this reason, we used dynamic optimization<sup>11</sup> under constraint in order to approximate the optimum points which describe the extreme situations between the two phenomena. From these results we identified two cycles of competition-stability:

<sup>11</sup> We used the functions of optimization on MATLAB (fmincon) while basing ourselves on the Lagrangian function.



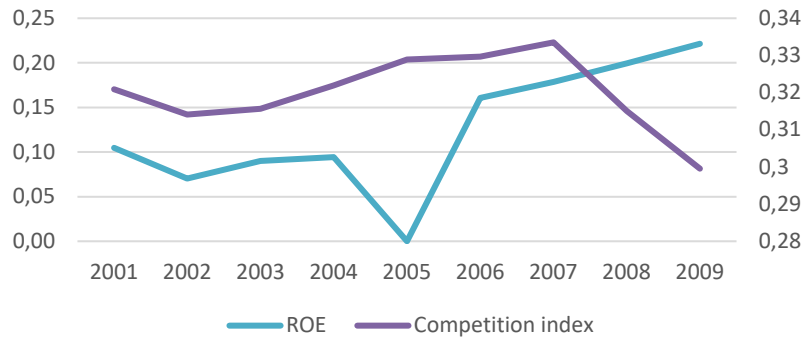
the first cycle where competition was weak stability tended to settle with a level of risk in fall. In addition, as from the moment when the degree of competition to start to increase financial instability increased describing a situation of amplification of the risks. Indeed, the engagement of the banks in a fierce competition induced a strong instability.



Several implications are to be raised according to the results obtained, especially in the field of the financial regulation. Indeed, if the relation between financial stability and competition is cyclic that makes it possible to also check the obligation to have in Morocco a prudential policy of cyclic nature. The micro regulation prudential orthodoxe considers that the risks are of individual nature and that the structure of the financial system as a whole cannot induce instability. Following the example results obtained, the authorities in charge of financial stability and banking supervision are capable to manage the taking risk of the banks in situation of instability.

In the same way, the results make prevail a new analysis of the relation competes with vs stability. Indeed, the deceleration of competition makes it possible the banks to reduce their takings risk is while counting on the improvement of the economic conditions and the profiles of risk of the economic agents where because of the negotiable instrument cuts which enjoys in this situation the banks which enables them to guarantee a better absorption of the risks. However, this situation is nondurable, since the competition which is installed on the long run starts to stimulate the aggressive behaviors of the banks inducing an excessive taking risk and a loss more and more of the sizes negotiable instruments. This immediately induces an increase in instability which will be able to facilitate the supervening of financial crisis.

**Figure 3. Competition index and ROE**



The analysis of competition in comparison with the return on assets banking confirm the before advanced results. In fact, between the years 2001 and the 2004 tendency of the two phenomena was the same one, allowing to affirm that competition supports banking profitability and stimulates the taking risk while counting on the profits of diversification. In addition, between the period 2005 and 2010, this relation changes. Indeed, more competition leads to a fall of banking profitability because of the increase in profile in risk.

## Conclusion

Competition in the banking system ensures the wellbeing of the borrowers and the depositors and makes it possible to attenuate the irrational behaviors which are often of possible sources of risks. From this point of view, its evaluation contributes to help the authorities of supervision with set up of the devices aiming at fighting against of the anti-competitive structures.

The passage of a quasi-monopolistic structure to a more competitive structure has several implications on the performance and the stability of the Moroccan banking system. Although competition between the banking firms positively impacts the economic growth by lowering interest rates and thus by stimulating the granting of the credit, it supports the rise of the action leverages and the taking risk on the level of the assets and the liabilities. Thus, the evolution of the degree of competition of banking industry must be analyzed by taking account of its implications on the stability of the banking system, since competition all the time does not ensure an efficiency in the financial intermediation.

This level of competition of course has implications on the level of the stability of the banking system. However, this relation between competition and financial stability remain discussed on the theoretical level. Indeed, current perception is that competition has negative negotiable instruments on the stability of the system by stimulating the behaviors at the risk, on the level of the assets, aiming at monopolizing more market shares and who result in an increase in the probability of defect of the finance companies. On the other hand, other theoretical investigations consider that competition supports financial stability while exploiting anticipations of the economic agents which profit from competitive interest rates to finance the whole of their projects without having to practice an adverse selection. Naturally, when interest rates are important, the investors finance the high-risk projects by the banking system, which exposes the balance-sheets of the banks to the risks of instability. Another argument as for the positive relation between competition and financial stability is the probability of having systemic banks. Indeed, a very concentrated sector can be fertile for the birth of systemic banks which can facilitate the phenomena of financial instability.

According to our results the relation between competition and financial stability is cyclic. Indeed, which we have let us prove in this work is that competition supports financial stability in situation of impact strength of the financial system. On the other hand, in situation of rise of the risks, competition contributes to install a situation of strong financial instability. This has important implications as well on the theoretical level as empirical. On the theoretical level, competition supports financial stability and encourages the banks to take more risk which are compensated by the negotiable instrument cuts, allowing even more financial stability. In addition, this continuous competition until the negotiable instrument cuts reached its optimal threshold, for this reason, fierce competition between the banks results in supporting the riskiest projects, inducing a rise of the financial instability which facilitates the emergence of financial crisis.

On the empirical or decisional level, these results make it possible to propose an new approach of regulation known as cyclic. In this direction, the authorities in charge of financial stability from now on will be encouraged with set up of the tools of regulations prudential or macro microphone prudential dependently of the cycle stability vs competition. Thus, in the event of opposite relation between financial stability, the authorities can follow closely the ratio of lever to tally the profitability of the banks. In addition, at the time of a positive relation, the authorities can reduce the taking risk by the banks to guarantee the quality of the banking assets.

## Appendices

### Appendix 1: estimate of the degree of competition

Models	Model of competition (M1)	Model of balance (m2)
Endogenous variables	Income from interest	Return on assets (ROA)
ln(ft)	0.22 (0.00)	-0.0008 (0.32)
ln(fk)	0.03 (0.00)	-0.0001 (0.00)
ln(ff)	-0.07 (0.00)	-0.0005 (0.08)
ln(size)	-0.32 (0.00)	-0.0002 (0.9)
ln(scal)	0.66 (0.00)	-0.003 (0.06)
ln(share)	0.26 (0.00)	0.005 (0.01)
constante	2.23 (0.00)	2.2 (0.00)
$R^2$	0.995	0.33
DW	2.05	1.93
Test of Hausman	15.32 (0.00)	-
Test of Fisher	21.50 (0.00)	-
<b>H=0.22+0.03-0.07=0.18 (M1)</b>		
Test of the assumption of perfect competition (H=1)	-8.8 (0.00)	
Test of the assumption of monopoly ( $H \leq 0$ )	1.85 (0.09)	
<b>Test of balance (m2)</b>		
Test of assumption H=0	1.04 (0.29)	

The estimates were carried out by method LSDV with correction of the autocorrelations

### Appendix 1: checking of the nonlinear relation stability-competition

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SCAL	-0.213166	0.026129	-8.158320	0.0000
SIZE	-0.550527	0.104655	-5.260379	0.0000
PIB(-1)	-0.051203	0.049780	-1.028577	0.3056
H <sup>square</sup>	0.417026	0.132040	3.158334	0.0020
HHI	1.162687	0.267833	4.341088	0.0000
<b>R-squared</b>	0.781979	<b>F-statistic</b>	39.15505	
<b>Adjusted R-squared</b>	0.762008	<b>Prob(F-statistic)</b>	0.000000	

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