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Determinants of Bank Performance in Mexico: Efficiency or Market Power

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Abstract

The Mexican banking sector has experienced a process of consolidation which has caused concerns of possible collusion effects. This paper analyzes the determinants of bank performance in the Mexican banking sector for 2001-2009. Two market power hypotheses, Structure-Conduct-Performance (SCP) and Relative-Market-Power (RMP) alongside two variants of the Efficient-Structure (ES) hypotheses are tested in order to find out whether bank performance has been driven by market structural effects or by greater efficiency. The results state that bank profits have been determined by greater market share, confirming the RMP hypothesis. At the same time, the findings show that profits persist over time but adjust slowly to their natural (average) level, suggesting that the banking sector is not very competitive. Moreover, there is no evidence of a positive relationship between greater efficiency and bank profits. Finally, while capitalization levels increase bank profits, liquidity risk decreases them.

Keywords: Bank Performance, Data Envelopment Analysis (DEA), Generalized Method of Moments (GMM), Structure-Conduct-Performance (SCP), Efficient-Structure Hypothesis (ES).

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I. Introduction

During the last few decades, the Mexican banking system has experienced a process of financial liberalization which was focused on generating a more competitive and efficient banking sector. As a result, the banking sector in Mexico has become more consolidated mainly through an increased activity in M&As. Many of the largest banks in the country are now foreign owned and there are concerns about a more concentrated banking sector and its implications towards consumers. At the same time, the banking sector has experienced a trend of growing profitability alongside positive trends for both capital adequacy and total loans. It is important therefore, to understand if the banking sector profitability is being driven by market power considerations with its possible effects on final consumers. On the other hand, banks could have been profitable due to greater efficiency and therefore the implications of market structural effects on bank profits could be discarded.

This paper analyzes two market power hypotheses: the Structure-Conduct-Performance (SCP) hypothesis and the Relative-Market-Power (RMP) hypothesis alongside two variants of the Efficient-Structure (ES) hypothesis in order to find out whether greater market power or efficiency has a positive influence on bank profits. Efficiency estimates are elaborated by applying the non-parametric Data Envelopment Analysis (DEA) method and two different efficiency measures are obtained: namely X-efficiency (ESX) and Scale-efficiency (ESS). To the extent that the market power hypotheses are proven then policies should be aimed at limiting further M&As in the banking sector since they could be costly to consumers. On the other hand, if the efficiency hypothesis is sustained then limiting M&As could be socially costly. The study of these hypotheses has been widely analyzed in developed countries but there are few studies focused on emerging economies. Moreover, there are

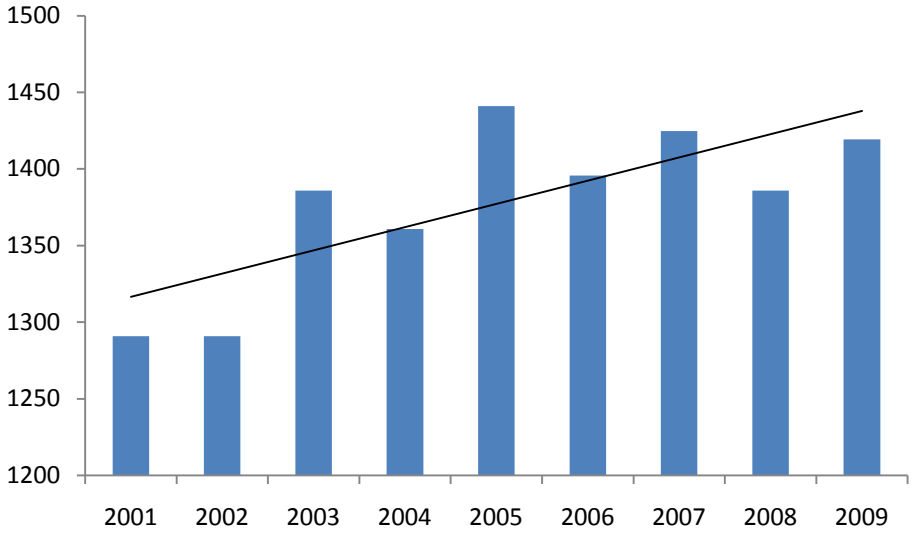
only a handful of studies which analyze these hypotheses in the Mexican banking sector, and to best of my knowledge none of them apply non-parametric methodologies to estimate efficiency scores.

This paper is divided into five sections. Section 2 presents the background of the Mexican banking sector; Section 3 introduces the methodology and data used in this study; Section 4 presents the main findings; and finally Section 5 concludes.

II. Background

This decade has seen an increase in the concentration level of the banking system in Mexico. Fig. 1 shows the Herfindahl-Hirschmann Index for the period of study which presents an upward trend.

Fig. 1. Concentration Index (Herfindahl-Hirschmann Index)

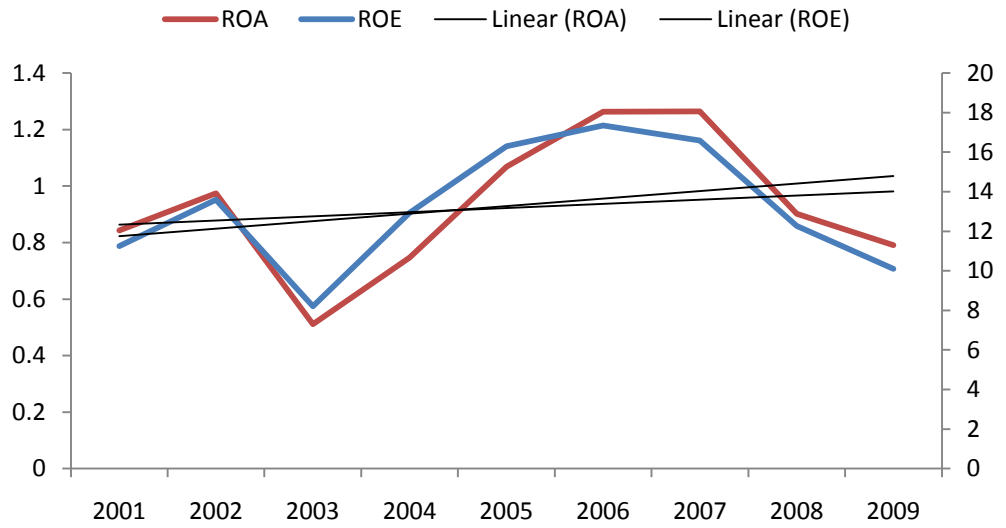


Source: Elaborated with data obtained from the Mexican banking supervisor (CNBV).
The Herfindahl-Hirschmann Index is defined as the sum of the squared market share of each bank in the banking sector.

This trend has been fuelled by recent M&As, many of them of foreign banks acquiring domestic banks. Since 1997 foreign banks in Mexico have increased their participation in

the banking sector, by 2004 they controlled 82% of bank assets (Haber and Musacchio, 2004). In particular, a big rise in the HHI is observed from 2002 onwards. At the same time, the profitability of the banking sector has increased for the period of study. Fig. 2 shows the return on assets (ROA) and return on equity (ROA) for the banks under study.

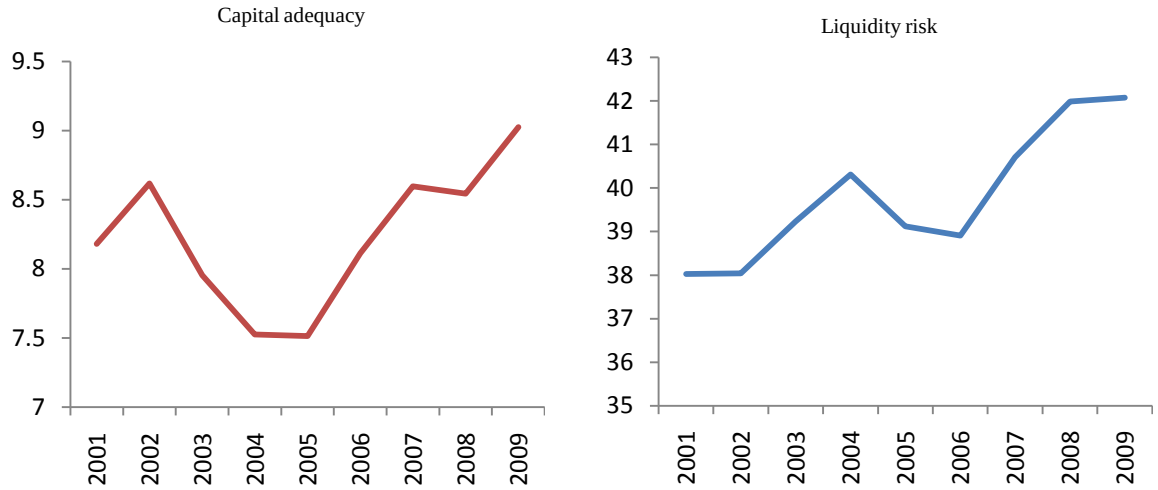
Fig. 2. Profitability Measures (ROA and ROE)



Source: CNBV.
ROA is defined as total returns over total assets; ROE is defined as total return over total equity.

As observed in Fig. 2, there is an upward trend in both profitability measures from 2003 to 2007, and then a sudden drop afterwards probably due to the worldwide financial crisis. Moreover, both lineal measures of ROA and ROE show a general positive trend. In terms of the degree of capitalization and the number of loans, Fig. 3 shows its trends.

Fig. 3. Capital adequacy (equity over total assets) and liquidity risk (total loans over total assets)



Source: Elaborated with data from CNBV.

It is clear from Fig. 3 that both measures of capitalization and liquidity have increased for the period of study. In terms of the degree of capital adequacy, there is a downturn in this ratio from 2002 to 2005 but a stiff recovery afterwards. With regards to the degree of loans over assets there is a slight drop from 2004 to 2006 but a gradual increase soon after. These ratios suggest that the banking system in Mexico has increased its capital level and has increased its overall loan levels during the last decade.

Fig. 4. Non-performing loans over total loans

Source: Elaborated with data from CNBV.

Fig. 4 shows the trend for the overall level of non-performing loans with respect to total loans in the Mexican banking system. Although the ratio fell from 2001 to 2006 it has increased afterwards, probably absorbing the financial crisis effects, which increased the level of non-performing loans in the banking sector.

Overall, the degree of banking concentration has increased during the last decade alongside a positive trend in the profitability measures of the Mexican banking sector. However, it is important to test whether there is a direct structural effect on the performance of Mexican banks or whether their profitability is driven by greater efficiency.

III. Literature Review

Earlier Industrial Organization studies have argued about a causal link between market concentration and the performance of firms, supporting the collusion hypothesis of the Structure-Conduct-Performance (SCP) paradigm (Goddard et al., 2001). According the

collusion hypothesis, when few numbers of banks control the banking sector, it is easier for them to collude (Goddard et al., 2001). Collusion can then be observed by higher interest rates on loans, lower deposit rates and higher fees and commissions charged on consumers. Moreover, firms may earn abnormal profits when banks enjoy large market shares and well differentiated products (Shepherd, 1982). Berger (1995) suggests two market power hypotheses to explain bank performance: Structure-Conduct-Performance (SCP), where prices are less favorable to consumers due to more concentrated markets and the Relative-Market Hypothesis (RMP), where banks with greater market share exercise higher pricing resulting in greater than competitive profits (Berger, 1995). However, Berger (1995) also states that in contrast to the market power hypotheses, profitability in banks can be driven by greater managerial and scale efficiency. He proposes two alternative hypotheses: 1) X-efficiency hypothesis (ESX), where firms with greater managerial efficiency or better technologies have lower costs and therefore higher profits; 2) Scale-efficiency (ESS), where firms produce at more efficient levels than others and therefore have lower unit costs and higher profits (Berger, 1995). It is important to note that greater efficiency may increase both profits and market share, thus resulting in a spurious relationship. It is therefore necessary to test the market power and efficiency hypotheses altogether in order to find which hypothesis determines greater profitability (Claeys and Vander Vennet, 2009). To the extent that market power hypotheses are proven then M&As should be limited since they are setting unfavorable prices to consumers. On the other hand, if ES hypotheses are proven, then M&As shouldn't be limited since they are motivated by efficiency gains, which are then transmitted as more favorable prices to consumers (Berger, 1995).

The empirical evidence on the market power and efficiency hypotheses is mixed and the majority of the studies focus on developed countries. Gilbert (1984) reviewed over 44 banking studies and found that over half supported the SCP hypothesis. Lloyd-Williams and Molyneux (1994) and Molyneux and Forbes (1995) find evidence supporting the SCP paradigm for Spanish and European banks respectively. Berger and Hannan (1997) study the US and find support for the SCP hypothesis and also test the "quiet life"[1] hypothesis. They conclude that firms with greater market share are more inefficient. Other authors find evidence of the ES hypothesis. Goldberg and Rai (1996) found evidence for the ESX hypothesis in countries with low concentration ratios, but supported the RMP hypothesis otherwise. Maudos (1998) finds support for both the X-efficiency and RMP hypotheses in Spain for the period 1990-1993. Berger (1995) shows that X-efficiency is consistently associated with higher profits for a large sample of US banks. More recently, Fu and Heffernan (2005) test the SCP hypothesis for China and find support it but only before economic and financial reforms were imposed (before 1992).

In Mexico there are only a handful of studies which have analyzed the determinants of bank performance. Arteaga (2001) studies the Mexican banking sector for the period 1995-1999 in order to test the SCP and ES hypotheses. His findings argue in favor of the SCP hypothesis, finding a positive relationship between the concentration index and profitability. However, he does not include any efficiency variables in the model. Rodriguez-Montemayor (2003) studies the determinants of bank performance in Mexico for the period 1995-2000 for 16 commercial banks. He tests both the SCP and ES hypotheses and concludes that both help to determine bank performance. He suggests that regulatory

[1] The "quiet life" hypothesis suggests that firms with greater market shares have no incentives to become more cost efficient, even at the expense of somewhat lower profits (Berger and Hannan, 1997).

entities should limit M&As only when efficiency gains are low and when the concentration levels reduce the degree of market competition. In order to measure the efficiency variable he uses two financial ratios: net interest margin over financial income and the inverse of the cost over income ratio. Guerrero and Villalpando (2003) analyze whether the SCP, RMP or ES hypotheses explain bank performance for 18 banks in Mexico during 1997-2005. They obtain X-efficiency and Scale-efficiency estimators by applying the parametric Distribution Free Approach (DFA). Their findings suggest that the market power hypotheses (namely SCP and RMP) are responsible for explaining bank profitability in Mexico. As seen above, there are only a few studies which have studied the market power and efficiency hypotheses for the Mexican banking sector.

IV. Methodology and Data

Methodology

The methodology in this study follows two steps: first, the two efficiency estimators (ESX and ESS) are computed by applying the non-parametric Data Envelopment Analysis (DEA) method. Afterwards, a dynamic panel system GMM regression is run, including the market power and efficiency variables, in order to obtain the main determinants of bank profitability.

Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a mathematical program which is used to develop relative efficiency measures by generating an efficiency frontier and measuring the distance of a Decision Making Unit (DMU) to this frontier. Any measurable distance between the

relative efficiency measures of each DMU with the efficiency frontier is considered as inefficiency, whereas a DMU that lies alongside the efficiency frontier is considered fully efficient. The DEA methodology follows an input-oriented (intermediation) approach since commercial banks are considered as acting as financial intermediaries following previous studies (e.g. Hasan and Morton, 2003; Ray, 2007; Berger at al., 2009; among others). Thus, the DEA input-oriented methodology seeks to identify any levels of inefficiency as a proportional reduction of inputs (Casu and Molyeneux, 2003).

The original DEA model was proposed by Charnes et al. (1978) and assumed that the model followed Constant Returns to Scale (CRS). However, some authors argue that CRS is appropriate only when all DMUs are operating at an optimal scale. However, factors such as imperfect competition and constraints on finance may impede a DMU from operating at an optimal scale (Casu and Molyneux, 2003). Banker et al. (1984) suggested the alternative Variable Returns to Scale (VRS) model which incorporates these factors into the model. The VRS linear programme can be defined as:

$$
\begin{aligned}
&\min_{\theta,\lambda} \theta, \\
&st - y_i + Y\lambda \geq 0 \\
&\theta x_i - X\lambda \geq 0 \qquad (1) \\
&N1' = 1 \\
&\lambda \geq 0
\end{aligned}
$$

Where θ is a scalar which represents the efficiency score for the *ith* bank and will range from 0 to 1, λ is a vector of $N \times 1$ constants, *y* is the output vector for the *i-th* DMU, Y is the matrix of outputs of the other DMUs and the number of DMUs ranges from *i*=1…*n* ; *x* is a vector of input of the *i-th* DMU and X is the matrix of input of the other DMUs. When the convexity constraint λ =1 is omitted from (1) we obtain the CRS based efficiency

scores. On the other hand, SE = CRS / VRS, and when SE = 1 then the bank is efficient under both CRS and VRS, when SE < 1 the bank is not scale efficient. This paper computes the efficiency scores considering VRS and SE, which are interpreted as managerial efficiency (ESX) and Scale-efficiency (ESS) respectively.

The selection of inputs and outputs was considered by analyzing previous studies (Sealey and Lindley, 1977; Becalli et al., 2006). The study considers two inputs: the total costs (personnel expenses, administrative expenses and interest rate expenses) and total deposits, and two outputs: total loans and other earning assets. Table 1 presents the descriptive statistics of the inputs and outputs selected.

Table 1. Input/output descriptive statistics (in millions of pesos)

	Mean	Std. Dev.	Min	Max
Inputs				
Tot. Costs	5,223.691	10,277.26	3.397	76,237.48
Deposits	57,448.27	102,862.5	.0189	556,147.3
Outputs				
Loans	49,140.21	87,740.23	0	526,530.4
Other Earning Assets	52,093.58	96,881.81	0.022	572,355.9

Source: CNBV (banking supervisor in Mexico).

Generalized Method of Moments (GMM)

After computing the ESX and ESS efficiency scores, the next step is to run a dynamic panel data Generalized Method of Moments (GMM) in order to test the market power and efficiency hypotheses. One of the main advantages of using GMM is that it controls for endogeneity in the model. According to Roodman (2009), system GMM estimators are suitable for panels with large number of observations and short-periods of time. Moreover,

it gives the best estimator when dealing with explanatory variables which are not strictly exogenous.

The exogenous variables, the lagged dependent variable and the lagged endogenous variables are used as instruments in the system GMM equation. The equation is defined as:

$$\pi_{it} = \alpha_{it} + \beta_1 \pi_{i,t-1} + \beta_2 HHI_t + \beta_3 MS_{it} + \beta_4 LOATA_{it} + \beta_5 NPL_{it} + \beta_6 CAP_{it} + \beta_7 ESX_{it} + \beta_8 ESS_{it} + \beta_9 CPI_{it} + \beta_{10} GDP_{it} + \beta_{11} INT_{it} + \mu_i + \nu_{it} \quad (2)$$

where:

π = is a measure of bank performance, e.g. ROA or ROE.
α = is the constant term.
HHI = is the measure of concentration.
MS = is a measure of market share.
LOATA = is a measure of liquidity risk.
NPL = is a measure of credit risk.
CAP = is a measure of capital adequacy.
ESX = is a measure of X-efficiency.
ESS = is a measure of Scale-efficiency.
CPI = is the annual inflation rate.
GDP = is the annual GDP growth.
INT = is a measure of interest rate volatility.
μ = unobserved bank-specific time invariant effect.
ν = a disturbance effect independent across banks.

The coefficient of the lagged dependent variable, $\pi_{i,t-1}$, represents the level of profit persistence. According to Berger at al. (2000), the persistence of profits in banks is the tendency of a firm remaining in the same profit distribution. “Without market power, relatively high performance by a firm would be eliminated reasonably quickly as other firms enter its local market, imitate its transparent techniques or strategies, bid for its most profitable customers, or bid up the price of its managerial talent” (Berger et al., 2000: pp. 1). Athanasoglou et al. (2005) argue that the coefficient of the lagged profitability measure,

in this case β_1, is the speed of adjustment to equilibrium profits. They state that a value of this coefficient between 0 and 1 suggests that profits persist, but they eventually return to their natural level. A value close to 0 suggests that the speed of adjustment is very high meaning that the banking industry is highly competitive, and when the value is close to 1, the speed of adjustment is very low suggesting an industry with a low competitive structure.

The HHI is the measure of the degree of market concentration (in terms of assets) and if a positive relationship is found, then the SCP hypothesis would be accepted. The MS is the market share in terms of assets and a positive relationship with bank profitability would suggest the acceptance of the RMP hypothesis (Berger, 1995). From the remaining bank-specific variables, LOATA is a measure of liquidity risk and the literature has found mixed evidence on the expected sign of this variable with regards to profitability. Garcia-Herrero et al. (2007) argue that greater loans imply more interest revenue but overall higher risks. However, they also acknowledge that a higher number of loans have higher operational costs which need to be originated, serviced and monitored. Therefore, they state that profitability should increase as long as interest rates on loans are liberalized and the bank applies mark-up pricing (Garcia-Herrero et al., 2007). NPL is a measure of credit risk and a negative relationship is expected since non-performing loans are costly to banks. Garcia-Herrero et al. (2007) argue that poor asset quality reduces bank profits as it reduces the number of profitable loans that could be used. Bourke (1989) and Miller and Noulas (1997) find that a higher accumulation of unpaid loans contributes to lower banking returns. CAP is a measure of capital adequacy and the literature mainly finds a positive relationship with regards to bank profitability. According to Garcia-Herrero et al. (2007) the degree of

capitalization could affect bank profitability through several channels: a) greater capital may increase the share of loans which increases profitability, b) banks with a high franchise value have incentives the remain well capitalized, c) greater amount of capital is an important parameter of creditworthiness, and d) well capitalized banks need to borrow less than their counterparts, thus reducing their funding costs. The empirical evidence has found a positive relationship between CAP and bank profitability in the US (Berger, 1995), Europe (Goddard et al., 2004b), 80 industrialized and emerging economies (Demirguc-Kunt, 1999), Mexico (Guerrero and Villalpando, 2009) among others.

The efficiency estimators, ESX and ESS, if positive should support the ES hypothesis where bank profitability is driven by greater banking efficiency (Berger, 1995). Turning to the macroeconomic variables, CPI is the inflation rate and the expected sign is ambiguous. According to Perry (1992) the inflation rate should affect the real value of costs and revenue in banks depending on whether it is anticipated by the bank. GDP is the measure of GDP growth and a positive relationship is expected if bank profits are correlated with the business cycle (Demirguc-Kunt and Huizinga, 2000; and Bikker and Hu, 2002). The measure for interest rate volatility, INT, measures the risk of market interest rates. According to many authors, interest rate volatility fosters bank profits since banks transfer these risks to consumers (Ho and Saunders, 1981; and, Maudos and Fernandez de Guevara, 2004) particularly in developing countries (Demirguc-Kunt and Huizinga, 1999). Thus a positive sign is expected.

Data

The data for this study was obtained from the Mexican banking supervisor (CNBV) and from the International Financial Statistics from the IMF. The bank-specific data obtained from the CNBV is monthly and the IFS data has a yearly periodicity. Table 2 presents the description of the variables used in this study.

Table 2. Description of Variables

Variables	Description
ROA	Measure of bank performance. Return on average assets.
ROE	Measure of bank performance. Return on average equity.
HHI	Measure of degree of concentration. Herfirndahl-Hirschmann Index: the sum of squared market shares (assets) in each period.
MS	Market share in terms of assets.
LOATA	Measure of liquidity risk. Loans over total assets.
NPL	Measure of credit risk. Non-performing loans over total loans.
CAP	Measure of capital adequacy. Total capital over total assets.
ESX	Measure of X-efficiency (managerial efficiency).
ESS	Measure of Scale-efficiency.
CPI	Inflation rate. Annual change in the Consumer Price Index.
GDP	GDP growth. Annual GDP growth.
INT	Interest rate volatility. Annual standard deviation of the money market interest rate.

Table 3 shows the description of the variables used in this study.

Table 3. Descriptive Statistics

	Mean	Std. Dev.	Min	Max
ROA	.939	1.25	-5.902	5.612
ROE	13.405	15.141	-99.146	112.527
HHI	1 385.266	73.924	985.308	1 489.999
MS	5.573	7.226	.116	25.7
LOATA	39.972	15.575	10.318	88.813
NPL	2.565	2.035	.007	11.247
CAP	8.229	4.55	.325	32.746
ESX	.876	.146	.4	1
ESS	.884	.13	.465	1

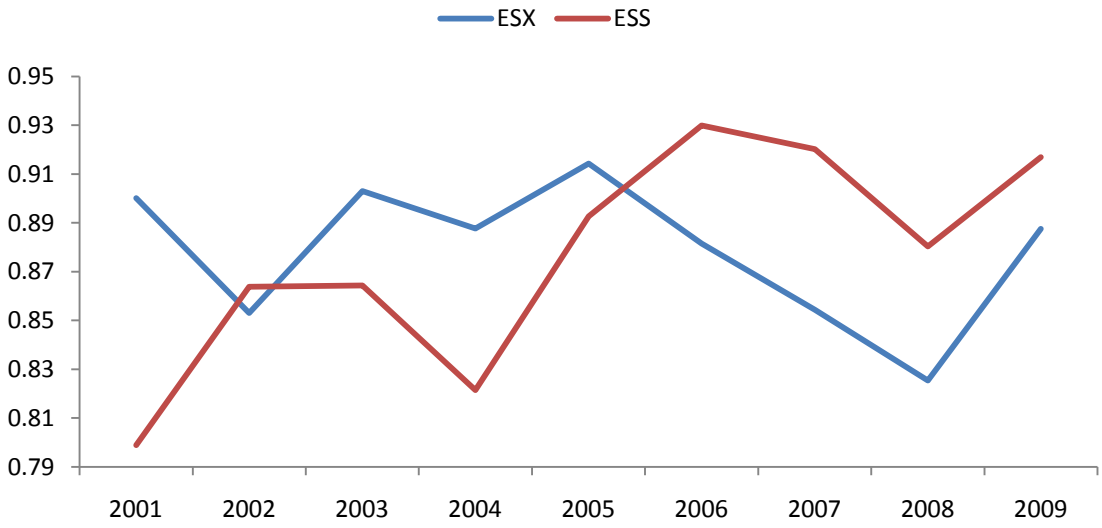
CPI	6.223	1.497	4.276	8.546
GDP	1.564	3.23	-6.538	4.933
INT	.77	.647	.144	4.136

From Table 2 there are interesting insights on the descriptive statistics of the variables used in this study. The ROA and ROE show averages of 0.94 and 13.41 respectively; the HHI shows a minimum value of 985 compared to its highest value of 1 490; the market share average is 5.6% although with a minimum value is 0.12% and a highest value of 26%. The efficiency scores show inefficiencies averages of 12% for both efficiency scores for the period of study. Finally, the macroeconomic variables show a reduction in the CPI from 2001 (8.5%) to 2009 (4.3%); GDP which varies from 4.9% to -6.5%; and interest rate volatility which varied from 0.144 to 4.1.

V. Results

The results in this study are divided into two, first the estimation of the efficiency scores, both ESX and ESS, and then running the system GMM dynamic panel data regression including the efficiency scores and market power variables. Fig. 5 presents the trends for the ESX and ESS efficiency scores.

Fig. 5. X-efficiency and Scale-efficiency estimators



The efficiency variables are the average efficiencies of all the banks each year.

Fig. 5 above shows a clear positive trend when considering X-efficiency, from approximately 0.80% (2001) to 0.93% (2009). On the other hand, the Scale-efficiency estimator shows a decreasing trend, from 0.90% (2001) to 0.83 (2008), but a swift recovery to 0.88% (2009). If compared to other studies, Guerrero and Negrin (2006) find inefficiency averages for the period 1997-2004 of 15% and 19% for ESX and ESS respectively. In this study the inefficiency averages for the period 2001-2004 are 11% and 16% for ESX and ESS respectively.

The next step is to run the system GMM dynamic panel data. Table 4 shows the results of this regression where ROA and ROE are the dependent variables.

Table 4. System GMM dynamic panel data

	ROA (1)	ROA (2)	ROE (3)	ROE (4)
L.DEP	**.823*** **	**.799*** **	**.937*** **	**.97*** **
HHI	.001	.0002	.003	.002
MS	**.088***	**.089***	**1.043***	**1.102***
LOATA	**-.012***	**-.013****	-.108	-.105
NPL	.057	.049	**.775****	.132

CAP	**.093****	**.088***	.704	.609
ESX	.347	.382	6.503	3.494
ESS	-.275	-.329	-6.532	-6.159
CPI	-.004		-.269	
GDP	.016		.232	
INT	-.047		.131	
C	-1.289	-.823	-9.061	-4.686
F-test	54.71	16.70	341.62	66.18
p-value	(0.00)	(0.00)	(0.00)	(0.00)
AR(1)	-1.86	-2.02	-1.69	-1.71
p-value	(0.063)	(0.044)	(0.090)	(0.087)
AR(2)	-1.05	-0.88	-0.98	-0.81
p-value	(0.294)	(0.379)	(0.326)	(0.419)
Hansen J-test	10.52	11.66	4.26	7.76
p-value	(0.161)	(0.112)	(0.749)	(0.652)

*,**,*** represents significance at the 10%, 5% and 1% confidence intervals.
Where ROA/ROE are measures of bank performance, L.DEP is the lagged dependent variable, HHI is a measure of market concentration, MS is a measure of market share, LOATA is a measure of liquidity risk, NPL is a measure of credit risk, CAP is a measure of capital adequacy, ESX is a measure of X-efficiency, ESS is a measure of Scale-efficiency, CPI is the inflation rate, GDP is a measure of GDP growth, INT is a measure of interest rate volatility and C is the constant term.

The first set of results indicates that the lagged dependent variable is always positive and significant in all models. The coefficient of the lagged dependent variable shows the tendency of bank profits to persist over time. It reflects lack of competition and/or information as well as sensitivities to other macroeconomic effects (Berger et al., 2000). Accordingly, a value between 0 and 1 implies that profits will persist but will eventually converge to their normal levels. However, a coefficient close to 1 would imply a less competitive industry (a very slow adjustment). The persistence of profitability signals barriers to competition as the lagged performance coefficient approaches unity (Mueller, 1977; Berger at al., 2000; Goddard et al., 2002a). The coefficients of the lagged dependent variable are very close to 1, from 0.80 in model 2 to 0.97 in model 4, which could reflect the lack of competition in the Mexican banking sector (Athanassoglou et al., 2005). The

HHI shows no significance in any case so the SCP hypothesis is rejected in all cases. Nevertheless, the MS coefficient is always positive and significant, accepting the RMP hypothesis. Therefore, banks with greater market share obtain higher profits by pricing above competitive levels. At the same time, the ESX and ESS variables are not significant in any case, thus rejecting the ES hypothesis. Accordingly, bank profits are not determined by greater managerial and/or scale efficiencies. A similar result is obtained by Guerrero and Villalpando (2009) when analyzing the determinants of bank performance in Mexico, accepting both market power hypotheses and rejecting the ES hypothesis.

Turning to the remaining bank-specific variables, LOATA is negative and significant in models 1 and 2. Thus, greater liquidity risk reduces bank profits in Mexico. According to Garcia-Herrero et al. (2007) greater amount of loans do not necessarily imply greater revenues, since these loans have to be serviced and monitored. Thus, profitability should increase when the revenue from these loans is greater than the cost of operating them. NPL is only significant and positive in model 3, suggesting that credit risk increases profits, maybe by transferring this cost to the final consumer. Finally, CAP is positive and significant as expected since greater capital in banks reduces its funding costs and releases them more resources to find profitable investments. Similarly, Guerrero and Villalpando (2009) find a positive relationship between CAP and bank profitability in their study of the Mexican banking sector. The macroeconomic variables do not show any significance whatsoever, thus the banking sector performance is not affected by its macroeconomic environment. Some authors have argued that the macroeconomic environment is not necessarily correlated with the financial sector, a result which can interpreted with the main the findings in this study.

VI. Conclusions

The Mexican banking sector has experienced a process of financial liberalization during the last decades which was focused on generating a more competitive and efficient banking sector. As a result, the banking sector has become more consolidated and the degree of market concentration has increased. At the same time, the banking sector has experienced growing profitability trends. As such, it is important to determine if bank profits have increased due to market power considerations or if banks have become more efficient and therefore more profitable. This paper tests two market power (Structure-Conduct-Performance and the Relative-Market-Power) hypotheses and two variants of the Efficient-Structure (X-efficiency and scale efficiency) hypothesis in order to find whether bank performance is driven by market power or by efficiency considerations. In order to estimate the efficiency variables, the non-parametric Data Envelopment Analysis (DEA) method is applied, and then a system GMM regression is run including the market power and efficiency variables.

The first set of results suggest that the banking sector in Mexico has experienced average inefficiencies of around 12% for both measures of efficiency estimated for the period of study. Moreover, the results indicate that the banking sector has become more X-efficient during the last decade. The second set of results indicate that profits persist and that they adjust to their natural level (average) slowly, which suggests that the banking sector is not very competitive (Athanassoglou, 2005). Furthermore, there is evidence that greater market share increases bank profits, accepting the RMP hypothesis. However, the concentration index is never significant rejecting the SCP hypothesis. On the other hand, the efficiency variables are not significant in any case so there is no evidence to support the ES

hypothesis. Finally, while the degree of capitalization increases bank profits, liquidity risk decreases them.

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