Determinants of Commercial Bank Profitability in Mexico

RUBÉN CHAVARÍN RODRÍGUEZ[1]

· **Abstract.** The aim of the present work is to identify the main determinants of profitability for commercial banks established in Mexico. A database of 45 banks representing virtually the whole world of commercial banking in the period 2007-2013 was used. Dynamic models using Arellano-Bover/Blundell-Bond estimators with an error that follows an MA(1) process were employed along with static models having random effects and Hausman-Taylor estimator. Findings suggest that the profitability of commercial banking is sustained by the level of capital, the charging of commissions and fees, and control of operating expenses, as well as certain market entry barriers and obstacles to competition that provoke a relatively high persistence of profitability.

· **Keywords:** Bank profitability, Dynamic panel-data, Latin America.
· **JEL classification:** G21, C23, L13, O54.

· **Resumen.** El objetivo del presente trabajo es identificar los principales determinantes de la rentabilidad de la banca comercial establecida en México. Se ha utilizado una base de datos de 45 bancos que representan prácticamente todo el universo de la banca comercial en el periodo 2007-2013. Se estimaron modelos dinámicos mediante estimadores Arellano-Bover/Blundell-Bond con un error que sigue un proceso MA(1), así como modelos estáticos con efectos aleatorios y estimadores Hausman-Taylor. Los resultados sugieren que la rentabilidad de la banca comercial está sustentada por el nivel de capital, el cobro de comisiones y tarifas, y el control en los gastos de operación, así como por ciertas barreras a la entrada al mercado e impedimentos a la competencia que provocan una persistencia relativamente alta en la rentabilidad.

· **Palabras clave:** Rentabilidad bancaria, Panel dinámico, Latinoamérica.
· **Clasificación JEL:** G21, G23, L13, O54.
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■ *Introduction*

An efficient commercial banking system supports the operation and growth of companies, as well as the formation of new businesses and, in a wider sense, can contribute to economic growth and development (Aghion et al., 2005; Levine, 2005). However, its potential as a driving force of the economy is not always realized, as the banks sometimes restrict the issue of credit too much, or on other occasions, assume risks that can affect their performance. In both situations other economic agents are harmed and the influence of the banks on the rest of the economy reverses from positive to negative.

The operation of commercial banks implies a relation of equilibrium between risks, liquidity and diversification, which the banks themselves can modify, but there are also other market and macroeconomic factors whose influence is external to decisions taken by the banks. The functions of determinants of bank profitability are important because they reveal the interaction between these internal and external factors, and show the key elements supporting the performance of the banks. The more we know about the function of profitability in a banking system, the better we shall be able to identify certain patterns that determine its functioning and its effects on the rest of the economy.

During the last twenty years, the international academic community has maintained a constant interest in the study of bank profitability, and this has produced an extensive literature reviewing different countries separately, as well as various groups of banking systems. However, Latin America has been studied very little as a region or by individual country. The case of Mexico is no exception, as studies of this subject are few and have certain drawbacks in their econometric estimates, as well as having been produced some years back.

Further, recent studies have explored whether the profitability of commercial banks depends on the level of economic development of the countries where they operate, and their findings suggest that there is indeed a differentiated impact not only on their profitability but also on the determining factors (Dietrich and Wanzenried, 2014). For example, low-income countries may have greater rates of capitalization than countries with higher incomes, but in the former this variable does not turn out to be significant for explaining bank profitability, whereas for the latter it is significant. The individual estimate of the function of bank profitability in one country makes it possible to set up comparisons with the findings obtained by research projects conducted on groups of economies, and in this way possible similarities with other banking systems can be identified.

The aim of the present work is to make an estimate of the function of profitability for commercial banks established in Mexico, in order to identify the principle determinants of their profitability, over a period of study that allows an analysis of the present state of the banking system. The period to be studied is specifically that of 2007-2013, which happens to be an interesting period, as the banking system of

this country seems to have stabilized by then into a situation of co-existence between foreign owned banks that dominate the market, along with banks of different sizes linked to business groups with national capital, and a third set of banks, almost all of them small, some national, some foreign, that occupy some niche in the market. It is important to know what function of profitability explains this phenomenon.

Also, studying the function of profitability helps to deepen our knowledge of several distinctive features of the commercial banking system in Mexico. For example, in the first place, some scholars have pointed out that the problem with the banks established in this country is in their scanty provision of credits, especially for financing business projects (Hernández and Villagómez, 2012). The same problem has been recognized (in particular with regard to medium and small sized companies) recently by the agency that regulates economic competition in Mexico (Comisión Federal de Competencia Económica, 2014). Secondly, as explained in Section 3, a number of authors have suggested that there is significant market power in the banking industry (Arteaga, 2001; Rodríguez 2003; Guerrero and Villalpando, 2009; Garza-García, 2012). Thirdly, in previous years the financial authorities had established certain restrictions on the charging of fees by the banks, noting that they had identified inappropriate practices that were harming economic competition and obstructing the inclusion of certain segments of the population in the financial system (Banco de México, 2010); however, public perception is that the banks are still profiting from making excessive charges, so much so that as part of the financial reform passed at the end of 2013, the central bank was given the authority to limit the charging of fees.[2] In the fourth place, other authors have stressed that one of the main features of contemporary banking in Mexico is the strength of its levels of capitalization, which is a consequence of the establishment of foreign banks in the country around 15 years ago (Castañeda, 2014). On the basis of these features, the central question of the present study is whether the commercial banks established in Mexico base their profits on charging commissions and aspects having to do with the lack of competition, or is it variables such as the level of loans granted and the level of capitalization that are of greater relevance? The contribution of the present study is its inclusion in the research of the various factors that explain the profitability of the commercial banks from a point of view seldom explored in the empirical literature on Mexico, which include estimation techniques that allow the drawbacks presented by previous researches to be overcome.

Section 2 summarizes some of the elements that are characteristic of the present system of commercial banks in Mexico, elements that help with understanding in greater depth the findings presented in later parts of the study. Section 3 provides a review of literature on bank profitability, and calls attention to the most representative studies on the subject, as well as those conducted for the Latin American

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[2]   For an example, see the newspaper article by Mayoral (2013).

region and Mexico. Section 4 explains the database and the estimation models; it also provides the descriptive statistics and the correlations between variables. Section 5 gives the econometric findings. Section 6 presents the conclusions.

■ *The make-up and qualities of present day banking in Mexico*

Concentrating our attention on the Mexican financial system, the principle effect of the banking crisis of the mid 1990s was a change in the ownership of the biggest banks of the system, which passed to foreign financial groups.[3] The first of these banks to pass into the hands of foreign shareholders were Bancomer, acquired by BBVA, and Serfin, purchased by Santander; both in the year 2000. The last was Bital, acquired by HSBC in the year 2002. The 5 big banks included in this move had 77 percent of all the assets of the system in 2002.[4] In 2007, the same banks had 73 percent of the assets. In the period of 2002 to 2006, few new banks came into the market, but in 2007-2008, 13 new banks came in, some of them linked to business groups with national capital, and others related to consumer goods businesses, whose capital was foreign.

The process of mergers and takeovers and the arrival of new banks contributed to giving the commercial banking system in Mexico a new shape, and it came to consist of banks operating domestically that are subsidiaries of foreign banks, a set of fifteen banks that belong to Mexican business groups,[5] and another set, of over 20 banks, that operate in specific niches, some of them national and some of them foreign owned.

This composition of the system was consolidated in recent years and did not suffer alterations in the international financial crisis of 2008-2009. Although this crisis did reduce economic growth in Mexico, it did not have a direct impact on the banking system of the country; the impacts were in fact indirect, coming through economic activity, and no bank was at risk of collapsing and only two reported considerable losses. However, the indicators of profitability did see their tendency of growth from previous years interrupted (see Figure 1).

One of the reasons why the international financial crisis did not have destabilizing effects on the commercial banks established in Mexico was the experience of a national banking crisis in the 1990s. This crisis led to the federal government's clearing the loan losses of several banks and also motivated greater capitalization and less exposure to

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[3]   The commercial banks in Mexico were State-owned from 1982-1991. In 1992 the process of privatizing the commercial banks concluded with their being owned by Mexican shareholders. A macroeconomic crisis started in 1994 (and led to the Tequila effect) and soon afterwards presented itself as a banking crisis which led to government intervention in several banks and the de-capitalizing of the system, which opened the door for the majority of the big banks of the system to be sold to foreign financial groups.

[4]   These 5 banks were: Banamex, Bancomer (which became BBVA Bancomer), Bital (HSBC), Inverlat (Scotiabank), and Serfin (Santander).

[5]   This set of banks can be seen in Chavarín (2012), p.15.

credit risks by the banks in the system (see Figure 2). However, the relative solidity of the commercial banks has also been accompanied by significant market concentration,[6] as well as certain practices such as restricting credit and maintaining large spreads between active and passive interest rates, especially in the consumer credit market.

Figure 1
ROA and ROE of commercial banking in Mexico, 2000-2013
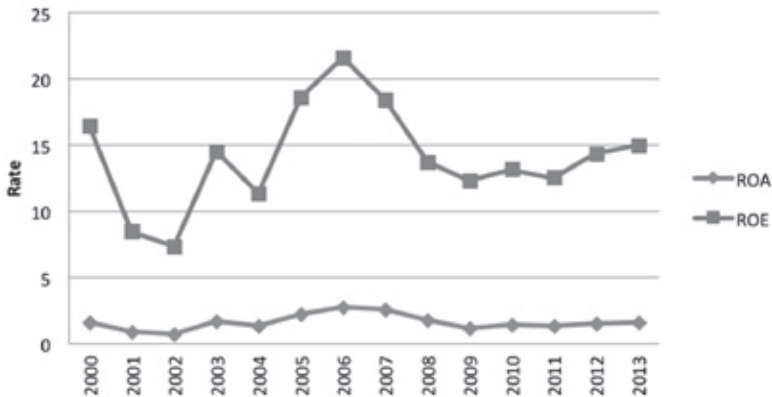
Source: Original elaboration based on data from the Comisión Nacional Bancaria y de Valores.

Figure 2
Capital and loans of commercial banking in Mexico, 2000-2013
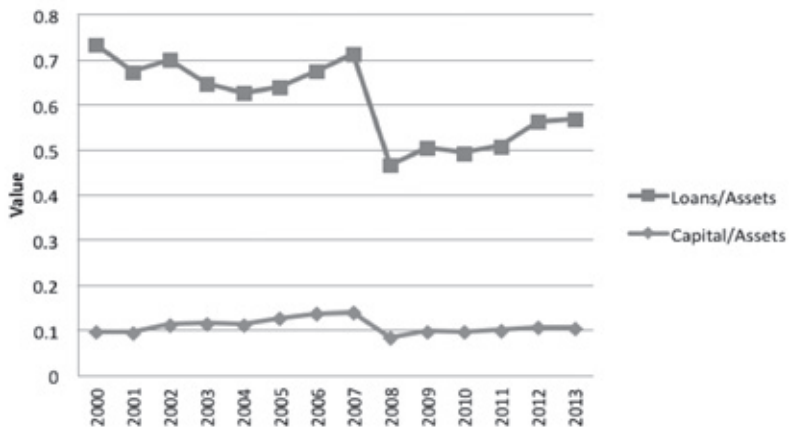
Source: Original elaboration based on data from the Comisión Nacional Bancaria y de Valores.

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[6] The concentration, measured by the Herfindahl index, of assets, loans and customer deposits has shown levels a little under 1,500 points during the period of study. However, measured by the dominance index, it has been above 2,500 in every case, which according to the regulating body in Mexico (la Comisión Nacional Bancaria y de Valores) implies the possibility of a negative effect on the level of competition in the industry.

■ *International evidence on the determinants of bank profitability*

According to Berger (1995), from a theoretical point of view, the relations between bank profitability and other variables may be understood on the basis of a basic model of capital markets during one period, with perfect and symmetrical information. As other periods are taken into consideration and the assumptions of information are relaxed, variants of the model can be established, in such a way as to make it possible to interpret empirical findings that do not necessarily meet the expectations raised by the basic model where all assumptions are fulfilled.[7]

From an empirical point of view, the first studies on the determinants of bank performance centered on factors that were liable to be influenced by those exercising control over the banks and managing them. Some of these are the level of capitalization, the amount of deposits, loans given, the quantity of provision for loan losses, a mix of income sources, operating costs, etc. In the course of time factors of this kind came to be called "internal", to distinguish them from other elements, of an external type, that were incorporated into the functions of profitability. External factors refers especially to market factors such as concentration, but the expression also serves to designate certain variables of regulation or of an institutional type that have been incorporated into some studies. More recently it has become a common practice to include macroeconomic factors, which allude to variables like inflation or economic growth. There is a wealth of literature that assigns great importance to these three kinds of factor in making better estimates of the functions of bank profitability.

As noted previously, in the last two decades the international academic community has produced an extensive literature on this subject. However, the origins of this kind of research can be traced back to the works of Hester and Zoellner (1966), Haslem (1968), Short (1979), Bourke (1989) and other researchers.[8] Other important works that study the cases of individual countries are those of Berger (1995), De Young and Rice (2004), Hirtle and Stiroh (2007), Park and Weber (2006), Athanasoglou et al. (2008), and Dietrich and Wanzenried (2011). The first three studies focus on the case of the United States; the last three on South Korea, Greece and Switzerland, respectively.

In all the profusion of works on the subject, there are a number of studies that have looked at groups of countries, and among these the following stand out: Molyneux and Thornton (1992) analyzed 18 European countries in the period 1986-1989. Demirgüç-Kunt and Huizinga (1999) studied 80 developed and developing nations in the period 1988-1995. Goddard et al. (2004) analyzed the 5 most developed

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[7]   The work of Berger (1995) concentrates in particular on the relation between profitability and the ratio of capital to assets.

[8]   For an account of these early works, see Rasiah (2010).

banking systems in Europe in the period 1992-1998. Staikouras and Wood (2004) studied 13 developed countries of Europe in the period 1994-1998. Athanasoglou et al. (2006) analyzed 7 developing countries of South-East Europe in the period 1998-2002. Micco et al. (2007) studied 179 countries for the period 1995-2002. Flamini et al. (2009) analyzed banks from 41 countries in sub-Saharan Africa in the period 1998-2006. Ben Naceur and Omran (2011) studied 11 countries of the Middle East and Northern Africa in the period 1988-2005. Bolt et al. (2012) studied 19 OECD countries in the period 1990-2007. Lee et al. (2014) analyzed 22 countries in Asia in the period 1995-2009. Finally, Dietrich and Wanzenried (2014) used a sample of 118 countries, divided into three income brackets, in the period 1998-2012.

With regard to studies of the Latin American region, research has been directed more towards explaining margins in interest rates, and there are about ten articles on this subject.[9] Whereas, studies explaining profitability are scarcer; only three of these were found in the course of this study to be on groups of countries. In the first one, Chortareas et al. (2010) studied 9 Latin American countries (not including Mexico) during the period 1997-2005. They found the principle determinants of profitability were capitalization and size, but the main part of their analysis was concerned with proving the possible influence of market concentration and efficiency. Their findings show that the efficiency of the banks is more important as a determinant of their profitability.

Jara et al. (2011) analyzed 6 Latin American countries (including Mexico), and the United States, for the whole period of 1997-2010.[10] The authors point out that U.S. banks are more profitable than the Latin America banks included in the sample. Their findings show that the variables of profitability have persistence over time, and a great proportion of the internal, external and macroeconomic factors included are significant.[11]

Guillén et al. (2014) studied 12 countries (including Mexico) in the period 1989-2005. The authors state that although the variable of bank efficiency is significant and positive in explaining their profitability, the market power of the banks has stopped the gains made in efficiency from reducing active interest rates.

Six works dealing specifically with the case of Mexico were found, and five of them use a static specification on panel data. Also five of them, Arteaga (2001), Rodríguez (2003), Chortareas et al. (2009), Guerrero and Villalpando (2009), and Garza-García (2012) concentrate on analyzing whether the profitability of the banking system is explained by market power or by a condition of efficiency in the banks. Arteaga (2001) analyzes the period 1995-1999 and comes to the conclusion

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[9]   Several of these works are cited in Jara et al. (2011).
[10]   Only two banks established in Mexico were included.
[11]   The results obtained by these scholars are based on regressions that include both banks in Latin American countries and banks in the U.S.A. Their claim that U.S. banks are more profitable than the rest is based on a difference of means test.

that market concentration is an important factor for explaining bank profitability.[12] Rodríguez (2003) studies the period 1995-2000 and concludes that both market concentration and efficiency are factors explaining bank profitability;[13] his findings show that the variables of capitalization and size are also significant. Chortareas et al. (2009) study the period 1996-2003 and also conclude that market concentration and efficiency are explicative factors for bank profitability, although evidence is weak for the first factor; they find also a positive impact between capitalization and profitability.[14] Guerrero and Villalpando (2009) analyze the period 1997-2005 and come to the conclusion that the variables of market power can explain bank profitability; their findings show that the variables of capitalization and provision for loan losses are also significant. Garza-García (2012) studies the period 2001-2009 and concludes that there is influence by market power on the profitability of the banks; he also finds some evidence of significant effects from the level of capitalization and the level of loans granted.[15] It is worth pointing out that the work just mentioned is the only one conducted for Mexico that estimates a dynamic model.

Finally, Rodríguez and Venegas (2010) sought to define precisely what the determinants of profitability were in groups of banks of four different sizes, using the period 2002-2009. These scholars gave exclusively financial ratios as explicative variables and their findings show that capitalization is a relevant variable for explaining the profitability of banks in Mexico.[16]

On the whole findings obtained in international empirical research tell us that it is very important to include explicative variables that represent internal, external and macroeconomic factors. At the same time, a number of recent studies demonstrate the importance of proving dynamic specifications of the function of bank profitability. This aspect has been omitted, with one exception, from studies on Mexico and macroeconomic variables have not been included either. Further, studies on the Latin American region and on Mexico agree about the relevance of certain factors, such as market power and capitalization, and to a lesser extent size and credit risk.

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[12] The author does not specify which technique of estimation was used to obtain his results.

[13] The author states that he made estimates through fixed effects but does not say whether he conducted any test to determine if it was more appropriate to make estimates through random effects.

[14] As a measure of efficiency the authors used the ratio of cost-to-income. Their findings were obtained through the technique of random effects for panel data.

[15] The author does not specify the number of banks included in his study.

[16] These authors say their results were obtained through using OLS. Estimates of this type made with panel data tend to create estimators which have certain drawbacks and, also, the authors do not say they have given any special treatment to their standard errors. What is more, their explicative variables are atypical in relation to the general corpus of international empirical literature.

▪ *Data and the empirical model*

The data employed are from 45 commercial banks representing virtually the whole world of commercial banking in Mexico during the period 2007-2013.[17] A total of 31 of these banks have information for all seven years; the rest joined the market or left it during the period. As certain criteria for accounting were introduced at the start of 2007, the period considered allows the data to be homogeneous in the variables used.

Most of the figures were obtained from the components of the information portfolio of the National Banking and Values Commission (la Comisión Nacional Bancaria y de Valores), which is the regulating body of banks in Mexico. This portfolio contains information on loan books, capitalization and other indicators of bank operations; it also includes the financial statements of each bank.[18] Any information not provided for particular banks was obtained from the annual reports found on their web pages.

Due to the form taken by the database the estimation options represent variants of panel data models. As various empirical studies have found that the variable of bank profitability can be significant when aggregated as a lagged explicative variable, a dynamic specification of the function is proposed. Theoretically, this lag of the dependent variable means that the function of profitability is not necessarily in long-run equilibrium, which appears to be the commonest situation of markets. In this type of specification, the coefficient of lagged profitability reflects a condition of persistence in profitability. According to Goddard et al. (2004), this coefficient captures implicitly the impact of entry barriers or other obstacles to competition on the dynamics of profitability, and reflects the velocity at which abnormal benefits tend to converge with long-run average profits. This happens because certain banks have particular advantages that allow them to discourage the entry of competitors to specific segments of the market, and this makes the differences between average rates of profitability keep up indefinitely. The model is the following:

(1) $$profitability_{it} = \delta_1 profitability_{i,t-1} + \ldots + \delta_p profitability_{i,t-p} + x'_{it}\beta + \alpha_i + \varepsilon_{it}$$

where:
α_i = panel-level effects.
x'_{it} = vector of control variables: $X_1, X_2, \ldots, X_k$
ε_{it} = error.

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[17] Those not included are the six small banks that came into the market in 2013. These banks taken together represented less than 1 percent of the assets of the system in December the same year.

[18] As is usual, all the information available was evaluated, and some figures that presented anomalies or inconsistencies were removed.

The dependent variables included in the analysis are: return on average assets (ROAA) and return on average equity (ROAE). For the case of Mexican banks it is not possible to include measures of value, like Tobin's q, as virtually none of the banks has shares in the stock exchange.

Studies of the determinants of bank profitability suggest the following factors need to be controlled in a function of profitability:[19] size, capital adequacy, liquidity, credit risk, activity mix, expense management, and market concentration. In this case, the growth rate of economic activity is added. The variables used for measuring each factor are the following:

1) *Size*. Measured with the logarithm of total assets. The square of this variable was also included in order to prove the possibility of a non-linear effect, but it turned out not to be significant in the various regressions.

2) *Capital adequacy*. The capital-to-total assets ratio was included.

3) *Liquidity.* The loans-to-deposits ratio was used.

4) *Expense management*. The ratio of operating expenses-to-total assets was included.

5) *Credit risk*. The ratio of provision for loan losses-to-total loans was used.

6) Activity mix. The ratio of non-interest revenue-to-total revenue was included. Income of this sort that does not derive from interest charges consists basically of the final balance of commissions, fees and other revenue.

7) *Market concentration*. Initially the Herfindahl indices for loans and deposits were included, as well as market shares for loans and deposits. Results obtained with market shares for loans are given.

8) *Growth rate of economic activity*.- The growth rate of the Gross Domestic Product (GDP) of the country was used.

Also a binary variable was added to measure the impact of the international financial crisis. The variable was defined with a value of 1 for 2008 and 2009, the years that presented the strongest effects of the crisis.

It is important to note that, according to Berger (1995), capital behaves endogenously within the function of profitability, as an increase in profits allows an increase in the ratio of capital, especially because those banks which expect to perform better transmit this information to the public as they increase their capital.

As for credit risk it can be modeled as a predetermined variable, as the regulating bodies of the banking system have determined certain specific standards for the level of provision to be made against credit risk. According to these standards, those running each bank decide their provisions for loan losses (Athanasoglou et al., 2008).

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[19] It is important to point out that the specialized literature on this type of profitability functions does not include explicitly variables related to the socio-economic and demographic situations of the customers; neither has systematic use been made of variables to define the institutional framework. This is still a limitation of this kind of study.

Taking into consideration the presence of the endogenous and predetermined variables mentioned, the expression (1) is modified in the following way:

(2)
$$profitability_{it} = \sum_{j=1}^{p} \delta_j \, profitability_{i,t-j} + x'_{it}\beta + w'_{it}\gamma + \alpha_i + \varepsilon_{it}$$

where:
α_i = panel-level effects.
x'_{it} = vector of exogenous variables: $X_1, X_2,…, X_k$
w'_{it} = vector of endogenous and predetermined variables: W_1, W_2
ε_{it} = error.

In empirical literature on the subject only the first lag of the dependent variable has been reported as significant. If this remains true for the present study, then the expression to be estimated will be:

(3)
$$profitability_{it} = \delta_1 \, profitability_{i,t-1} + x'_{it}\beta + w'_{it}\gamma + \alpha_i + \varepsilon_{it}$$

In various international studies attempts have been made to prove whether or not foreign owned banks are more profitable than those owned nationally. The present study has set out to test this possible difference in performance, which implies the creation of a binary variable with a value of 1 for foreign banks and a value of zero for the other case. But this variable does not change over time so its coefficient cannot be estimated in the dynamic model defined in expressions (1-3), as the estimation of those models involves the introduction of first differences, which eliminates the variables that do not change over time. For this reason a static estimation with panel data is proposed, in particular, the use of a model with random effects is suggested. Furthermore, a model with Hausman-Taylor estimator is proposed, which, though static, allows endogenous effects in some variables to be taken into consideration, as in the dynamic model.

The random effects model is expressed as follows:

(4)
$$profitability_{it} = \lambda_1 \, foreign \ property_i + x'_{it}\beta + \alpha_i + \varepsilon_{it}$$

where:
α_i = random individual-specific effects.
x'_{it} = vector of control variables: $X_1, X_2,…, X_k$
ε_{it} = error.

The model with Hausman-Taylor estimator is expressed as follows:

(5)
$$profitability_{it} = \lambda_1 \, foreign \ property_i + x'_{it}\beta + w'_{it}\gamma + \alpha_i + \varepsilon_{it}$$

where:
α_i = fixed-effects.
x'_{it} = vector of exogenous variables: $X_1, X_2, \ldots, X_k$
w'_{it} = vector of endogenous variables: W_1, W_2
ε_{it} = error.

Table 1 presents the descriptive statistics of the variables included in the reported results. It can be seen that for the 45 banks as a whole the period is, from the perspective of ROAE, one of modest profits, while according to ROAA, it is one of slightly negative profitability. These degrees of profitability seem to contradict to some extent the argument referred to above that the commercial banks in Mexico did not suffer a direct effect due to the international financial crisis. However, the means of these variables were affected by the results from two banks that showed very high losses during the period studied,[20] occasioned to a large extent by problems of non-performing loans. With these two banks excluded, the ROAA mean would be 0.0060 and that of ROAE would be 0.0799, both of them positive.

Table 1
Descriptive statistics

All banks					
Variable	Observations	Mean	Stand. Desv.	Minimun	Maximun
ROAA	280	-0.0064	0.0900	-0.8293	0.2324
ROAE	280	0.0552	0.2019	-1.2712	0.655
Log (Assets)	280	10.0369	2.0138	4.9786	14.0612
Capital-to-assets	278	0.1896	0.2010	0.0113	0.9924
Loans-to-deposits	247	0.0137	0.0542	0.0003	0.6503
Provision for loan losses-to-loans	251	0.0561	0.0791	0	0.9780
Operating expenses-to-assets	278	0.0816	0.1124	0.0018	0.9539
Non-interest revenue-to-revenue	279	0.4262	0.8155	-5.9018	7.4085
Market share	280	0.0250	0.0536	0	0.2753
GDP growth rate	280	0.0201	0.0306	-0.0470	0.0511

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[20]   They are Banco Walmart de México and Banco Fácil. The former had an ROAA average of −0.3296 and an average ROAE of −0.5651. The latter had an ROAA average of −0.2193 and an ROAE of −0.4051.

Excluding Banco Fácil and Banco Walmart					
Variable	Observations	Mean	Stand. Desv.	Minimun	Maximun
ROAA	268	0.0060	0.0518	-0.3371	0.2324
ROAE	268	0.0799	0.1534	-0.6740	0.655
Log (Assets)	268	10.1733	1.9326	6.0414	14.0612
Capital-to-assets	266	0.1748	0.1877	0.0113	0.9924
Loans-to-deposits	235	0.0136	0.0555	0.0003	0.6503
Provision for loan losses-to-loans	238	0.0514	0.0754	0	0.9780
Operating expenses-to-assets	266	0.0664	0.0754	0.0018	0.3782
Non-interest revenue-to-revenue	266	0.4335	0.7268	-4.1690	7.4085
Market share	268	0.0260	0.0545	0	0.2753
GDP growth rate	268	0.0201	0.0306	-0.0470	0.0511

Descriptive statistics were calculated from the full sample for period 2007-2013.
Source: Own elaboration.

Table 2 presents the pairwise correlations between measures of profitability, the characteristics of the 45 banks in the period 2007-2013 and the GDP growth rate for the same period. It can be seen that the size measured by assets and market share are associated with higher profitability. Whereas ratios of capital, administration costs and provision for loan losses are associated with a lower rate of profitability. The GDP growth rate has a positive association with profitability, but only when it is measured with ROAA.

■ *Results*

First the model referred to by the expression (2) was estimated. Having verified that only the first lag of the dependent variable is significant, the next step was to estimate the equation (3). In both cases the generalized method of moments (GMM) was used, with Arellano-Bover/Blundell-Bond estimators. These estimators introduce additional moment conditions to those of the Arellano-Bond estimators, obtaining coefficients with greater precision and with better properties for finite samples. According to Arellano and Bover (1995), the dynamic panel technique is also useful for resolving problems of endogeneity, heteroskedasticity and autocorrelation.

In these first estimates it was considered to start with that the term of error did not present a serial correlation. But as this supposition was rejected by the Arellano-Bond test for autocorrelation in first-differenced errors, it was then proposed that in the expression (3) the term of error (ε_{it}) would follow an MA(1) process, in such a way that:

Table 2
Pairwise correlation matrix of the variables used in the econometric analysis

Variable	ROAA	ROAE	Log (Assets)	Capital-to-assets	Loans-to deposits	Provision for loan losses-to-loans	Operating expenses-to-assets	Non-interest revenue-to-revenue	Market share	GDP growth rate
ROAA	1.0000									
ROAE	0.8744 (0.0000)	1.0000								
Log (Assets)	0.3676 (0.0000)	0.4846 (0.0000)	1.0000							
Capital-to-assets	-0.3407 (0.0000)	-0.3701 (0.0000)	-0.6507 (0.0000)	1.0000						
Loans-to-deposits	-0.0285 (0.6558)	0.0488 (0.4451)	-0.1821 (0.0041)	0.2591 (0.0000)	1.0000					
Provision for loan losses-to-loans	-0.1363 (0.0312)	-0.1413 (0.0255)	-0.1963 (0.0018)	0.1941 (0.0021)	-0.0576 (0.3686)	1.0000				
Operating expenses-to-assets	-0.6034 (0.0000)	-0.5110 (0.0000)	-0.4864 (0.0000)	0.5704 (0.0000)	0.1249 (0.0510)	0.3808 (0.0000)	1.0000			
Non-interest revenue-to-revenue	0.0561 (0.3514)	0.0631 (0.2944)	-0.0457 (0.4475)	0.0347 (0.5647)	0.0655 (0.3074)	0.0188 (0.7672)	-0.0325 (0.5899)	1.0000		
Market share	0.1201 (0.0446)	0.2268 (0.0001)	0.7009 (0.0000)	-0.1869 (0.0017)	-0.0487 (0.4463)	-0.0818 (0.1976)	-0.1820 (0.0023)	-0.0387 (0.5203)	1.0000	
GDP growth rate	0.0538 (0.0371)	0.0812 (0.1757)	0.0329 (0.5840)	0.0078 (0.8969)	-0.0019 (0.9761)	-0.0445 (0.4829)	-0.0366 (0.5432)	0.0274 (0.6486)	0.0013 (0.9825)	1.0000

Pairwise correlations were calculated from the full sample for period 2007–2013. p-values are reported in parentheses.
Source: Own elaboration.

(6)
$$\varepsilon_{it} = \eta_{it} + \pi\eta_{i,t-1}$$

where:

η_{it} is i.i.d.

It should be noted that the number of instruments included in each regression was reduced, because as the number of variables and the number of periods used increased, so was the number of instruments. If the number of these is very large then the result is a poor finite-sample approximation to the distribution of the estimator. Specifically, according with Louzis et al. (2012), when the number of instruments is greater or equal to the number of cross sectional units, then both the standard errors and the Sargan test are downwards biased. With the aim of keeping to this rule, we limited the number of lags to be used as instruments in the endogenous and predetermined variables.

The most robust results were obtained using ROAE as the dependent variable. Table 3 presents the regressions that include all the banks, and also those in which the bank that reported the greatest losses in the period of study was excluded. It is worth mentioning that estimates were made of robust standard errors to heteroskedasticity. Following the order of the variables in the expression (3), the first result is that for the lagged dependent variable, which is the coefficient of persistence in profitability. In all cases this coefficient is significant to 1 percent and has a value of between 0.41 and 0.48, which is relatively high and shows implicitly the impact of the barriers to entry or of other obstacles to competition in the dynamic of profitability, and reflects the velocity at which abnormal profits tend to converge with long term average benefits. However, a result that might have been complementary in the characterization of an oligopolistic market, the coefficient of market share, turned out not to be significant. To obtain a more conclusive result for the effect of market concentration, it will be necessary to explore the hypothesis of market power and efficiency, but that is not the aim of the present study.

Table 3
Dynamic panel regressions considering ROAE as dependent variable

Variable	Dependent variable: ROAE			
	Including all banks		Excluding the bank with greatest losses [a]	
ROAE t-1	0.4843[***]	0.4211[***]	0.4411[***]	0.4173[***]
	(0.0661)	(0.1082)	(0.1663)	(0.1371)
Log (Assets)	0.0070	0.0195	0.0492	0.0407
	(0.0255)	(0.0376)	(0.0441)	(0.0403)

Variable	Dependent variable: ROAE			
	Including all banks		Excluding the bank with greatest losses [a]	
Capital-to-assets	0.6718** (0.2761)	0.8570** (0.3383)	0.6739* (0.3988)	0.6187 (0.3813)
Loans-to-deposits	-0.0316 (0.0593)	0.0043 (0.0745)	0.0372 (0.0549)	-0.0076 (0.0507)
Provision for loan losses-to-loans	0.1895 (0.3684)	0.2295 (0.5066)	-0.0564 (0.4327)	-0.0609 (0.4007)
Operating expenses-to-assets	-1.4774*** (0.2109)	-1.4306*** (0.3144)	-0.7338 (0.5188)	-0.7312 (0.4911)
Non-interest revenue-to-revenue	0.0389*** (0.0092)	0.0339*** (0.0124)	0.0499*** (0.0108)	0.0484*** (0.0098)
Market share	0.4329 (1.3193)	-0.5417 (1.9592)	-1.2558 (1.7335)	-0.9430 (1.6631)
GDP growth rate		0.3403* (0.1820)		0.3479** (0.1675)
Constant	-0.0540 (0.2684)	-0.1881 (0.3855)	-0.4845 (0.4532)	-0.4005 (0.4142)
Number of observations	206	206	200	200
Wald chi^2 Prob > chi^2	1312.36 (0.0000)	882.87 (0.0000)	551.53 (0.0000)	676.77 (0.0000)
Arellano-Bond test (Order 1)				
z Prob > z	-2.5317 (0.0114)	-2.0143 (0.0440)	-2.0121 (0.0442)	-2.0952 (0.0362)
Arellano-Bond test (Order 2)				
z Prob > z	-0.6180 (0.5366)	-0.4961 (0.6199)	-0.1702 (0.8649)	-0.3288 (0.7423)
Sargan test chi^2 Prob > chi^2	38.5834 (0.1642)	27.9925 (0.3588)	39.7507 (0.1348)	41.6914 (0.0951)

Dynamic panel regressions were run with Arellano-Bover/Blundell-Bond estimator with an error that follows an MA(1) process.
[a] Excluding Banco Walmart de México. Robust standard errors are reported in parentheses.
* Significant at 10%.   ** Significant at 5%.   *** Significant at 1%.
Source: Own elaboration.

With regard to exogenous variables, firstly, the impact of non-interest revenue is positive and significant in all regressions, which reveals that the commissions, fees and other charges are relevant to the profitability of commercial banking in Mexico.

Secondly, the ratio of operating expenses is found to be negative and significant to 1 percent when the whole sample of banks is considered, though it becomes insignificant when the bank with the largest losses is excluded. Operating expenses represent the non-financial costs of the banks and are usually a very important variable in the functions of bank profitability. Thirdly, the growth rate of GDP comes out as positive and significant, which implies that the growth of economic activity in the country has a favorable impact on bank profitability. Finally, variables about size and liquidity turn out not to be significant.

With regard to endogenous variable, the capital ratio, this shows a positive and significant impact. This effect can be understood as a consequence of the banks expecting greater profitability transmitting this information to the public through increases in their capital. Also, increases in capital levels can create incentives for shareholders to improve their supervision of the operations and processes of the bank, and as a result, encourage the banks' profitability indirectly. On the other hand, predetermined variable, the ratio of provision for loan losses, is not significant. This result shows that the profitability of the commercial banks in Mexico does not appear to be sensitive to variations in credit risk.

It is to be noted that the variable of the impact of the international financial crisis was found to be not significant in all the cases analyzed and therefore it was not included in the reported regressions. However, this result corroborates the fact that there was no direct effect of the international financial crisis on the profitability of the banks operating in Mexico.

With the intention of exploring further the robustness of the results presented, Table 4 shows also the estimate of the equation (3) with a term of error like that of expression (6) for the ROAE as the dependent variable, but with two other versions of the data base: a) not including the 7 main banks of the system,[21] and b) considering all the banks but only for the period 2007-2012. These two versions of the data base confirm the results obtained previously, even making them firmer. In the first place, the coefficient of lagged profitability is positive and significant to 1 percent, with values of between 0.38 and 0.42. Taken together, the findings from Tables 3 and 4 give a range of persistence values of between 0.38 and 0.48, but in seven of the eight regressions the coefficient is above 0.40. How does this value compare with that found in other studies? For example, Jara et al. (2011) found a coefficient of persistence of between 0.40 and 0.44 for a combination of 6 countries from Latin America and a number of banks from the U.S.A., which turned out to be very similar as that found for this study.[22] If we compare these results with others, Dietrich and Wanzenried (2014) found a coefficient of persistence for middle income countries

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[21] These are Banamex, Banorte, BBVA Bancomer, HSBC, Inbursa, Santander and Scotiabank, the only large scale banks working in Mexico.

[22] The range given for the coefficient of persistence refers to the regressions with ROE as a dependent variable. When they used ROA the range was of 0.46 to 0.47.

(where Mexico may be placed) of 0.33,[23] which is lower than the figure estimated in the present study; and the coefficient they found for high income countries is considerably less (0.14). As for Ben Naceur and Omran (2011), they found an average persistence coefficient of 0.31 for 11 countries of the Middle East and North Africa. Flamini et al. (2009) reported a persistence coefficient of 0.21 for 41 sub-Saharan countries. Finally, the results obtained by Garza-García (2012) in the only study before this to estimate the coefficient for Mexico oscillate between 0.80 and 0.97. It can be seen from the results obtained by other authors for different regions of the world, that Garza-García's figures seem to have an upward bias, maybe because the control variables of size and activity mix were not included.

However, it is important to consider that the lack of competition as a determinant of bank profitability needs further research, because other scholars, using different methodologies, have found contradictory results about the degree of competition between commercial banks established in Mexico.

In the second place, regressions with both versions of the data shown in Table 4 yielded the same significant exogenous variables as those presented in Table 3. The non-interest revenue ratio is positive and significant to 1 percent in all cases. This result is different to that found for other regions, for example, for Asia (Lee et al., 20014) and the United States (Stiroh and Rumble, 2006), where this variable is not significant. Moreover, the ratio of operating expenses is negative and significant to 1 percent in all cases. This result coincides with that found for a group of countries in Latin America (Jara et al., 2011), but differs from that for other regions, for example, the sub-Saharan countries of Africa (Flamini et al., 2009) or middle income countries (Dietrich and Wanzenried, 2014), where this variable is not significant.[24] Finally, the growth rate of GDP turns out to be positive and significant in three of the four outputs shown in Tables 3 and 4. This result agrees with those obtained in virtually all regions of the world. With regard to the non-significant variables, considering the four versions of the database shown in Tables 3 and 4, it can be seen that the variable of size keeps a positive sign in all cases. According to Athanasoglou et al. (2008), a possible explanation for this finding may be that small banks usually try to grow as fast as possible even at the expense of their profitability. Further, for exactly the same reason, new banks tend not to be particularly profitable in their first years of operation, and as mentioned here, 13 new banks entered the market in the years 2007-2008.

In third place, in regressions shown in Table 4, the endogenous variable (the ratio of capital) also remained positive and significant. The results about this variable

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[23] Dietrich and Wanzenried (2014) classified countries according to GDP per capita calculated by the World Bank for the year 2007.

[24] The ratio of operating expenses does not turn out to be significant in middle income countries when the dependent variable is ROAE. If ROAA is used as the dependent variable then the variable is significant.

coincide with research papers undertaken for Latin America and Mexico in so far as the level of capital is given a significant role as a factor for explaining profitability.

Finally, the ratio of provision for loan losses is not significant in all regressions presented in Tables 3 and 4. As noted previously, this result shows that the profitability of the commercial banks in Mexico does not appear to be sensitive to variations in credit risk. Whereas in countries that have recently faced problems of credit risk management, the coefficient of this variable is usually negative and significant.

Table 4
Dynamic panel regressions considering reduced forms of
database and taking ROAE as dependent variable

Variable	Dependent variable: ROAE			
	Excluding the biggest banks [a]		Excluding year 2013 [b]	
ROAE t-1	0.4163***	0.3805***	0.4271***	0.4015***
	(0.0980)	(0.0971)	(0.0842)	(0.0766)
Log (Assets)	0.0241	0.0294	0.0097	0.0096
	(0.0291)	(0.0331)	(0.0253)	(0.0276)
Capital-to-assets	0.9303***	1.0021***	0.9245***	0.9326***
	(0.2699)	(0.2685)	(0.3306)	(0.3262)
Loans-to-deposits	0.0152	0.0015	0.0189	0.0028
	(0.0681)	(0.0745)	(0.0766)	(0.0788)
Provision for loan losses-to-loans	0.1019	0.1598	-0.3459	-0.3521
	(0.5037)	(0.4879)	(0.4262)	(0.4172)
Operating expenses-to-assets	-1.5670***	-1.5449***	-1.6423***	-1.6193***
	(0.1885)	(0.2067)	(0.2443)	(0.2476)
Non-interest revenue-to-revenue	0.0321***	0.0289***	0.0301***	0.0292***
	(0.0092)	(0.0097)	(0.0091)	(0.0089)
Market share	2.1348	1.6603	1.1074	1.1569
	(8.8085)	(8.6655)	(1.4261)	(1.5218)
GDP growth rate		0.3728**		0.2359
		(0.1774)		(0.1563)
Constant	-0.2290	-0.2990	-0.0890	-0.0944
	(0.2987)	(0.3345)	(0.2720)	(0.2905)
Number of observations	164	164	175	175
Wald chi^2	729.31	834.27	244.80	311.95
Prob > chi^2	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Variable	Dependent variable: ROAE			
	Excluding the biggest banks [a]		Excluding year 2013 [b]	
Arellano-Bond test (Order 1)				
z	-2.0693	-1.9162	-2.3495	-2.3575
Prob > z	(0.0385)	(0.0553)	(0.0188)	(0.0184)
Arellano-Bond test (Order 2)				
z	-0.1919	-0.2735	-0.1276	-0.1932
Prob > z	(0.8478)	(0.7844)	(0.8985)	(0.8468)
Sargan test				
chi^2	28.1641	30.6674	31.9094	36.8857
Prob > chi^2	(0.3504)	(0.2409)	(0.3718)	(0.1805)

Dynamic panel regressions were run with Arellano-Bover/Blundell-Bond estimator with an error that follows an MA(1) process.

[a] Excluding Banamex, Banorte, BBVA Bancomer, HSBC, Inbursa, Santander, and Scotiabank.

[b] Including all banks, but considering only the period 2007-2012.

Robust standard errors are reported in parentheses.

[*] Significant at 10%.   [**] Significant at 5%.   [***] Significant at 1%.

Source: Own elaboration.

Table 5 shows the results of the estimation of equation (3) with an equation (6) type of error, but now taking ROAA as a dependent variable. As mentioned previously, regressions with ROAA were less solid than those obtained with ROAE, because the Arellano-Bond test for autocorrelation in first-differenced errors only rejects the null hypothesis to 10 percent in order 1. The results presented correspond to two versions of the data base: a) not including the two banks that reported greatest losses, b) not including the two banks mentioned in the last paragraph nor the 7 biggest banks of the system. The result that most stands out is that of the lagged dependent variable, which turns out to be positive and significant to 1 percent, with values of between 0.50 and 0.56. The capital ratio is also positive and significant. The loans-to-deposits ratio, which is an indicator of liquidity, turns out to be positive and significant as well.

Table 5

Dynamic panel regressions considering ROAA as dependent variable

Variable	Dependent variable: ROAA			
	Excluding the banks with greatest losses [a]		Excluding the banks with greatest losses and the biggest banks [b]	
ROAA t-1	0.5613[***]	0.5156[***]	0.5552[***]	0.5061[***]
	(0.1094)	(0.1251)	(0.1074)	(0.1228)

Variable	Dependent variable: ROAA			
	Excluding the banks with greatest losses [a]		Excluding the banks with greatest losses and the biggest banks [b]	
Log (Assets)	0.0000	0.0003	-0.0019	-0.0012
	(0.0048)	(0.0061)	(0.0057)	(0.0038)
Capital-to-assets	0.1309**	0.1201**	0.1163**	0.1168**
	(0.0505)	(0.0530)	(0.0520)	(0.0588)
Loans-to-deposits	0.0715***	0.0589***	0.0622***	0.0565***
	(0.0129)	(0.0176)	(0.0156)	(0.0181)
Provision for loan losses-to-loans	-0.0131	0.0052	0.0183	0.0127
	(0.0700)	(0.0914)	(0.0769)	(0.0748)
Operating expenses-to-assets	-0.0755	-0.0824	-0.1077	-0.1094
	(0.1016)	(0.1301)	(0.0785)	(0.0796)
Non-interest revenue-to-revenue	-0.0008	-0.0002	-0.0015	-0.0007
	(0.0023)	(0.0024)	(0.0061)	(0.0056)
Market share	-0.0278	0.0267	0.4700	0.6058
	(0.3076)	(0.4177)	(1.7840)	(0.9121)
GDP growth rate		0.0117		-0.0049
		(0.0370)		(0.0465)
Constant	-0.0039	-0.0085	0.0144	0.0070
	(0.0480)	(0.0597)	(0.0557)	(0.0414)
Number of observations	196	196	154	154
Wald chi^2	226.68	339.70	212.24	249.09
Prob > chi^2	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Arellano-Bond test (Order 1)				
z	-1.8137	-1.7865	-1.8368	-1.8423
Prob > z	(0.0697)	(0.0740)	(0.0662)	(0.0654)
Arellano-Bond test (Order 2)				
z	-0.0324	-0.0048	0.2043	0.4623
Prob > z	(0.9742)	(0.9962)	(0.8382)	(0.6439)
Sargan test				
chi^2	21.0279	25.3407	23.0338	23.2236
Prob > chi^2	(0.7405)	(0.4998)	(0.6310)	(0.6203)

Dynamic panel regressions were run with Arellano-Bover/Blundell Bond estimator with an error that follows an MA(1) process.
[a] Excluding Banco Walmart de México and Banco Fácil.
[b] Excluding Banco Walmart de México, Banco Fácil, Banamex, Banorte, BBVA Bancomer, HSBC, Inbursa, Santander, and Scotiabank. Robust standard errors are reported in parentheses.
* Significant at 10%.   ** Significant at 5%.   *** Significant at 1%.
Source: Own elaboration.

Finally, Table 6 gives the results for the static models obtained on the basis of equations (4) and (5), and retaking ROAE as a dependent variable. As already explained, the main object of these models is to analyze the impact of nationality in bank ownership, controlling for the rest of the variables included in the study. In this sense, the most important result is that the random effects model indicates that the foreign owned banks are less profitable than the nationally owned. However, once the effects of the capital ratio and the ratio of provision for loan losses are considered endogenous, the coefficient of the variable for foreign ownership keeps nearly the same values, but ceases to be significant. Demirgüç-Kunt and Huizinga (1999) found that foreign banks are more profitable than nationally owned banks in those economies that are less developed, while the result is inverted in more developed economies. Taking this reference into account, the estimated coefficients in the present study represent an intermediate result. By contrast, Dietrich and Wanzenried (2014) found that foreign banks from middle income countries are less profitable than national ones.

One collateral effect of the regressions shown in Table 6 is that in a static model, the variables that turned out to be significant in the dynamic model remain so, as do others.

Table 6
Static panel regressions considering all banks and taking ROAE as dependent variable

Variable	Random effects [a]		Hausman-Taylor	
Log (Assets)	0.0582**	0.0561**	0.0599***	0.0570***
	(0.0250)	(0.0249)	(0.0166)	(0.0166)
Capital-to-assets	0.2863	0.2677	0.3181***	0.2947**
	(0.1824)	(0.1803)	(0.1150)	(0.1153)
Loans-to-deposits	0.0792	0.0543	-0.0145	-0.0500
	(0.0858)	(0.0830)	(0.2087)	(0.2089)
Provision for loan losses-to-loans	0.3794***	0.3864***	0.4152***	0.4227***
	(0.1037)	(0.0996)	(0.1049)	(0.1046)
Operating expenses-to-assets	-0.9188***	-0.9075***	-0.9583***	-0.9453***
	(0.3238)	(0.3224)	(0.1461)	(0.1456)
Non-interest revenue-to-revenue	0.0408**	0.0406**	0.0420***	0.0418***
	(0.0165)	(0.0159)	(0.0126)	(0.0126)
Market share	-0.4053	-0.3581	-0.1854	-0.1296
	(0.5834)	(0.5795)	(0.6490)	(0.6474)
GDP growth rate		0.3486*		0.3680*
		(0.1937)		(0.2143)
Foreign property	-0.0912**	-0.0893**	-0.0963	-0.0937
	(0.0433)	(0.0438)	(0.0665)	(0.0664)

Variable	Random effects [a]		Hausman-Taylor	
Constant	-0.5879** (0.2627)	-0.5714** (0.2622)	-0.5199*** (0.1769)	-0.4986*** (0.1763)
Number of observations	245	245	245	245
Wald chi^2	174.64	195.84	132.26	136.30
Prob > chi^2	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R^2 within	0.3535	0.3627		
R^2 between	0.4275	0.4206		
R^2 total	0.3853	0.3858		
Hausman test				
chi^2	8.14	8.71		
Prob > chi^2	(0.3204)	(0.2742)		

[a] For random-effects regressions, robust standard errors are reported in parentheses.
* Significant at 10%. ** Significant at 5%. *** Significant at 1%.
Source: Own elaboration.

▪ *Conclusions*

The stated aim of this paper has been to identify the determinants of profitability for the commercial banks established in Mexico, incorporating the most important elements from international empirical literature on the subject, and at the same time filling the gaps in research into the case of Mexico. A data base of commercial banks operating in Mexico during the period 2007-2013 was used. The data base consists of 45 banks representing virtually the whole universe of banks that conducted operations during this period.

Dynamic models were estimated using Arellano-Bover/Blundell-Bond estimators with an error that follows an MA(1) process, as well as static models with random effects and Hausman-Taylor estimators. The dependent variables were ROAE and ROAA but the most robust results were obtained with the first of these. The regressions present the following principal results: 1) The coefficient of the dependent variable lagging one period is positive and highly significant, with a value above 0.40. 2) The principle explicative factors of profitability are the level of capital and the activity mix that generates income, both in a positive sense; and running expenses, in a negative sense. 3) The nationality of bank ownership is not relevant to the determination of profitability.

According to what has happened in recent years, the commercial banking system in Mexico appears to have stabilized into a state where foreign owned banks that dominate the market co-exist with banks of various sizes affiliated to business

groups with national capital, and a third group of banks, nearly all of them small - nationally owned and foreign - which occupy particular niches in the market. The findings of the present study suggest that the profitability of this system of commercial banks is sustained by the level of capital, the charging of commissions and fees, and control of operating costs, as well as certain market entry barriers and obstacles to competition that leave only enough room for tiny new banks to operate in determined niches.

However, it is important to consider that the lack of competition as a determinant of bank profitability needs further research, because other scholars, using different methodologies, have come to different conclusions about the degree of competition between commercial banks established in Mexico.

■ *References*

AGHION, PHILLIPPE, PETER HOWITT, AND DAVID MAYER-FOULKES (2005). "The effect of financial development on convergence: Theory and evidence", *Quarterly Journal of Economics,* Vol.120, pp.173-222.

ARELLANO, MANUEL, AND OLYMPIA. BOVER (1995). "Another look at the instrumental-variable estimation of error-components", *Journal of Econometrics*, Vol.68, No.1, pp.29-52.

ARTEAGA, JULIO CÉSAR (2001). "Poder de mercado o eficiencia: Origen de las utilidades del sistema bancario mexicano de 1995 a 1999", *Ensayos*, Universidad Autónoma de Nuevo León, Monterrey, Vol.20, No.1, pp. 35-48.

ATHANASOGLOU, PANAYIOTIS P., MATTHAIOS D. DELIS, AND CHRISTOS K. STAIKOURAS (2006). "Determinants of bank profitability in the South Eastern Europe region", Bank of Greece, Working Paper No.47.

ATHANASOGLOU, PANAYIOTIS P., SOPHOCLES N. BRISSIMIS, AND MATTHAIOS D. DELIS (2008). "Bank-specific, industry-specific and macroeconomic determinants of bank profitability", *International Financial Markets, Institutions and Money*, Vol.18, pp.121-136.

BANCO DE MÉXICO (2010). "Circular 22/2010. Disposiciones de carácter general que establecen prohibiciones y límites al cobro de comisiones", *Diario Oficial de la Federación*, México, H. Congreso de la Unión, 26 de julio de 2010, (http://dof.gob.mx/nota_detalle.php?codigo=5153087&fecha=26/07/2010).

BEN NACEUR, SAMI, AND MOHAMMED OMRAN (2011). "The effects of bank regulations, competition, and financial reforms on banks' performance", *Emerging Markets Review*, Vol.12, pp.1-20.

BERGER, ALLEN N. (1995). "The Relationship between Capital and Earnings in Banking", *Journal of Money, Credit and Banking*, Vol.27, No.2, pp.432-456.

BOLT, WILKO, LEO DE HAAN, MARCO HOEBERICHTS, MAARTEN R.C. VAN OORDT, AND JOB SWANK (2012). "Bank profitability during recessions", *Journal of Banking and Finance*, Vol.36, pp.2552-2564.

BOURKE, PHILIP (1989). "Concentration and Other Determinants of Bank Profitability in Europe, North America and Australia", *Journal of Banking and Finance*, Vol. 13, No.1, pp. 65-67.

CASTAÑEDA, GONZALO (2014). *La naturaleza multidimensional de la competencia bancaria en México*, México, Centro de Estudios Espinosa Yglesias.

CHAVARÍN, RUBÉN (2012). "Bancos ligados a grupos económicos en México y concentración de mercado en la banca comercial". *Paradigma Económico*, Universidad Autónoma del Estado de México, Toluca, Vol.4, pp.5-26.

CHORTAREAS, GEORGIOS, JESÚS G. GARZA-GARCÍA, AND CLAUDIA GIRARDONE (2009). "Market structure, profits, and spreads in the Mexican banking industry". *Banks and Bank Sistems*, Vol.4, No.3, pp.43-52.

CHORTAREAS, GEORGIOS, JESÚS GARZA-GARCÍA, Y CLAUDIA GIRARDONE (2010). "Desempeño del sector bancario en algunos países latinoamericanos: Poder de mercado versus eficiencia", Banco de México, Documento de Investigación, No.20.

CLAESSENS, STIJN, AND NEELTJE VAN HOREN (2012). "Foreign Banks: Trends, Impact and Financial Stability". International Monetary Fund, Working Paper 12/10.

COMISIÓN FEDERAL DE COMPETENCIA ECONÓMICA (COFECE) (2014). "Trabajo de investigación y recomendaciones sobre las condiciones de competencia en el sector financiero y sus mercados", México, COFECE, (http://www.cfc.gob.mx/cofece/ images/ Estudios/ENTREGADEFINITIVO_PROTEG. pdf).

DEMIRGÜÇ-KUNT, ASLI, AND HARRY HUIZINGA (1999). "Determinants of commercial bank interest margins and profitability: some international evidence", *World Bank Economic Review*, Vol.13, No.2, pp.379-408.

DE YOUNG, ROBERT, AND TARA RICE (2004). "Noninterest Income and Financial Performance at U.S. Commercial Banks", *The Financial Review*, Vol.39, pp.101-127.

DIETRICH, ANDREAS, AND GABRIELLE WANZENRIED (2011). "Determinants of bank profitability before and during the crisis: Evidence from Awitzerland", *Journal of International Financial Markets, Institutions and Money*, Vol.21, pp.307-327.

DIETRICH, ANDREAS, AND GABRIELLE WANZENRIED (2014). "The determinants of commercial banking profitability in low-, middle-, and high-income countries", *The Quarterly Review of Economics and Finance*, forthcoming.

FLAMINI, VALENTINA, CALVIN MCDONALD, AND LILIANA SCHUMACHER (2009). "The determinants of commercial bank profitability in Sub-Saharan Africa", International Monetary Fund, Working Paper.

GARZA-GARCÍA, JESÚS GUSTAVO (2012). "Does market power influence bank profits in Mexico? A study on market power and efficiency". *Applied Financial Economics*, Vol.22, No.1, pp.21-32.

GODDARD, JOHN, PHIL MOLYNEAUX, AND JOHN O.S. WILSON (2004). "Dynamics of Growth and Profitability in Banking", *Journal of Money, Credit and Banking,* Vol.36, No.6, pp.1069-1090.

GUERRERO, RODOLFO, Y MARIO VILLALPANDO (2009). "Rentabilidad, concentración y eficiencia en el sistema bancario mexicano", *El Trimestre Económico*, Fondo de Cultura Económica, México, Vol.76, No.301, pp.237-263.

GUILLÉN, JORGE, ERICK W. RENGIFO, AND EMRE OZSOZ (2014). "Relative power and efficiency as a main determinant of banks' profitability in Latin America", *Borsa Istambul Review*, forthcoming.

HASLEM, JOHN A., (1968). "A Statistical Analysis of the Relative Profitability of Commercial Banks", *Journal of Finance*, Vol. 23, pp. 167-176.

HERNÁNDEZ, FAUSTO, Y ALEJANDRO VILLAGÓMEZ (2012). *El enigmático sistema bancario mexicano contemporáneo*, México, Centro de Estudios Espinosa Yglesias.

HIRTLE, BEVERLY J., AND KEVIN J. STIROH (2007). "The Return to Retail and Performance of U.S. Banks", *Journal of Banking and Finance,* Vol.31, No.4, pp. 1101-1133.

HESTER, DONALD D. AND ZOELLNER, JOHN F. (1966). "The Relation between Bank Portfolios and Earnings: An Econometric Analysis." *Review of Economics and Statistics*, Vol. 48, pp.372-386.

JARA, MAURICIO, JOSÉ TOMÁS ARIAS, Y ARTURO RODRÍGUEZ PERALES (2011). "Diversificación y determinantes del desempeño bancario: una comparación internacional", *Estudios de Administración*, Universidad de Chile, Santiago, Vol.18, No.2, pp.1-48.

LEE, CHIEN-CHIANG, YANG, SHIH-JUI, AND CHANG CHI-HUNG (2014). "Non-interest income, profitability, and risk in banking industry: A cross-country analysis", *North American Journal of Economics and Finance*, Vol.27, pp.48-67.

LEVINE, ROSS (2005). "Finance and Growth: Theory and Evidence," in Philippe Aghion, and Steven Durlauf (eds.), Handbook of Economic Growth, North Holland, Vol.1A, chapter 12, pp. 865-934.

LOUZIS, DIMITRIOS P., ANGELOS T. VOULDIS, AND VASILIOS L. METAXAS (2012). "Macroeconomic and bank-specific determinants of non- performing loans in Greece: A comparative study of mortage, business and consumer loan portfolios", *Journal of Banking and Finance*, Vol.36, pp.1012-1027.

MAYORAL, ISABEL (2013). "Banxico limitará comisiones de bancos", CNN *Expansión*, 29 de noviembre de 2013 (http://www.cnnexpansion.com/economia/2013/11/28/banxico-pondra-en-orden-a-los-bancos).

MICCO, ALEJANDRO, UGO PANIZZA, AND MONICA YAÑEZ (2007). "Bank ownership and performance. Does politics matter?" *Journal of Banking and Finance*, Vol.31, pp.219-241.

MOLYNEUX, PHILIP, AND JOHN THORNTON (1992). "Determinants of European bank profitability: a note", Journal of Banking and Finance, Vol.16, pp.1173–1178.

PARK, KANG H., AND WILLIAM L. WEBER (2006). "Profitability of Korean banks: Test of market structure versus efficient structure", *Journal of Economics and Business*, Vol.58, pp.222-239.

RASIAH, DEVINAGA (2010). "Review of literature and theories on determinants of comercial bank profitability*", Journal of Performance Management*, Vol.23, No.1, pp.23-49.

RODRÍGUEZ, EDUARDO (2003). "Concentración industrial y rentabilidad de la banca en México. Evaluación posterior a la crisis de 1995", *El Trimestre Económico*, Fondo de Cultura Económica, México, Vol. 70, No. 278, pp. 371-404.

RODRÍGUEZ, ABIGAIL, Y FRANCISCO VENEGAS (2010). "Indicadores de rentabilidad y eficiencia operativa de la banca comercial", *Problemas del Desarrollo*, Universidad Nacional Autónoma de México, México, Vol.41, No.161, pp.165-191.

SHORT, BROCK K. (1979). "The relation between commercial bank profit rates and banking concentration in Canada, Western Europe and Japan", *Journal of Banking and Finance*, Vol.3, 209–219.

STAIKOURAS, CHRISTOS, AND GEOFFREY E. WOOD (2004). "The Determinants of European Banks Profitability", *International Business and Economics Research Journal*, Vol.3, No.6, pp.57-69.

STIROH, KEVIN J., AND ADRIENNE RUMBLE (2006). "The dark side of diversification: The case of US financial holding companies", *Journal of Banking and Finance*, Vol.30, No.8, pp.2131–2161.