

## THE EFFECT OF LIBERALIZATION ON BANKING EFFICIENCY: EVIDENCE FROM MEXICO

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### ABSTRACT

This study investigates the effect of foreign ownership on cost efficiencies of the largest banks in Mexico during 2000-2009. Results from Stochastic Frontier Analysis (SFA) show that on average cost efficiency for the whole sample is 73 percent. By dividing the sample into two time periods, we find that cost efficiencies increased significantly from 2000 to 2009. Cost efficiency improved from 72% in 2000 to 82% in 2009. Fixed and random effects models controlling for size, ownership, performance, and loan portfolio provide compelling evidence that foreign banks are more cost efficient than domestic banks. These findings support previous evidence on the efficiency levels of foreign banks in developing countries. On one hand, the amount of government loans, the percentage of non-performing loans to total loans, and the size of the banks have a negative effect on cost efficiency. On the other hand, the amount of consumer loans has a positive effect on the efficiency of banks. These results imply that among the largest banks, size has a negative influence on efficiency.

**Key words:** Banking efficiency, foreign ownership, liberalization, Mexico

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## **I. INTRODUCTION**

In the last two decades, financial systems in many developing countries became globalized. Mexico provides a clear example of how globalization can change the financial structure of a country. In the mid-1980's, Mexico changed from a closed economy to an open one. The consequences of this change reached its banking sector. During the 1990's, the banking sector was privatized after being nationalized by the government in 1982. During the mid-1990's, coinciding with the beginning of the North American Free Trade Agreement (NAFTA), the Mexican government lifted restrictions on the operations of foreign banks. These changes helped improve the precarious situation of banks after the financial crisis of 1995, but led to a 300% increase in foreign market share between 1997 and 2007 (Haber and Musacchio, 2010).

This study investigates the efficiency of the Mexican banking sector during a period with one distinctive characteristic, the dramatic increase of foreign ownership in its structure. The purpose of this study is to provide empirical evidence on differentials in efficiency levels between foreign and domestic banks. In Mexico, the share of assets held by foreign banks increased from 15 percent in 1997 to 82 percent in 2004, and has remained approximately at this level ever since. Furthermore, foreign banks own four of the five largest commercial banks since 2001, with 77% of Mexican banks assets held by only five banks, four of these under foreign control.

Studies on banking efficiency are relevant in constantly changing economies. Countries that undergo significant transformations in their financial institutions will face different challenges from one year to another, and only efficient institutions will be able to face them successfully. The incursion of foreign banks into the Mexican banking sector has increased both capitalization and asset quality (Schulz, 2006), and the improvement in asset quality contributed to the reduction of bad debt in the banking sector. However, according to Haber and Mussachio (2005) while foreign banks helped recapitalized the banking sector their entry had limited effects on efficiency or lending.

The contribution of this study is twofold. First, it adds to the extant literature on banking efficiency in developing nations, and in particular to Mexican studies. Second, the study explicitly addresses the effect of the increasing foreign participation in the Mexican banking industry's efficiency

for the last ten years. Evidence shows that foreign banks capitalized Mexican banks and helped in their recovery, but they also granted less credit than domestic banks, particularly during 2000-2005 (Detragiache et al., 2008). However, there is one question that still remains unanswered: Have these structural changes improved the quality of Mexican banks? This study provides the answer to this question and provides compelling evidence that foreign banks are more efficient than domestic banks in Mexico.

## **II. LITERATURE REVIEW**

Foreign ownership and banking efficiency has been studied in the following developing countries: Brazil (Staub, et al., 2010), China (Berger, et al., 2009), Pakistan (Bonaccorsi di Patti and Hardy, 2005), Hungary (Hasan and Marton, 2003), India (Sensarma, 2006), and Malaysia (Mathews and Ismail, 2006). Evidence suggests that foreign banks are slightly more efficient than domestic banks, and that foreign banks are more efficient than state-owned banks.

Empirical evidence on banking efficiency in Mexico is very limited. To my knowledge, there is no empirical study addressing the effect of foreign ownership on the efficiency of Mexican banks. The first country study to use Mexican data on banking efficiency was published by Taylor et al. (1997). Using data on thirteen Mexican banks for the years 1989 to 1991, they investigate the efficiency and profitability of income and expense generating activities of banks. The authors illustrate that an advantage of using Mexican banks, to analyze banking efficiency, is that the small number of economic units in the sample facilitates the interpretation of the results.

Guerrero and Negrin (2005) investigate the Mexican banking system estimating static and dynamic parametric models of banking efficiency. They analyze the banking industry during 1995-2004 using a panel of 21 large and medium-sized banks. Results show that the Mexican banking system experienced a drastic improvement in banking efficiency. Finally, Solis and Maudos (2008) analyze the relationship between cost efficiency and market power in the Mexican banking system from 1993 to 2005. The main purpose of their study is to find evidence of the so-called quiet life hypothesis (Berger and Hannan, 1998) in Mexico to explain the effect of market power on management efficiency. They find that market power has a negative effect on cost efficient and no significant effect on profit efficiency.

### **III. THE MEXICAN BANKING SECTOR**

During the beginning of the liberalization period and NAFTA, Mexico's economy was booming. In 1989, the Mexican government finalized negotiations of its international debt allowing the country its return to international financial markets. In 1988 fiscal deficits were replaced by a budget surplus and inflation levels began decreasing in 1991. Forecasts and expectations during 1993 about the Mexican economy were extremely positive (Aspe, 1993).

The financial liberalization and lack of monitoring of banks led to reckless lending behavior and excessive risk taking. The Mexican banking sector was heading straight to collapse even before the devaluation of the peso in December 1994. The precarious situation of the banking sector together with the unstable political environment<sup>2</sup> and high levels of capital leaving out of the country contributed to a dramatic fall in foreign reserves. Mexico's "crawling peg" exchange rate was at risk without sufficient foreign reserves to maintain the exchange rate level. Finally, the peso was devalued in December 1994. The banking sector endured the collapse of the peso but by February 1995, banks in Mexico were practically bankrupt. (Torre Cepeda, 2006).

With the initiation of NAFTA in 1994, restrictions on foreign bank ownership were gradually released. However, in 1995, the government removed some restrictions on foreign bank acquisitions of Mexican banks beyond the schedules originally negotiated under NAFTA. In March of 1995, the Mexican Congress passed legislation allowing foreign banks a major stake in Mexican banks. However, foreign interest in the three largest banks was limited to 30 percent. With the removal of some restrictions, from 1994 to 1996 a total of seventeen foreign banks, mainly from the U.S., entered the Mexican market. In December 1996, seven percent of total bank assets were controlled by foreign banks.

In 1998, all remaining restrictions on foreign ownership of Mexican banks were removed by the government. These important changes in the banking sector drastically modified the nature of the financial sector. Foreign ownership increased dramatically from 1997-1998 with foreign acquisitions of the largest commercial banks. As a result, the share of assets held by foreign

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<sup>2</sup> In 1994, a revolutionary group appeared in Chiapas and one of the strongest presidential candidates was assassinated.

banks increased from 20 percent in 1999 to 82 percent in 2004. Furthermore, in 2009 77% of total assets were concentrated in only five banks and four of these are under foreign control, Banamex, BBVA Bancomer, Santander, and HSBC. At this time, Banorte is the only “big” bank still controlled by domestic investors.

#### IV. ECONOMETRIC METHODOLOGY

This study utilizes Stochastic Frontier Analysis (SFA) to estimate cost efficiencies for the banks in the sample. According to Paxton (2007), incorporating an error term is particularly important when estimating an efficient frontier for a sample of institutions in developing countries where financial data on banks may include measurement errors or accounting irregularities.

Cost efficiency measures how close a bank’s costs are from the efficient frontier bank’s costs when producing the same bundle of outputs with the same bundle of inputs under the same environment. That is, cost efficiency measures how close to the minimum cost a bank is, where the minimum cost is determined by the best performers in the sample. The cost function in which variable costs depend on input prices, a vector of outputs, environmental factors, a random error and efficiency, can be written as:

$$C = C(w, y, v, \varepsilon) \quad (1)$$

Where  $C$  measures variable costs,  $w$  indicates input prices,  $y$  is a vector of outputs,  $v$  indicates inefficiency and  $\varepsilon$  is a random error. To simplify the efficiency measure, the inefficiency factor and the random error are assumed to be multiplicatively separable from the rest of the cost function and transforming both sides of (1) using natural logs we get the following,

$$\ln C = f(w, y) + \ln v + \ln \varepsilon \quad (2)$$

Efficiency levels are estimated by specifying the commonly-used translog functional form for the cost function as follows:

$$\ln C = \delta_0 + \sum_j \delta_j \ln(y_j)_{it} + \frac{1}{2} \sum_j \sum_k \delta_{jk} \ln(y_j)_{it} \ln(y_k)_{it} \quad (3)$$

$$\beta_1 \ln(w_1/w_2)_{it} + \frac{1}{2} \beta_{11} \ln(w_1/w_2)_{it} \ln(w_1/w_2)_{it} + \sum_j \theta_j \ln(y_j)_{it} \ln(w_1/w_2)_{it} + \ln(u)_{it} + \ln(v)_{it}$$

where  $i, t$  index the bank and quarter, respectively,  $k=1, 2$  index the two output variables, and  $\delta_{jk} \equiv \delta_{kj}$ .  $C$  represents the bank’s total costs. There are

two outputs ( $y$ ): total loans and total deposits, and two input prices ( $w$ ): price of loanable funds and price of labor. The  $\ln u$  term represent a bank's efficiency level and  $\ln v$  is a random error that incorporates both measurement error and luck. The normalization by the last input price ( $w_2$ ) ensures price homogeneity.

**Table 1****Active Banks in Mexico per year**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Domestic Banks	15	13	13	13	14	13	15	23	22	22
Foreign Banks	20	18	20	19	14	16	16	17	19	19

**V. SAMPLE**

The sample in this study is a balanced panel of quarterly financials and ownership data of the five largest commercial banks in the Mexican banking

industry from January 2000 to December 2009, totaling 220 observations. Even though, we only consider 15 percent of the banks in the industry, these five banks controlled between 2000 and 2009 almost 80% of the banking sector's total assets. Moreover, in 2005 their control reached 81% and then decreased to 77 % in 2009 with the entry of eight de novo banks between 2007 and 2009. Table 1 shows the number of foreign and domestic banks in the financial system across the sample. Foreign banks are defined as those with more than 50% foreign capital. Domestic banks are defined as those with less than 50% foreign capital. The data source is the National Banking and Securities Commission (known by its Spanish acronym CNBV).

Total	35	31	33	32	28	29	31	40	41	41
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During the analysis, foreign owned banks are identified with a dummy variable (FOREIGN) which takes the value of 1 starting with the quarter after the date of the acquisition for banks that end the sample period as foreign-owned, and 0 otherwise. Total costs (COST) include interest expense and operating costs. In this study, banks are defined as multi-product economic units that produce two outputs (loans and deposits) and employ two inputs (labor and lendable funds). Following Solis and Maudos (2008) the price of lendable funds is calculated as the ratio of financial costs to deposits. Given data restrictions, the ratio of noninterest expense to total non-interest expenditure is used as proxy for the price of labor. Table 2 shows descriptive statistics of variables used in the estimation of cost efficiency.

**Table 2**

**Descriptive statistics of variables used in cost efficiency estimations**

	Mean	SD	Minimum	Maximum
<i>Output quantities</i>				
Total loans	185811.43	100006	52136.12	525938.06
Total deposits	253233	118830.5	81745.836	602840.9
<i>Input prices</i>				
w1	0.487	0.284	0.120	1.256
w2	0.047	0.026	0.016	0.130

Output variables are total loans, and total deposits. Input prices are: unit cost of deposits (w1), and unit price of labor (w2). All financial assets are inflation adjusted to the base year 2000.

## VI. EMPIRICAL RESULTS

The empirical results are presented following a two-step process. The first step is to obtain the efficiency levels from the residuals of the stochastic frontier estimation using stochastic frontier analysis. The second step is to examine the determinants of efficiency through regression methods.

### A. Stochastic Frontier Analysis

Table 3 shows estimates of average cost efficiency for two sample periods, 2000-2004 and 2005-2009. In the first subsample all acquisitions of domestic banks by foreign banks took place. The second subsample considers the assimilation period by these banks to the new economic structure of the industry. The average cost efficiency level for the largest five banks of the industry is 73%, meaning that on average they are 27% inefficient in costs. Cost efficiency improved from 72% in 2000 to 82% in 2009. Furthermore, the cost efficiency level is lower in the high acquisition activity period than in the assimilation period, increasing from 70% to 77%, respectively.

**Table 3**

<b>Average Efficiency Measures</b>	
	Cost Efficiency
2000-2009	0.7312
Subsample 1: 2000-2004	0.6970
Subsample 2: 2005-2009	0.7654
Difference t-test between time periods	0.0684 ***
<i>t-statistic</i>	(4.914)

\*\*\* represents significance at the 1% level.

### B. Regression Analysis

Several environmental factors may influence the efficiency of a bank. To analyze the effect of these factors on efficiency, I estimate the following regression,

$$Y = f(ASSETS, ROE, NPL, C\_LOAN, B\_LOAN, G\_LOAN), \quad (4)$$

where the dependent variable is cost efficiency, and the independent variables are FOREIGN as described in the previous section, and other



explanatory variables that may affect the efficiency of the Mexican banks. Specifically, six control variables are used: total assets (ASSETS), return on equity (ROE), non-performing loans to total loans (NPL), and loan portfolio variables (C\_LOAN, B\_LOAN, and G\_LOAN).

**Table 4****Determinants of Cost Efficiency**

	Cost Efficiency	
	Fixed Effects	Random Effects
Constant	0.7326 *** (20.36)	0.6723 *** (18.76)
Foreign	0.0531 ** (2.52)	0.0668 *** (3.63)
Assets	-0.0000 *** (-2.97)	-0.0000 ** (-2.14)
ROE	-0.0001 (0.61)	-0.0001 (-0.70)
NPL	0.0036 (1.03)	0.0025 (0.77)
C_ Loans	0.0001 *** (2.86)	0.0000 (0.08)
B_ Loans	-0.0000 (1.16)	0.0000 (0.52)
G_ Loans	-0.0003 *** (6.90)	0.0001 *** (6.41)
N	200	200
R <sup>2</sup>	0.7842	0.7117
LM Test	169.35	122.72
<i>p-value</i>	(0.000)	(0.000)
Hausman Test		13.77
<i>p-value</i>		(0.055)

The dependent variable is cost efficiency from the stochastic frontier estimation. All regressions include firm and time dummy variables which are not reported. Absolute values of t-statistics are shown in parentheses below the coefficients. \*, \*\*, \*\*\* represent significance at the 10%, 5%, and 1% levels respectively.

The ASSETS variable is included in the model to account for the effect of bank size on efficiency. The ROE variable is included as a measure of bank profitability and capitalization. The NPL variable controls for asset and loan portfolio quality. Banks with lower NPL levels are expected to be more efficient than banks with high levels of non-performing loans. Also, this variable is very important to consider in the Mexican banking context, since the Mexican banking bailout of 1995 was strongly linked to the amount of non-performing loans in bank's balance sheets (Hernández-Murillo, 2007) and related lending (La Porta et al., 2003). Finally, data on consumer loans (C\_LOANS), business loans (B\_LOANS) and government loans (G\_LOANS) is included to control for loan portfolio composition and loan supply in Mexico. Table 4 reports the results of the estimation. The second stage regressions were estimated using GLS two-way fixed and random effects models. Both models include firm and time-specific effects which are not reported. Overall, most of the coefficients are significant and are in line with sign expectations. The regression results of cost efficiency show that the foreign dummy variable is significant and thus implies that banks are more cost efficient than domestic banks.

Furthermore, the size of the bank and the amount of government loans have a negative effect on cost efficiency, meaning that larger banks are less cost efficient, and that banks that supply loans to the government are less cost efficient than their competition. Finally, consumer loans have a positive effect on cost efficiency, but its effect is very small. Overall, results indicate that significant differences exist between foreign and domestic banks.

## **VII. CONCLUSION**

The Mexican banking sector is unique in its composition, not only is it highly concentrated but the top five banks in the industry own almost 80% of total assets on every year of the sample. The objective of this study is to analyze the effect of foreign ownership in the efficiency of the Mexican banking industry. Therefore, to analyze the real effect on ownership without a confounding effect of bank size on efficiency, I use data on the five largest banks in the industry.

Using stochastic frontier analysis, I measure cost efficiency measures from 2000 to 2009. Results show that the evolution of cost efficiencies has been positive from 2000 to 2009. Finally, using regression analysis I find

compelling evidence that significant differences exist between foreign and domestic banks thus, supporting previous evidence on the positive effect of foreign ownership on banking efficiency. However, there is one caveat in the Mexican case, foreign bank participation helped improve cost efficiency levels of the largest banks in the industry but only for those acquired by foreign banks.

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