Empirical evidence on the relationships between concentration and profitability in Latin American banking

Arize, Augustine C. and Kallianotis, Ioannis N. and Kasibhatla, Krishna M. and Malindretos, John and Rivera-Solis, Luis Eduardo

2008
Empirical Evidence on the Relationship Between Concentration And Profitability in Latin American Banking

Augustine C. Arize, Ioannis N. Kallianotis, Krishna M. Kasibhatla, John Malindretos, and Luis Eduardo Rivera-Solis

There has been growth in globalization as a result of increased liberalization. This has also resulted in an increase in the role of financial institutions, such as banks. It is the purpose of this study to test Classen’s (2001) hypothesis that increase foreign bank presence has positive welfare implications and that the functioning of national banking markets are improved as a result. Using financial data for 2003 this paper will examine the influence of foreign bank entry on Latin American domestic markets.

LITERATURE REVIEW

There has been growth in globalization as a result of increased liberalization. This has also resulted in an increase in the role of financial institutions, such as banks. Internationalization of banking has occurred to accommodate this increased trade. Foreign banks have gone abroad either by opening up a subsidiary or via acquisition of domestic banks. These activities have been made possible since trade liberalization has also been accompanied by financial market liberalization.

The influence of foreign bank entry and its potential benefits has been a subject of interest in the literature Claessens, et.al. (2001), Levine (1996) Bonitsis and Rivera-Solis (1995), Rivera-Solis (1997) and Rivera-Solis (1991). In essence, there are two basic hypotheses: 1) The presence of foreign banks through increased competition and their possession of superior skills and technology to provide a better quality of financial services (Levine 1996 & 1997) With regard to the first hypothesis, Claessens et al. (2001) concluded that foreign bank entry had “positive welfare implications” and that the functioning of national banking markets were improved as a result of foreign bank entry. Clarke et al (1999), Claessens and Glaessner (1998), found similar results. This could be called the Efficient Structure Hypothesis. (Smirlock, 1985) 2) It is not the foreign bank’s superior efficiency but rather conditions prior to entry that are relevant Kumbhakar et al. (2001), and (Montinola and Moreno 2001. This could be referred to as the Structure-Conduct-Performance hypothesis (SCP).

It is the purpose of this study to test Classen’s (2001) hypothesis that increase foreign bank presence has positive welfare implications and that the functioning of national banking markets are improved as a result.

METHODOLOGY

The methodology used in this study follows the methodology employed by Smirlock (1985) in his study concentration and profitability. The empirical model incorporates both market share and concentration, and

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Dr. John Malindretos is Chairman, Alpha Securities.
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is as follows:

\[ n = a + b_1 MS + b_2 CR + b_3 MSCR + b_4 Z \]  

(1)

where \( n \) represents the profit rate, \( MS \) is the market share of the bank, \( CR \) is the foreign bank’s concentration ratio, \( MSCR \) is \( MS \) multiplied by \( CR \) (representing an interaction term), and \( Z \) is a vector of additional control variables that prior studies have found to affect profitability.” (Smirlock, 1985, p.73)

According to Smirlock (1985) the above model is very useful in evaluating the two competing hypotheses. If \( b_1 > 0 \) and \( b_2 = 0 \), the efficient structure hypothesis is supported. If \( b_1 = 0 \) and \( b_2 > 0 \), the profits are not affected by market share but are influenced by market concentration, supporting the SCP hypothesis. If both \( b_1 \) and \( b_2 \) are greater than zero, then the results could be subject to different interpretations. The supporters of the SCP hypothesis would view the results as showing “that all firms in concentrated markets earn monopoly rents from collusion” (Smirlock, 1985, p.74) and monopoly rents going to the largest firms not the most efficient firms. The supporters of the E-S hypothesis would see the results as evidence “that leading firms are more efficient than their rivals” (Smirlock, 1985, p.74) In order to interpret the findings correctly, Smirlock (1985) introduced MSCR as an additional regressor. If the coefficient for MSCR is positive, then collusion is present. However, if it is less than zero, then collusion is not extant.

DATA

Data was obtained for nineteen Latin American countries from the Latin Banking Guide and Directory 2003 published by Latin Finance. This issue has income and balance sheet data for most of the banks in all nineteen countries. It also includes important financial indicators and ratios.

EMPIRICAL FINDINGS

At the time of this writing, the empirical results were completed for the five Central American countries (Guatemala, El Salvador, Honduras, Costa Rica, and Nicaragua), the South American Countries (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela), and Mexico. Data for this study were collected on the banking system of each of the countries cited. Panama was not included in this study as the majority of its banks are all foreign owned due to the nature of its liberal policy towards foreign banks.

To test the hypothesis that “there is no relationship between concentration and profitability, but rather between market share and bank profitability” [12], the following model was constructed:

\[ n = a + b_1 MSD + b_2 CR + b_3 MSCR + b_4 ADQCY + b_5 QUALITY + b_6 FR \]  

(2)

The variables were:

- \( n \): Profitability. Two different measures were used: 1) return on equity (ROE), and return on total assets (ROA). Return on equity has been suggested by Weiss [13] as the measure to use, while others have preferred return on total assets. This study will use both.
- \( MSD \): this variable is each bank’s total deposits divided by the market’s total deposits.
- \( MS \): This variable is each bank’s total assets divided by the banking system’s total assets.
- \( CR \): this variable measures the four bank deposit concentration ratio for all banks in the industry.
- \( MSCR \): MSCR is MS multiplied by CR (representing an interaction term.
- \( ADQCY \): Equity over assets. This variable was included since it measures capital adequacy. It is possible improved capital adequacy has a positive impact upon profitability.
- \( QUALITY \): Asset quality measured by overdue loans to gross loans. This variable was included since improved asset quality has an influence on bank profits. The expected sign of the coefficient can be positive or negative depending on whether or not the ratio of overdue loans to gross loans decreases or increases.
- \( FR \): Multinational bank. This dummy variable has a value of one if the bank is a subsidiary or a branch of a foreign bank, and zero if it is not. This variable was introduced to measure foreign bank influence on bank profitability. The expected sign of the coefficient is negative, as increased foreign bank presence is expected to increase competition and decrease industry bank profits.

Regressions were run on individual countries having a sufficiently large banking sector to allow robust results, i.e. Argentina, Brazil, Mexico, and Venezuela. Due to the small size of some of the banking sectors (less than 30 banks) and the cultural and historical ties, regressions were run by geographical region, i.e. Mexico (North America), Central America, and South America. Tables 1 through 12 present the findings of this study.
TABLE 1
Econometric Regression Equation: Argentina ROE

\[ \text{ROE}[t] = -1.8513992636519 \text{MSD}[t] + 1510.8115696526 \text{MSCR}[t] - 0.076958951684638 \text{ADEQUACY}[t] + 0.12021871359215 \text{QUALITY}[t] - 4.8905116514403 \text{FR}[t] - 69769.474904282 \text{MS}[t] + 0.2696582460019 \text{cr}[t] - 1.0754082069298E-11 + e[t] \]

<table>
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<th>T-STAT</th>
<th>2-tail p-value</th>
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<td>-1.241771</td>
<td>0.085274 *</td>
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<tr>
<td>QUALITY[t]</td>
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<td>0.054881</td>
<td>2.190531 ***</td>
<td>0.001482 ***</td>
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<td>Constant</td>
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Multiple R: 0.485381
R-squared: 0.235595
Adjusted R-squared: 0.057233
F-TEST: 1.320885
Observations: 38
Degrees of Freedom: 30

Multiple Linear Regression - Residual Statistics
- Standard Error: 8.61103
- Sum Squared Errors: 2224.49505
- Log Likelihood: -131.243947
- Durbin-Watson: 2.047237

* significant at the 10 percent level
** significant at the 5 percent level
*** significant at the 1 percent level

TABLE 2
Econometric Regression Equation: Argentina ROA

\[ \text{ROA}[t] = -0.309111107864535 \text{MSD}[t] - 0.0094413865986214 \text{MSCR}[t] + 0.0373418244116665 \text{ADEQUACY}[t] + 0.066571246913822 \text{QUALITY}[t] - 1.0939763701827 \text{FR}[t] + 1.2015683650123 + e[t] \]

<table>
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<tr>
<td>MSCR[t]</td>
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<tr>
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<td>0.001482 ***</td>
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Multiple R: 0.593796
R-squared: 0.352594
Adjusted R-squared: 0.251436
F-TEST: 3.485597
Observations: 38
Degrees of Freedom: 32

Multiple Linear Regression - Residual Statistics
- Standard Error: 3.03102
- Sum Squared Errors: 293.986609
- Log Likelihood: -92.792677
- Durbin-Watson: 2.059168
- Von Neumann Ratio: 2.114821

* significant at the 10 percent level
** significant at the 5 percent level
*** significant at the 1 percent level
TABLE 3
Return on Equity: Brazil

Multiple Linear Regression - Estimated Regression Equation

\[ \text{ROE}[t] = +0.012352315405034 \text{mscr}[t] -9.3818898815644 \text{F}[t] -0.24232888804576 \text{msd}[t] +0.050781408295243 \text{quality}[t] -0.20945058915734 \text{adequacy}[t] +18.653472670358 + e[t] \]

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<tr>
<td>Constant</td>
<td>18.653473</td>
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<td>5.512033</td>
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Multiple R 0.348117
R-squared 0.121186
Adjusted R-squared 0.085462
F-TEST 3.392264
Observations 129
Degrees of Freedom 123

Multiple Linear Regression - Residual Statistics

Standard Error 21.287389
Sum Squared Errors 55737.808294
Log Likelihood -574.467872
Durbin-Watson 2.206801

* significant at the 10 percent level
** significant at the 5 percent level
*** significant at the 1 percent level

TABLE 4
Econometric Regression Equation: Brazil ROA

Multiple Linear Regression - Estimated Regression Equation

\[ \text{ROA}[t] = +0.0027716400575682 \text{mscr}[t] -0.85990147781308 \text{F}[t] -0.19345075650233 \text{msd}[t] +0.037123962215547 \text{quality}[t] -0.047742568747237 \text{adequacy}[t] +2.3861326827078 + e[t] \]

<table>
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<td>msd[t]</td>
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<td>quality[t]</td>
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<td>2.090741</td>
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Multiple R 0.180437
R-squared 0.032557
F-TEST 0.827868
Observations 129
Degrees of Freedom 123

Multiple Linear Regression - Residual Statistics

Standard Error 7.179082
Sum Squared Errors 6339.324239
Log Likelihood -434.252192
Durbin-Watson 2.479818

* significant at the 10 percent level
** significant at the 5 percent level
*** significant at the 1 percent level
### TABLE 5
Econometric Regression Equation: Mexico ROE Multiple

**Linear Regression - Estimated Regression Equation**

\[
\text{ROE}(%)[t] = -1.623129 \times \text{fr}[t] - 0.022743 \times \text{mscr}[t] + 0.090321 \times \text{quality}[t] + 0.037670 \times \text{adequacy}[t] + 1.657326 \times \text{msd}[t] + 3.021985 + \epsilon[t]
\]

<table>
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**Multiple Linear Regression - Regression Statistics**

- Multiple R: 0.329133
- R-squared: 0.108329
- F-TEST: 0.58315
- Observations: 30
- Degrees of Freedom: 24

**Multiple Linear Regression - Residual Statistics**

- Standard Error: 6.268453
- Sum Squared Errors: 943.04393
- Log Likelihood: -94.286888
- Durbin-Watson: 2.261331

### TABLE 6
Econometric Regression Equation: Mexico ROA

**Multiple Linear Regression - Ordinary Least Squares**

\[
\text{ROA}(%)[t] = -0.038952 \times \text{fr}[t] - 0.001573 \times \text{mscr}[t] + 0.085950 \times \text{quality}[t] + 0.050291 \times \text{adequacy}[t] + 0.111456 \times \text{msd}[t] - 0.415781 + \epsilon[t]
\]

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**Multiple Linear Regression - Regression Statistics**

- Multiple R: 0.846497
- R-squared: 0.716557
- Adjusted R-squared: 0.657507
- F-TEST: 12.134629
- Observations: 30
- Degrees of Freedom: 24

**Multiple Linear Regression - Residual Statistics**

- Standard Error: 0.972963
- Sum Squared Errors: 22.719769
- Log Likelihood: -38.398727
- Durbin-Watson: 1.941477

* significant at the 10 percent level
** significant at the 5 percent level
*** significant at the 1 percent level
### TABLE 7
Econometric Regression Equation Venezuela ROE

ROE(%)\[t\] = -1.6363658532505 fb[t] -0.0762270949443016 mscr[t] +4.523655342856 ms[t] -0.1483279916532 adequacy[t] -0.17838247076507 quality[t] +21.914437889692 + e[t]

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**Multiple Linear Regression - Ordinary Least Squares**

- **H0:** parameter = 0
- **Multiple R:** 0.529954
- **R-squared:** 0.280851
- **Adjusted R-squared:** 0.175094
- **F-TEST:** 2.655621
- **Observations:** 40
- **Degrees of Freedom:** 34
- **Multiple Linear Regression - Residual Statistics**
  - **Standard Error:** 9.664245
  - **Sum Squared Errors:** 3175.519386
  - **Log Likelihood:** -144.244482
  - **Durbin-Watson:** 2.120138

*significant at the 10 percent level
**significant at the 5 percent level
***significant at the 1 percent level

### TABLE 8
Econometric Regression Equation Venezuela ROA

ROA(%)\[t\] = -0.046864878919551 fb[t] -0.0043036617743585 mscr[t] +0.2422758082146 ms[t] +0.027881541261952 adequacy[t] -0.049413911556652 quality[t] +2.8177118237717 + e[t]

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**Multiple Linear Regression - Ordinary Least Squares**

- **H0:** parameter = 0
- **Multiple R:** 0.406043
- **R-squared:** 0.280851
- **Adjusted R-squared:** 0.175094
- **F-TEST:** 2.655621
- **Observations:** 40
- **Degrees of Freedom:** 34
- **Multiple Linear Regression - Residual Statistics**
  - **Standard Error:** 1.827483
  - **Sum Squared Errors:** 137.549643
  - **Log Likelihood:** -77.624482
  - **Durbin-Watson:** 2.506138
TABLE 9
Econometric Regression Equation: Central America ROE

\[
\text{ROE}[t] = -1.9085445354637 \, \text{fb}[t] + 0.0088460075862965 \, \text{mscr}[t] - 0.45557097544923 \, [t] - 0.18222169622886 \, \text{ms}[t] - 0.55711294982498 \, \text{adequacy}[t] - 0.0694054410666807 \, \text{quality}[t] + 21.51307694065 + \epsilon[t]
\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter</th>
<th>S.E.</th>
<th>T-STAT</th>
<th>2-tail p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>fb[t]</td>
<td>-1.908545</td>
<td>3.364685</td>
<td>-0.567228</td>
<td>0.572323</td>
</tr>
<tr>
<td>mscr[t]</td>
<td>0.008846</td>
<td>0.008137</td>
<td>1.087167</td>
<td>0.280589</td>
</tr>
<tr>
<td>[t]</td>
<td>-0.455571</td>
<td>0.604572</td>
<td>-0.753543</td>
<td>0.453581</td>
</tr>
<tr>
<td>ms[t]</td>
<td>-0.182222</td>
<td>0.177039</td>
<td>-1.029275</td>
<td>0.306796</td>
</tr>
<tr>
<td>adequacy[t]</td>
<td>-0.557113</td>
<td>0.260108</td>
<td>-2.141856</td>
<td>0.035589</td>
</tr>
<tr>
<td>quality[t]</td>
<td>-0.069405</td>
<td>0.054345</td>
<td>-1.27712</td>
<td>0.205663</td>
</tr>
<tr>
<td>Constant</td>
<td>21.513077</td>
<td>4.95043</td>
<td>4.345699</td>
<td>4.5E-05</td>
</tr>
</tbody>
</table>

Multiple Linear Regression - Ordinary Least Squares

Multiple Linear Regression - Regression Statistics
- Multiple R: 0.398666
- R-squared: 0.158934
- Adjusted R-squared: 0.088845
- F-TEST: 2.267612
- Observations: 79
- Degrees of Freedom: 72

Multiple Linear Regression - Residual Statistics
- Standard Error: 10.121476
- Sum Squared Errors: 7375.988102
- Log Likelihood: -291.289367
- Durbin-Watson: 2.090254

* significant at the 10 percent level
** significant at the 5 percent level
*** significant at the 1 percent level

Table 10
Econometric Regression Equation: Central America ROA

\[
\text{ROA}[t] = -0.030501484278068 \, \text{fb}[t] + 0.00058367971630013 \, \text{mscr}[t] - 0.024072165061212 \, [t] + 0.098270346834668 \, \text{ms}[t] - 0.070573986716409 \, \text{adequacy}[t] - 0.0056619273353024 \, \text{quality}[t] + 0.8101623222098 + \epsilon[t]
\]

<table>
<thead>
<tr>
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<th>T-STAT</th>
<th>2-tail p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>fb[t]</td>
<td>-0.030501</td>
<td>0.302599</td>
<td>-1.097098</td>
<td>0.199991</td>
</tr>
<tr>
<td>mscr[t]</td>
<td>0.000584</td>
<td>0.000732</td>
<td>0.797627</td>
<td>0.42771</td>
</tr>
<tr>
<td>[t]</td>
<td>-0.024072</td>
<td>0.054372</td>
<td>-0.442734</td>
<td>0.659285</td>
</tr>
<tr>
<td>ms[t]</td>
<td>0.09827</td>
<td>0.015922</td>
<td>6.172062</td>
<td>0.000000 ***</td>
</tr>
<tr>
<td>adequacy[t]</td>
<td>-0.070574</td>
<td>0.023393</td>
<td>-3.016949</td>
<td>0.003528 ***</td>
</tr>
<tr>
<td>quality[t]</td>
<td>-0.005662</td>
<td>0.004887</td>
<td>-1.158454</td>
<td>0.250507</td>
</tr>
<tr>
<td>Constant</td>
<td>0.810162</td>
<td>0.445212</td>
<td>1.819724</td>
<td>0.072958</td>
</tr>
</tbody>
</table>

Multiple Linear Regression - Regression Statistics
- Multiple R: 0.623987
- R-squared: 0.38936
- Adjusted R-squared: 0.338473
- F-TEST: 7.651502
- Observations: 79
- Degrees of Freedom: 72

Multiple Linear Regression - Residual Statistics
Table 11
Econometric Regression Equation: Latin America ROE

\[
\text{ROE}[t] = -8.2346542241138 \times \text{FR}[t] -0.14607699147828 \times \text{MSD}[t] + 0.00018289763846875 \times \text{MSCR}[t] + 0.041511747689393 \times \text{QUALITY}[t] -1.1979077497465 \times \text{FR}[t] + 1.8587540635818 + \epsilon[t]
\]

Multiple Linear Regression - Ordinary Least Squares

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter</th>
<th>S.E.</th>
<th>T-STAT</th>
<th>2-tail p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H0: parameter = 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR[t]</td>
<td>-8.2346542241138</td>
<td>1.797618</td>
<td>-4.580869</td>
<td>7E-06 ***</td>
</tr>
<tr>
<td>MSD[t]</td>
<td>-0.14607699147828</td>
<td>0.391384</td>
<td>-0.373232</td>
<td>0.709232</td>
</tr>
<tr>
<td>MSCR[t]</td>
<td>0.00018289763846875</td>
<td>0.006114</td>
<td>0.001692</td>
<td>0.998651</td>
</tr>
<tr>
<td>ADEQUACY[t]</td>
<td>-0.16177006324311</td>
<td>0.040862</td>
<td>-3.958919</td>
<td>9.4E-05 ***</td>
</tr>
<tr>
<td>QUALITY[t]</td>
<td>0.037721991091462</td>
<td>0.057777</td>
<td>0.652891</td>
<td>0.514314</td>
</tr>
<tr>
<td>Constant</td>
<td>17.7654646</td>
<td>1.582222</td>
<td>11.228173</td>
<td>0</td>
</tr>
</tbody>
</table>

Multiple Linear Regression - Regression Statistics

- Multiple R: 0.335076
- R-squared: 0.112276
- Adjusted R-squared: 0.097865
- F-TEST: 7.790928
- Observations: 314
- Degrees of Freedom: 308

Table 12
Econometric Regression Equation Latin America ROA

\[
\text{ROA}[t] = -0.024519500779628 \times \text{MSD}[t] -0.000225133279731 \times \text{MSCR}[t] +0.00018289763846875 \times \text{ADEQUACY}[t] +0.041511747689393 \times \text{QUALITY}[t] -1.1979077497465 \times \text{FR}[t] + 1.8587540635818 + \epsilon[t]
\]

Multiple Linear Regression - Ordinary Least Squares

<table>
<thead>
<tr>
<th>Variable</th>
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<th>S.E.</th>
<th>T-STAT</th>
<th>2-tail p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H0: parameter = 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSD[t]</td>
<td>-0.02452</td>
<td>0.126266</td>
<td>-0.194189</td>
<td>0.846156</td>
</tr>
<tr>
<td>MSCR[t]</td>
<td>-0.000225133279731</td>
<td>0.001973</td>
<td>-0.11414</td>
<td>0.909201</td>
</tr>
<tr>
<td>ADEQUACY[t]</td>
<td>0.000183</td>
<td>0.013183</td>
<td>0.013874</td>
<td>0.988939</td>
</tr>
<tr>
<td>QUALITY[t]</td>
<td>0.041512</td>
<td>0.01864</td>
<td>2.227068</td>
<td>0.026665 **</td>
</tr>
<tr>
<td>FR[t]</td>
<td>-1.1979077497465</td>
<td>0.579937</td>
<td>-2.065582</td>
<td>0.039704 **</td>
</tr>
<tr>
<td>Constant</td>
<td>1.858754</td>
<td>0.510447</td>
<td>3.641423</td>
<td>0.000318</td>
</tr>
</tbody>
</table>

Multiple Linear Regression - Regression Statistics

- Multiple R: 0.182288
- R-squared: 0.033229
- Adjusted R-squared: 0.017535
Tables 1 through 12 for equations ROE and ROA provide some interesting results. The sign for the variable MSCR is positive in about half of the cases, but in no case is it statistically significant. It appears that once market share is taken into consideration; market concentration continues to be statistically insignificant. FR for Mexico and El Salvador had the expected sign since increased competition affects profit margins. On the other hand, FR was statistically significant for ROE for Argentina, Brazil, and Latin America. The signs of the coefficients were negative indicating that foreign bank presence had a negative impact on return on equity. In all other instances FR was statistically insignificant for both ROE and ROA. Adequacy was statistically significant for most of the equations for ROE and ROA. Quality was statistically significant for ROA for Argentina, Mexico, Venezuela, and Latin America.

SUMMARY AND CONCLUSION

These findings do not appear to support the S-C-P hypothesis. Once market share was taken into account, concentration continued to be statistically insignificant, but MSD was also statistically insignificant. It also appears that capital adequacy and asset quality in play an important influence on both ROE and ROA. As a result, the E-S hypothesis does appear to be supported. These findings tend to support Smirlock’s (1985) contention that concentration in banking markets do not lead to monopoly profits, and that the relationship between concentration and profitability as indicated in previous studies is spurious. Furthermore, the presence of concentration is a result of the “superior efficiency of the leading firms” rather than a result of collusion. Furthermore, the empirical results do not appear to support Classen’s (2001) hypothesis that an increase foreign bank presence has positive welfare implications and that the functioning of national banking markets are improved as a result.

REFERENCES


