

Competition in the Chilean Banking Sector: A Cross-Country Comparison

Conventional wisdom tends to associate market concentration with lack of competition, although no conclusive empirical evidence exists linking the two. The concentrated structure of the Chilean banking market has thus raised concerns of insufficient competition in the sector. Media reports in the past often complained that bank lending rates were sluggish in adjusting to changes in interest rates, especially following decreases in monetary policy interest rates; the reports linked this finding to insufficient competition in the banking system. The Chilean banking market is indeed relatively concentrated, and the majority of the banks are owned by a handful of financial conglomerates with significant linkages between the banking, securities, mutual and pension fund management, and insurance businesses. The ownership linkages are mitigated, however, by firewalls and cross-selling restrictions across the customer base, which reduce the possibility of realizing economies of scale at the financial conglomerate level.

The importance of competition in the banking market has been documented extensively.¹ The degree of competition can affect the efficiency and quality of financial services and thus the allocation of resources in the economy. Competition may also affect firms' and households' access to external financing, thereby affecting economic growth.² For bank-based systems, competition in the banking system plays a central role in the efficient allocation of resources, since most financial services tend to be generated by banks.³ In Chile, the low

I would like to thank Eduardo Engel, Marcela Meléndez, Ronald Fischer, Alejandro Jara, and Rodrigo Fuentes for valuable comments and suggestions. I am grateful to María Fernanda Pazmiño for providing excellent research assistance.

1. See Vives (2001); Claessens and Laeven (2005).

2. Beck, Demirgüç-Kunt, and Levine (2005); Honohan (2004).

3. A bank-based financial system is loosely defined as a system in which most of the credit to the private sector is provided by banks, rather than by capital markets. Most emerging market economies—as well as some advanced economies, such as Japan and Germany, where capital market and nonbank financial intermediation are low relative to bank intermediation—are characterized as bank-based systems.

level of access of small and medium-sized enterprises and poor households to banking services is the subject of recurrent debate. While Chile compares favorably with other Latin American countries in terms of access to credit and payment systems, it scores relatively low when its level of development and the depth of its credit markets are considered.⁴

To shed light on the conduct of Chilean banks, this paper estimates competition measures for Chile and compares them to those of twenty-eight other emerging market economies by applying Panzar and Rosse's methodology to bank level data for 1995–2004.⁵ This methodology allows for simple tests of the competitive conduct in the sector. Specifically, factor price elasticities of reduced-form revenue functions are estimated. Panzar and Rosse label the sum of these elasticities the H statistic, which measures the extent to which revenues change in response to changes in factor prices. They analyze the value of the H statistic under various assumptions about competitive conduct and derive testable values consistent with those using a Chamberlinian equilibrium. The estimation results suggest that the Chilean banking market is characterized by monopolistic competition, as are most other banking systems, but the estimated competition measure is statistically lower than in other countries in the sample. Chilean banks also appear to have statistically higher profit margins than their peers, which confirms the finding of less competition in the market. The paper provides empirical evidence on the lack of a link between competition and concentration.

The paper proceeds as follows. The next section reviews the literature and describes the methodology used in the paper. The following section provides estimates to test the conduct of competitive behavior among Chilean banks versus banks in other countries and compares the profitability of Chilean banks. The paper then considers potential sources of market power in the Chilean banking market, and the last section concludes.

Literature Review and Methodology

The literature on measuring and testing competition uses two main approaches: the structure-conduct-performance paradigm and a nonstructural approach based on reduced-form cost or revenue functions of the profit-maximizing

4. See Morales and Yáñez (2006).

5. Panzar and Rosse (1987).

firm under different market structures.⁶ The two arguments motivating the structure-conduct-performance paradigm are, first, that a concentrated market provides incentives for collusive behavior among firms and leads to excess profitability; and, second, that economies of scale may enhance the efficiency of large firms, such that the observed concentration and profitability may result from a strategic decision on the part of more efficient firms to increase their market share, rather than from the firms' exploiting their efficiency at the original market share and price level or from collusive behavior.⁷ This approach has been criticized for not taking into account the endogeneity of the market structure to firm behavior and competitive conduct in the industry. According to proponents, entry barriers determine the number of firms in the sector, which, in turn, determines the competitiveness of the industry and each firm's rate of return. Firms' entry decisions, however, are based on profitability and price, which reflect not only costs (including that of entry), but also the competition in the sector itself. Accordingly, the effect of a particular entry barrier on price will depend on the nature of this competition in the sector. Sutton's work demonstrates that industries with a high degree of competition will be more highly concentrated than those in which competition is not as vigorous.⁸ In other words, high concentration, far from being an indicator of a lack of competition, can indicate precisely the reverse.

The Panzar-Rosse approach circumvents the potential problems of the structure-conduct-performance paradigm by deriving input price elasticities from reduced-form revenue functions, which can be used to differentiate between different types of competitive behavior, namely, monopoly, monopolistic competition, perfect competition, and conjectural variation oligopoly.⁹ Several banking studies use the Panzar-Rosse approach to test competition in individual banking industries, partly because it is easy to apply to commonly available banking data.¹⁰ This method has also occasionally been applied in a cross-country setup, and this paper contributes to this literature by providing input price elasticity estimates for a set of mostly emerging market economies. Bikker and Haaf use the Panzar-Rosse methodology to estimate

6. The nonstructural approach was operationalized by Iwata (1974), Bresnahan (1982), and Panzar and Rosse (1987).

7. See Demsetz (1974) on the efficiency hypothesis.

8. Sutton (1991).

9. For an overview of the literature, see Bikker and Haaf (2001).

10. Molyneux, Lloyd-Williams, and Thornton (1994), Berger (1995), Belaisch (2003), and Hempell (2002) are only a few examples from a long list.

competition indexes—the so-called H statistics (defined in equation 6, below)—for twenty-three countries for the period 1988–98; they find that the H statistic is negatively correlated with various concentration measures.¹¹ Gelos and Roldós, who apply the same methodology to eight European and Latin American countries in two subsamples over the period 1994–99, find that increasing concentration did not affect estimated competition indexes in the period.¹² Levy Yeyati and Micco apply the Panzar-Rosse methodology to a set of Latin American countries for the period 1996–2002 and find that concentration did not significantly reduce competition.¹³ All three papers attempt to capture a time-varying competition index, whether by estimating a multiplicative time-curve for the input elasticities, by splitting the sample, or by estimating time-varying parameters. This is motivated by their focus on estimating a correlation between time-varying concentration indexes and the H statistic to shed light on the relation between concentration and competition. In most cases, however, the time variation is either not statistically significant or its magnitude is not large.

The primary motivation for applying this methodology to a cross-country dataset in this paper is to compare Chilean banks' competitive conduct against their peers in a consistent framework, rather than to test for changes in concentration and competition over time. The paper thus estimates time-invariant H statistics using the full available sample. I rely on Vesala's results to interpret the estimated competition index (the H statistic) as a continuous measure that increases with the competitive intensity when compared across countries.¹⁴

Testing for Competition: A Cross-Country Comparison

The structure-conduct-performance paradigm holds that more concentrated markets tend to be more collusive and thus more profitable, but the data do not support this link between market structure and competition. A clear relation cannot be discerned in cross-country data between return on average assets, return on equity, and net interest margins, on the one hand, and the commonly used Herfindahl-Hirschman index of concentration (HHI), on the

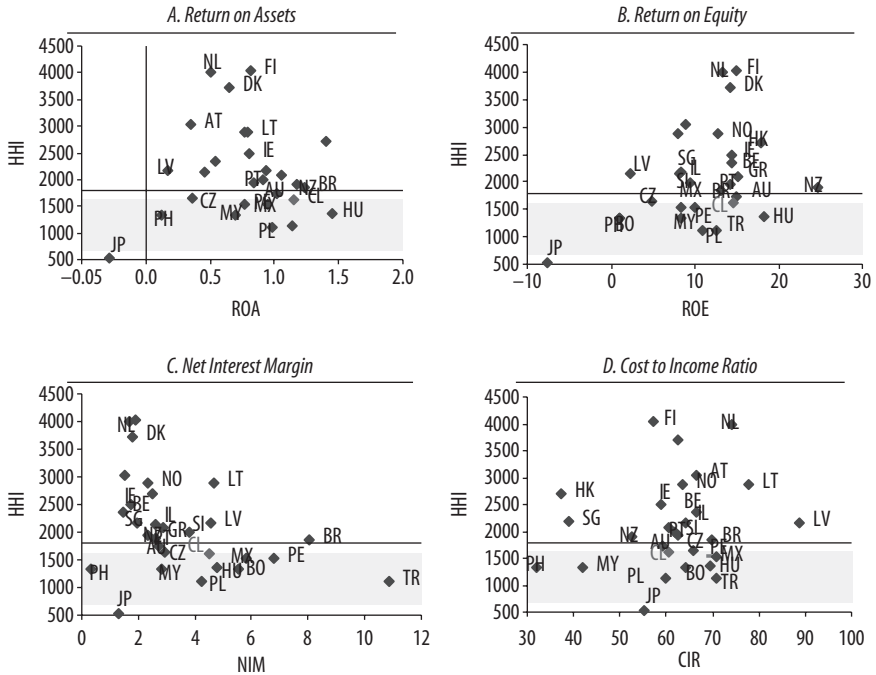
11. Bikker and Haaf (2001).

12. Gelos and Roldós (2004).

13. Levy Yeyati and Micco (2003).

14. Vesala (1995).

FIGURE 1. Herfindahl-Hirschman Index and Profitability Measures^a



Source: Bankscope database.

a. The country codes used in the figure are as follows: AT: Austria; AU: Australia; BE: Belgium; BO: Bolivia; BR: Brazil; CL: Chile; CZ: Czech Republic; DK: Denmark; FI: Finland; GR: Greece; HK: Hong Kong; HU: Hungary; IE: Ireland; IL: Israel; JP: Japan; LT: Lithuania; LV: Latvia; MX: Mexico; MY: Malaysia; NL: Netherlands; NO: Norway; NZ: New Zealand; PE: Peru; PH: Philippines; PT: Portugal; SG: Singapore; SI: Slovenia; TR: Turkey; and UY: Uruguay.

other (see figure 1).¹⁵ As noted above, concentration in the banking industry cannot be univocally associated with a lack of competitive behavior.

Panzar and Rosse provide a framework for empirically assessing competitive conditions in the banking market by testing input price elasticities, rather than relying on market concentration as a determinant of competitive

15. Net interest margins are defined as the difference between average interest charged on lending operations and the average interest paid on funding costs. The Herfindahl-Hirschman index (HHI) is a measure of market concentration given by $HHI = 10,000 \sum s_i^2$, where s_i is the market share of the i th firm. The HHI takes into account the relative size and distribution of the firms in a market and approaches zero when a market consists of a large number of firms of relatively equal size. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases. Markets in which the HHI is between 1,000 and 1,800 points are considered to be moderately concentrated, while those in which the HHI is above 1,800 points are considered to be highly concentrated.

conduct.¹⁶ This methodology does not attribute the conduct in the sector to market structure, since competition in the sector may affect potential sources of market power and hence market structure. It is based on estimates of the factor price elasticities of the reduced-form revenue equations and can be used on balance sheet and income statement data at the bank level. Under monopolistic competition with free entry, individual firm equilibrium is given by profit maximization as under monopoly profit-maximization conditions, and industry equilibrium is given by the zero-profit condition under entry and exit or until price equals the average cost for each bank. I assume that the firm's cost function, C , is linearly homogeneous in factor prices (that is, the technical rate of substitution does not depend on the scale of costs or production); that factor prices are exogenous to the individual firm; and that the elasticity of perceived demand faced by a representative bank, $e(y, n, X) = -P/(y\partial P/\partial y)$, is a nondecreasing function of the number of firms. Firm and industry equilibrium are then given, respectively, by

$$(1) \quad R_y(y_i, n, \mathbf{A}) - C_{y_i}(y_i, \mathbf{W}_i, \mathbf{Z}) = 0 \text{ and}$$

$$(2) \quad R_i^*(y_i^*, n^*, \mathbf{A}) - C_i(y_i^*, \mathbf{W}_i, \mathbf{Z}) = 0; \quad \forall i, i = 1, \dots, n^*.$$

R , the revenue function, is given by $yP(y, n, \mathbf{A})$, where P is the representative bank's perceived inverse demand function, y is output, and n is the number of banks in the industry. \mathbf{W} is the vector of factor prices, and \mathbf{A} and \mathbf{Z} are vectors of exogenous variables shifting the revenue and costs functions of the firm, respectively. Differentiating the above equations with respect to each factor price, w_{k_i} , and solving for $\partial y_i^*/\partial w_{k_i}$ yields the following:

$$(3) \quad \frac{\partial y_i^*}{\partial w_{k_i}} = \frac{\left[R_n \left(\frac{\partial X_{k_i}}{\partial y_i} \right) - R_{y_i n} X_{k_i} \right]}{\Delta^*},$$

where X_{k_i} is the firms' conditional demand for factor k , given by $C_{w_{k_i}}$, and thus $\partial X_{k_i}/\partial y_i = C_{y_i w_{k_i}}$, and $\Delta^* = R_n(R_{yy} - C_{yy}) > 0$ by the second-order profit-maximization conditions and the assumption that the elasticity of perceived

16. Panzar and Rosse (1987).

demand facing the individual firm is a nondecreasing function of the number of firms in the sector. From the industry equilibrium condition,

$$(4) \quad \frac{\partial R_i^* (\cdot)}{\partial w_{k_i}} = C_{y_i}^* (\cdot) \frac{\partial y_i^*}{\partial w_{k_i}} + C_{w_{k_i}}^* = C_{y_i}^* (\cdot) \frac{\partial y_i^*}{\partial w_{k_i}} + X_{k_i}.$$

After multiplying equation 4 with (w_{k_i}/R_i^*) and summing over all inputs,

$$(5) \quad H_i^* \equiv \frac{\partial R_i^*}{\partial w_{k_i}} \frac{w_{k_i}}{R_i^*} = \left(\frac{C_{y_i}^*}{R_i^*} \right) \sum_{k=1}^m w_{k_i} \left(\frac{\partial y_i^*}{\partial w_{k_i}} \right) + \frac{\sum_{k=1}^m w_{k_i} X_{k_i}}{R_i^*}.$$

By equations 1, 2, and 3 and following some manipulation,

$$(6) \quad H_i^* = 1 - \left(\frac{R_{y_i}^* R_i^*}{\Delta^* y_i^* e_i^2} \right) \frac{\partial e_i}{\partial n} \leq 1.$$

Given that the entrance of new firms makes demand faced by the representative bank more elastic, positive values of H are consistent with monopolistic equilibrium, whereas negative or zero values for H correspond to monopoly or perfectly collusive oligopoly. Under monopoly, an increase in input costs would increase marginal costs, reduce equilibrium output, and reduce revenues. In the limit, the model produces the perfectly competitive solution with a unitary value for H , as the demand elasticity, e_i , approaches infinity. In other words, in long-run equilibrium with entry and exit, firms operate at the minimum of their average cost, which then equals price. An increase in input prices increases average and marginal costs proportionally, since they are homogeneous of degree one in factor prices. The equilibrium output thus will not change, as the exit of some firms increases the demand faced by the remaining firms and would lead to a proportional rise in prices and revenues at the firm level.

Equation 6 also shows that the H statistic is an increasing function of demand elasticity, so the higher the value of H , the less market power banks exercise. This suggests not only that the H statistic can be used to test for certain competitive conduct, but that its magnitude can serve as a measure of competition, as well. This generalized result is based on as little as the profit-

maximization assumption and the zero-profit condition. Vesala extends the same conclusions to the case with no entry into the industry.¹⁷

Using a bank-by-bank cross-country dataset with annual data for twenty-nine countries over the period 1995–2004, I estimated reduced-form revenue functions with fixed effects. This method allows the analyst to control for unobserved heterogeneity by capturing all bank-specific, non-time-varying determinants of revenues that are not explicitly addressed in the regression specification by the bank fixed-effects term.¹⁸ In addition to input costs, the regressions take into account other control variables (namely, the share of loans in total assets, the share of customer deposits in total funding, and the ratio of equity to total assets) to control for business mix and bank-specific risk. The sample statistics, including the number of banks in each country, are presented in table 1. For Chile, I repeated the estimations using data from the Superintendency of Banks and Financial Institutions (SBIF) for a longer period (1990–2004): these results are reported separately (table 2). Since the Bankscope and SBIF data are not directly comparable, the paper relies on Bankscope-based estimates for cross-country comparisons.

Country-specific estimation results suggest that the Chilean banking system, like most banking markets in the sample, is monopolistically competitive (table 3). The estimated H statistic given by the sum of the factor price elasticities on labor, interest, capital, and other costs is 0.77 for the Chilean banking market, whereas its average value across countries is 0.81 (it ranges from a very low 0.18 to 1).¹⁹ In almost all cases with sufficient data—table 3 excludes six countries for which the total observations were fewer than 30 data points—the hypothesis of monopolistic competition cannot be rejected. These results echo earlier findings reported in the literature for both mature and emerging banking markets using the Panzar and Rosse approach, and they are consistent with general characterizations of the banking industry with product differentiation. Bank revenues are most responsive to funding costs: factor price elasticity for funds is 0.5, on average. The elasticity with respect to labor input is lower, but it is significantly different from zero throughout the sample. The price of fixed capital contributes only marginally to overall factor price elasticity and is insignificant for many countries, reflecting the infrequent and costly nature of capital adjustments.

17. Vesala (1995).

18. See the appendix for regression specifications and a description of the dataset.

19. Gelos and Roldós (2004) and Levy Yeyati and Micco (2003) report H statistics for Chile of 0.75 and 0.82, using data for 1994–2000, and 1996–2000, respectively. Neither study can reject the monopolistic competition hypothesis.

TABLE 1. Sample Statistics^a

<i>Country</i>	<i>Total assets</i>	<i>Overhead</i>	<i>Revenue</i>	<i>Net interest revenue</i>	<i>Other operating income</i>	<i>Total equity</i>	<i>No. banks</i>
Austria	4746.587 (18657.390)	70.664 (294.758)	260.677 (944.077)	67.726 (270.903)	38.964 (161.404)	184.369 (650.704)	73
Australia	20457.120 (41376.330)	528.301 (1008.459)	1429.026 (2776.326)	502.217 (1000.744)	381.525 (776.039)	1403.275 (2873.462)	43
Belgium	20259.030 (58801.760)	318.066 (913.624)	1151.467 (3157.378)	268.229 (747.013)	192.141 (582.986)	676.629 (1912.602)	54
Bolivia	312.282 (280.548)	12.350 (9.775)	40.260 (38.403)	15.376 (14.439)	3.983 (3.799)	27.419 (23.014)	16
Brazil	3272.404 (9652.430)	230.929 (742.851)	924.579 (2734.633)	210.705 (618.685)	103.950 (445.516)	292.261 (753.200)	188
Chile	2499.569 (3502.346)	73.056 (100.739)	280.659 (394.427)	98.564 (141.446)	27.328 (49.185)	197.928 (256.991)	32
Czech Republic	2581.711 (4300.878)	80.363 (152.881)	272.244 (456.278)	70.678 (137.444)	47.628 (95.657)	178.794 (301.641)	36
Denmark	4774.278 (20642.830)	73.460 (241.164)	240.938 (823.406)	81.822 (266.760)	27.094 (97.298)	235.902 (809.888)	61
Finland	30593.020 (46462.230)	496.018 (731.495)	1511.528 (1898.457)	496.404 (761.078)	367.281 (548.317)	1587.737 (2241.628)	11
Greece	9052.923 (12748.080)	246.629 (302.932)	789.653 (1202.842)	217.086 (276.500)	182.836 (261.242)	594.336 (705.818)	24
Hong Kong	10660.760 (33523.820)	125.819 (405.322)	697.296 (2171.576)	251.071 (751.115)	93.457 (328.316)	902.827 (2239.330)	50
Hungary	1160.302 (1774.175)	53.206 (100.663)	170.153 (275.132)	48.749 (85.925)	29.989 (57.481)	92.693 (120.900)	34
Ireland	9213.266 (18976.350)	175.939 (494.002)	601.764 (1218.939)	161.551 (426.184)	134.583 (406.223)	541.174 (967.125)	45
Israel	9942.464 (15479.310)	241.288 (378.344)	688.410 (1129.877)	226.976 (362.715)	137.840 (224.190)	550.616 (855.474)	19
Japan	51407.460 (126279.300)	655.673 (1393.175)	2439.574 (6262.512)	712.727 (1524.584)	323.642 (944.661)	2073.242 (5019.586)	171
Lithuania	286.812 (414.105)	14.986 (18.192)	20.357 (24.626)	10.565 (14.521)	7.855 (10.039)	28.507 (43.960)	14
Latvia	164.354 (246.155)	8.394 (10.654)	12.061 (15.130)	6.188 (8.630)	5.344 (8.823)	15.652 (22.895)	30
Mexico	3610.957 (7979.316)	178.047 (397.327)	694.526 (1491.462)	179.448 (447.702)	81.000 (215.981)	335.326 (803.654)	51
Malaysia	4512.454 (7047.335)	71.824 (105.112)	334.705 (540.594)	132.959 (204.082)	45.749 (75.628)	358.855 (558.375)	45
Netherlands	26989.510 (96234.190)	549.543 (2132.205)	1453.191 (5276.347)	442.939 (1671.718)	324.735 (1280.352)	1069.812 (3492.189)	57
Norway	7124.252 (11467.040)	163.084 (239.470)	506.571 (738.118)	167.087 (246.658)	83.874 (130.269)	457.979 (720.545)	18
New Zealand	8847.123 (6736.217)	182.333 (153.610)	705.977 (605.921)	212.528 (173.653)	114.292 (99.133)	408.849 (385.246)	14

(continued)

TABLE 1. Sample Statistics^a (continued)

Country	Total assets	Overhead	Revenue	Net interest revenue	Other operating income	Total equity	No. banks
Peru	830.291 (1284.749)	47.162 (63.946)	97.990 (146.039)	46.209 (64.766)	16.728 (30.971)	75.385 (109.301)	26
Philippines	1800.329 (2197.887)	64.198 (74.200)	200.013 (230.656)	65.599 (81.598)	36.903 (48.101)	233.654 (271.468)	42
Portugal	8043.414 (13362.900)	176.606 (321.399)	752.362 (1191.859)	173.192 (298.445)	102.665 (202.605)	448.315 (776.969)	37
Singapore	11231.700 (17142.930)	120.736 (170.082)	658.286 (849.721)	238.708 (332.782)	68.981 (101.272)	1302.905 (1991.726)	26
Slovenia	759.245 (1279.590)	28.191 (44.543)	70.721 (110.052)	29.634 (46.320)	15.573 (23.790)	74.993 (101.546)	27
Turkey	2881.709 (4814.326)	166.291 (318.368)	695.765 (1352.858)	238.035 (495.310)	20.326 (310.438)	282.691 (594.624)	56
Uruguay	621.423 (1039.823)	48.089 (156.267)	237.423 (484.383)	26.089 (66.183)	32.921 (132.861)	86.126 (267.160)	47

Source: Bankscope database.

a. Standard errors are in parentheses.

The H statistic estimates are subject to some downward bias for all countries owing to the inability to capture the maturity structure of loan portfolios in the database. If longer maturities in fixed rate contracts prevent banks from making fast price adjustments, even in perfectly competitive markets, then delayed changes in pricing would imply lower estimated elasticities. In the absence of cross-country information on contract maturity, there is no *ex ante* reason to expect this potential bias to affect only the estimates for Chile, although it would not be of equal magnitude across countries, either. Nonetheless, the H statistic estimates based on Chilean supervisory data only (table 2) for the period 1990–2004 also point to a lower H statistic when the regressions control for the maturity of the loans and deposits and the share of interbank loans and deposits. However, these results cannot be compared statistically to cross-country estimates of the H statistic obtained from another dataset and should be interpreted as self-standing.

To test whether the Chilean market's H statistic is statistically lower than those of other countries, I estimated a separate pooled regression with multiplicative dummies for the input costs; the dummy variable takes the value one if the bank operated in Chile, and zero otherwise. A significance test on the coefficients on these dummy variables provides the basis for comparing the input price elasticities of Chilean banks, and hence the H statistic of the Chilean

TABLE 2. Regression Results for Chile^a

<i>Explanatory variable</i>	(1)	(2)	(3)	(4)	(5)	(6)
Labor costs	-0.076 (0.083)	0.036 (0.073)	-0.056 (0.055)	0.080* (0.046)	-0.055 (0.056)	0.081* (0.046)
Interest costs	0.561*** (0.085)	0.481*** (0.075)	0.460*** (0.040)	0.385*** (0.034)	0.462*** (0.039)	0.384*** (0.034)
Capital costs	0.008 (0.089)	0.059 (0.084)	0.087** (0.044)	0.055 (0.039)	0.073* (0.043)	0.042 (0.039)
Other costs	0.104*** (0.028)	0.108*** (0.027)	0.144*** (0.017)	0.147*** (0.016)	0.151*** (0.017)	0.154*** (0.016)
Equity-to-assets ratio	0.900* (0.488)	0.436 (0.462)	0.7 (0.478)	0.263 (0.455)	0.715 (0.478)	0.291 (0.455)
Total loans / total assets	1.296*** (0.268)	1.124*** (0.236)	1.303*** (0.263)	1.097*** (0.230)	1.314*** (0.265)	1.104*** (0.231)
Foreign ^b × interest costs	-0.136 (0.092)	-0.133* (0.080)				
Foreign ^b × labor costs	0.026 (0.072)	0.055 (0.065)				
Foreign ^b × capital costs	0.058 (0.103)	-0.046 (0.096)				
Foreign ^b × other costs	0.063** (0.030)	0.068** (0.029)				
AFP ^c × interest costs			-0.037 (0.171)	-0.055 (0.168)		
AFP × labor costs			0.538* (0.324)	0.575* (0.322)		
AFP × capital costs			-0.600** (0.264)	-0.524** (0.255)		
AFP × other costs			0.198** (0.081)	0.209*** (0.080)		
Interbank loans/ total loans	-0.642*** (0.196)		-0.643*** (0.197)		-0.608*** (0.196)	
Short-term loans/ total loans	-0.074 (0.176)		-0.035 (0.173)		-0.066 (0.174)	
Short-term deposits/ total deposits	0.306 (0.187)		0.351* (0.189)		0.363* (0.186)	
Total deposits/ total funding	0.188 (0.253)	-0.149 (0.140)	0.242 (0.243)	-0.149 (0.134)	0.206 (0.244)	-0.158 (0.135)
<i>Summary statistic</i>						
No. observations	391	446	391	446	391	446
Adjusted R ²	0.48	0.42	0.48	0.42	0.47	0.42
H statistic	0.58	0.68	0.63	0.67	0.63	0.66
F value for H = 0	56.39	81.74	91.2	126.33	92.16	126.95
Probability > F for H = 0	0	0	0	0	0	0
F value for H = 1	25.58	17.465	30.351	31.64	31.844	33.04
Probability > F for H = 1	0	0	0	0	0	0

Source: Data are from the Superintendency of Banks and Financial Institutions (SBIF).

* Statistically significant at the 10 percent level.

** Statistically significant at the 5 percent level.

*** Statistically significant at the 1 percent level.

a. The dependent variable in all specifications is total revenues over total assets. All regressions use fixed effects. Standard errors are in parentheses.

b. Share of foreign ownership in a bank.

c. Dummy variable; AFP = 1 if a bank is affiliated with an AFP (private pension fund).

T A B L E 3 . Fixed-Effects Estimation of the Revenue Equation^a

<i>Explanatory variable</i>	<i>Austria</i>	<i>Australia</i>	<i>Belgium</i>	<i>Bolivia</i>	<i>Brazil</i>	<i>Chile</i>	<i>Czech Rep.</i>	<i>Denmark</i>	<i>Greece</i>	<i>Hong Kong</i>	<i>Hungary</i>	<i>Ireland</i>
Labor costs	0.146** (0.068)	0.113*** (0.031)	0.278*** (0.062)	0.219*** (0.046)	0.135*** (0.042)	0.205*** (0.072)	0.165*** (0.039)	0.356*** (0.037)	0.212** (0.082)	0.092*** (0.029)	0.213 (0.125)	0.216*** (0.060)
Interest costs	0.420*** (0.048)	0.736*** (0.051)	0.329*** (0.068)	0.400*** (0.043)	0.547*** (0.031)	0.417*** (0.063)	0.576*** (0.038)	0.303*** (0.020)	0.737*** (0.049)	0.557*** (0.025)	0.699*** (0.075)	0.734*** (0.053)
Capital costs	-0.028 (0.021)	0.069*** (0.021)	-0.02 (0.041)	-0.01 (0.040)	0.058** (0.029)	0.124*** (0.041)	-0.008 (0.023)	0.038** (0.017)	0.031 (0.039)	0.018 (0.017)	0.078 (0.111)	0.096* (0.050)
Other costs	0.084*** (0.022)	0.018* (0.010)	0.047** (0.022)	0.067*** (0.014)	0.105*** (0.021)	0.027 (0.018)	0.053*** (0.018)	0.075*** (0.011)	0.021 (0.016)	-0.014*** (0.004)	0.059* (0.032)	-0.015 (0.031)
Equity-to-assets ratio	0.976 (0.620)	2.013*** (0.572)	-1.643 (1.116)	2.728*** (0.816)	0.298* (0.160)	-0.14 (0.406)	0.875*** (0.300)	0.496 (0.504)	-0.725*** (0.229)	-0.319 (0.262)	3.645*** (1.157)	0.319 (0.724)
Total loans/ total assets	0.215 (0.161)	-0.212 (0.225)	-0.503* (0.270)	-0.254 (0.164)	-0.002 (0.118)	-0.311 (0.251)	-0.058 (0.142)	0.454*** (0.107)	0.299 (0.185)	0.325*** (0.087)	0.336 (0.303)	0.062 (0.222)
Total deposits/ total funding	-0.375* (0.189)	-0.079 (0.086)	0.098 (1.388)	0.099 (0.505)	-0.305** (0.119)	0.284** (0.131)	0.776*** (0.219)	-0.581* (0.324)	3.995* (2.115)	0.009 (0.044)	-0.46 (0.341)	-0.706*** (0.226)
Constant	-0.082 (0.340)	0.426* (0.242)	0.181 (1.463)	0.042 (0.530)	0.517*** (0.181)	-0.049 (0.515)	-0.418 (0.280)	0.622* (0.360)	-3.521 (2.128)	-0.645*** (0.172)	0.89 (0.639)	1.269*** (0.422)
<i>Summary statistic</i>												
No. observations	150	85	149	43	441	92	79	216	64	139	44	42
No. banks	47	23	39	14	129	26	25	53	18	33	13	13
Adjusted R ²	0.42	0.85	0.19	0.85	0.53	0.40	0.84	0.75	0.92	0.86	0.75	0.90
Within-group R ²	0.62	0.90	0.44	0.92	0.68	0.61	0.90	0.82	0.95	0.90	0.86	0.95
H statistic ^b	0.62	0.94	0.63	0.68	0.85	0.77	0.79	0.77	1.00	0.65	1.05	1.03
F statistic for null of H = 0 (MPC)	65.77***	330.22***	55.17***	99.76***	287.4***	47.43***	318.44***	246.64***	99.71***	340.98***	36.87***	103.74***
F statistic for null of H = 1 (PC)	24.18***	1.59	18.33***	22.97***	9.63**	4.13*	23.75***	21.63***	0.00	96.67***	0.08	0.09
Market structure	MPC	PC	MPC	MPC	MPC	MPC	MPC	MPC	PC	MPC	PC	PC

Explanatory variable	Israel	Japan	Latvia	Mexico	Malaysia	Netherlands	Philippines	Portugal	Slovenia	Turkey	Uruguay
Labor costs	0.377 (0.261)	0.431*** (0.043)	-0.264 (0.193)	0.097 (0.074)	0.208*** (0.036)	0.246*** (0.086)	0.144* (0.078)	0.116** (0.051)	0.024 (0.069)	0.198*** (0.048)	-0.048 (0.095)
Interest costs	0.425*** (0.033)	0.277*** (0.010)	0.348** (0.151)	0.731*** (0.062)	0.574*** (0.027)	0.677*** (0.052)	0.470*** (0.058)	0.332*** (0.041)	0.429*** (0.057)	0.552*** (0.034)	0.694*** (0.040)
Capital costs	0.18 (0.202)	0.041** (0.017)	0.01 (0.184)	-0.003 (0.036)	0.094*** (0.022)	-0.02 (0.030)	0.080** (0.031)	0.218*** (0.073)	-0.001 (0.023)	-0.007 (0.022)	0.097** (0.035)
Other costs	0.044 (0.073)	0.038*** (0.008)	0.089 (0.086)	0 (0.028)	0.019** (0.008)	0.048* (0.025)	0.025 (0.017)	0.262*** (0.019)	0.069*** (0.020)	0.072*** (0.016)	-0.034 (0.024)
Equity-to-assets ratio	2.564 (5.180)	1.174*** (0.341)	6.607*** (1.680)	0.656 (0.409)	0.645** (0.297)	-0.763 (0.919)	0.671* (0.340)	0.744 (0.491)	1.668* (0.836)	0.800*** (0.098)	3.286*** (0.827)
Total loans/ total assets	-0.367 (0.662)	-0.633*** (0.145)	-0.849 (0.659)	-0.322* (0.160)	0.033 (0.154)	0.346 (0.217)	0.134 (0.192)	-0.590*** (0.130)	-0.211* (0.106)	-0.393*** (0.128)	-0.358** (0.140)
Total deposits/ total funding	0.438 (2.229)	2.891*** (0.216)	0.708 (2.468)	0.714*** (0.188)	0.701*** (0.248)	-0.342 (0.361)	1.67 (6.593)	0.184 (0.173)	0.205 (0.135)	0.139** (0.069)	0.259 (0.273)
Constant	0.343 (2.078)	-2.208*** (0.314)	-2.574 (2.432)	-0.434 (0.440)	-0.352 (0.309)	1.104** (0.532)	-2.06 (6.563)	0.431 (0.354)	-0.807** (0.373)	0.683*** (0.207)	-0.946* (0.530)
<i>Summary statistic</i>											
No. observations	59	457	50	63	159	108	128	127	44	132	45
No. banks	17	112	17	28	40	29	36	29	12	44	17
Adjusted R ²	0.77	0.79	0.28	0.88	0.86	0.73	0.41	0.71	0.80	0.72	0.92
Within-group R ²	0.86	0.85	0.62	0.95	0.90	0.82	0.61	0.79	0.89	0.82	0.96
H statistic ^b	1.03	0.79	0.18	0.82	0.90	0.95	0.72	0.93	0.52	0.81	0.71
F statistic for null of H = 0 (MPC)	9.96**	529.64***	0.37	107.9***	445.01***	118.89***	67.66***	111.05***	31.57***	220.86***	48.62***
F statistic for null of H = 1 (PC)	0.01	38.76***	7.39*	4.93*	5.98*	0.32	10.33***	0.65	26.69***	11.59***	8.13**
Market structure	PC	MPC	MPC	MPC	MPC	PC	MPC	PC	MPC	MPC	MPC

Source: Bankscope data base.

MPC = monopolistic competition; PC = perfect competition.

* Statistically significant at the 10 percent level.

** Statistically significant at the 5 percent level.

*** Statistically significant at the 1 percent level.

a. The table reports the results of estimating equation 7 in the appendix. The dependent variable is total revenues over total assets. The sample excludes six countries for which the total observations were fewer than 30 data points. Standard errors are in parentheses.

b. The H statistic is given by the sum of the coefficients on "labor," "interest," "capital," and "other costs."

banking market, with a pooled sample of other banks. I also included other macroeconomic variables in this regression to control for country-specific factors, and two interactive dummy variables to control for the effect of foreign ownership, bank size on input prices, and the bank concentration (the HHI index) in each country.

The results from a set of alternative specifications suggest that the H statistic for Chile is statistically lower than that observed in the overall sample, reinforcing the conclusion that there is less competition in Chile (table 4). The difference in the H statistic is mostly due to a lower factor price elasticity for funds—the most important component of the H statistic—while the price elasticity of capital tends to be systematically higher.

The dispersion of the competition index across countries does not seem to be strongly correlated with the observed concentration in those markets (figure 2). The exercise reveals no clear relation between the estimated H statistics and the concentration index in banking systems across countries. This is consistent with the ambiguity of the structure-conduct-performance hypothesis in the data, as noted above. Levy Yeyati and Micco report estimates for Latin America in which increasing concentration does not significantly alter the estimated H statistics over time.²⁰ They also report a negative correlation between increasing foreign penetration and the estimated H statistics, a result confirmed by the negative sign of the interactive dummy for the share of foreign assets in the bank and the input prices reported in table 4.

High and persistent profitability is usually associated with noncompetitive behavior. To complement the analysis above, I compared cross-country bank profitability to assess whether Chilean banks are making profits above and beyond what can be explained by factors that affect cross-country differences in bank profitability. A simple comparison of profitability indicators across twenty-nine countries in 1995–2004 points to comfortable profit levels in Chile, in terms of both average assets and average equity, driven mainly by high net interest margins (figure 3). The Chilean banking system also has moderately high cost-to-income ratios relative to other countries.

To test whether Chile's net interest margins, the most important component of the return on average assets, are greater than what can be explained by bank- and country-specific factors, I estimated a pooled regression controlling for bank- and country-specific variables and including a dummy variable that identifies Chilean banks. Since this comparison aims to account for

20. Levy Yeyati and Micco (2003).

TABLE 4. Pooled Regression Results for Chile^a

<i>Explanatory variable</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(11)	(12)	(13)
Labor costs	0.091** (0.038)	0.081** (0.038)	0.194*** (0.017)	0.262*** (0.018)	0.062* (0.031)	0.269*** (0.018)	0.080** (0.038)	0.091** (0.038)	0.078** (0.038)	0.087** (0.038)	0.067** (0.031)
Interest costs	0.488*** (0.028)	0.512*** (0.026)	0.471*** (0.012)	0.464*** (0.013)	0.521*** (0.022)	0.442*** (0.011)	0.512*** (0.026)	0.488*** (0.028)	0.515*** (0.025)	0.486*** (0.028)	0.517*** (0.021)
Capital costs	0.064 (0.040)	0.071* (0.040)	0.030*** (0.010)	0.014 (0.009)	0.084*** (0.030)	0.013 (0.009)	0.073* (0.040)	0.065 (0.040)	0.077* (0.039)	0.077* (0.039)	0.077*** (0.029)
Other costs	0.052*** (0.013)	0.056*** (0.013)	0.053*** (0.006)	0.034*** (0.005)	0.057*** (0.010)	0.031*** (0.005)	0.056*** (0.013)	0.052*** (0.013)	0.058*** (0.013)	0.048*** (0.013)	0.057*** (0.010)
Chile dummy × interest costs	-0.245* (0.137)	-0.280** (0.137)	-0.165* (0.095)	-0.153*** (0.059)	-0.283** (0.114)	-0.115* (0.059)	-0.281** (0.137)	-0.245* (0.137)	-0.292** (0.136)	-0.236* (0.137)	-0.286** (0.113)
Chile dummy × labor costs	0.047 (0.169)	0.048 (0.170)	-0.044 (0.120)	-0.137* (0.075)	0.049 (0.136)	-0.137* (0.075)	0.048 (0.170)	0.048 (0.169)	0.051 (0.170)	0.046 (0.170)	0.048 (0.135)
Chile dummy × capital costs	0.230** (0.112)	0.228** (0.113)	0.096 (0.077)	0.138*** (0.048)	0.207** (0.087)	0.142*** (0.048)	0.227** (0.113)	0.229** (0.112)	0.224** (0.112)	0.232** (0.112)	0.201** (0.086)
Chile dummy × other costs	-0.049 (0.057)	-0.038 (0.058)	-0.024 (0.035)	-0.004 (0.022)	-0.033 (0.048)	-0.014 (0.022)	-0.037 (0.057)	-0.049 (0.057)	-0.036 (0.057)	-0.048 (0.057)	-0.03 (0.047)
Equity-to-assets ratio	1.108*** (0.255)	1.124*** (0.256)	0.494*** (0.075)	0.527*** (0.067)	1.251*** (0.194)	0.520*** (0.068)	1.120*** (0.255)	1.107*** (0.254)	1.139*** (0.254)	1.057*** (0.254)	1.268*** (0.191)
Total loans/total assets	-0.109 (0.096)	-0.123 (0.096)	0.004 (0.051)	0.127** (0.055)	-0.197*** (0.073)	0.109** (0.055)	-0.124 (0.096)	-0.109 (0.096)	-0.124 (0.096)	-0.106 (0.096)	-0.172** (0.071)
Total deposits/total funding	0.234* (0.126)	0.241* (0.126)	-0.101* (0.055)	0.228*** (0.056)	0.038 (0.093)	0.238*** (0.056)	0.242* (0.126)	0.234* (0.125)	0.240* (0.126)	0.208* (0.125)	0.04 (0.092)
Herfindahl-Hirschman index country	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)

(continued)

TABLE 4. Pooled Regression Results for Chile^a (continued)

Explanatory variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(11)	(12)	(13)
Total assets of deposit money banks/GDP	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000*** (0.000)	0.000 (0.000)	-0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	
Per capita income	0.000 (0.000)	0.000 (0.000)	-0.000** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)			
CPI inflation	0.005** (0.002)	0.005** (0.002)	0.003*** (0.001)				0.005** (0.002)	0.007** (0.004)	-0.006 (0.004)		
GDP growth	-0.002** (0.001)			0.002*** (0.000)				-0.002** (0.001)		-0.002** (0.001)	
Size ^b	-0.066* (0.040)	-0.072* (0.040)			-0.099*** (0.029)						
Foreign ^c											
Constant	-0.082 (0.332)	0.149 (0.318)	0.298*** (0.113)	0.137 (0.118)	0.510** (0.252)	0.045 (0.116)	0.128 (0.310)	-0.089 (0.323)	0.075 (0.304)	0.114 (0.298)	0.297 (0.230)
<i>Summary statistic</i>											
No. observations	664	664	2,465	1,604	794	1,604	664	664	664	664	822
No. banks	241	241	873	594	248	594	241	241	241	241	249
Adjusted R ²	0.47	0.46	0.42	0.58	0.53	0.58	0.46	0.47	0.46	0.46	0.52
Within-group R ²	0.67	0.67	0.63	0.74	0.68	0.74	0.67	0.67	0.67	0.67	0.67

Source: Bankscope database.

* Statistically significant at the 10 percent level.

** Statistically significant at the 5 percent level.

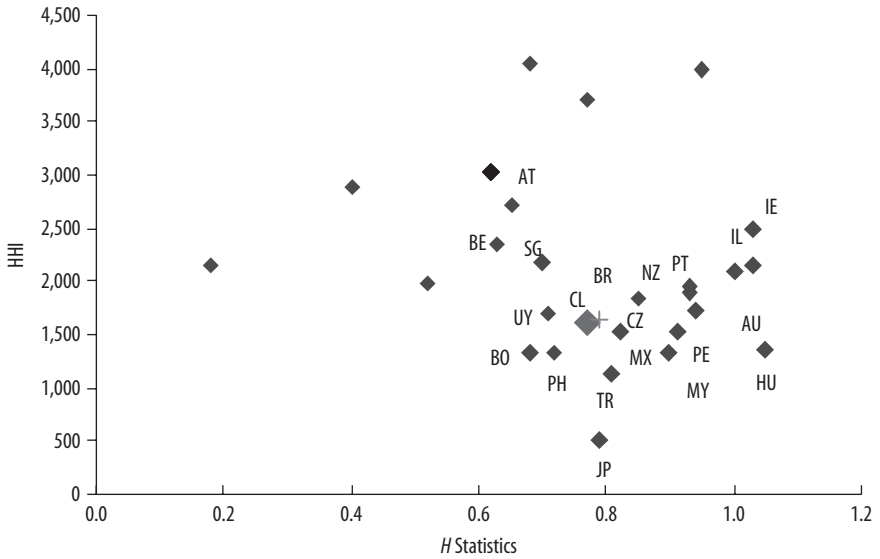
*** Statistically significant at the 1 percent level.

a. The dependent variable is total revenues over total assets. Standard errors are in parentheses.

b. Share of bank's assets in total system assets interacted with input prices.

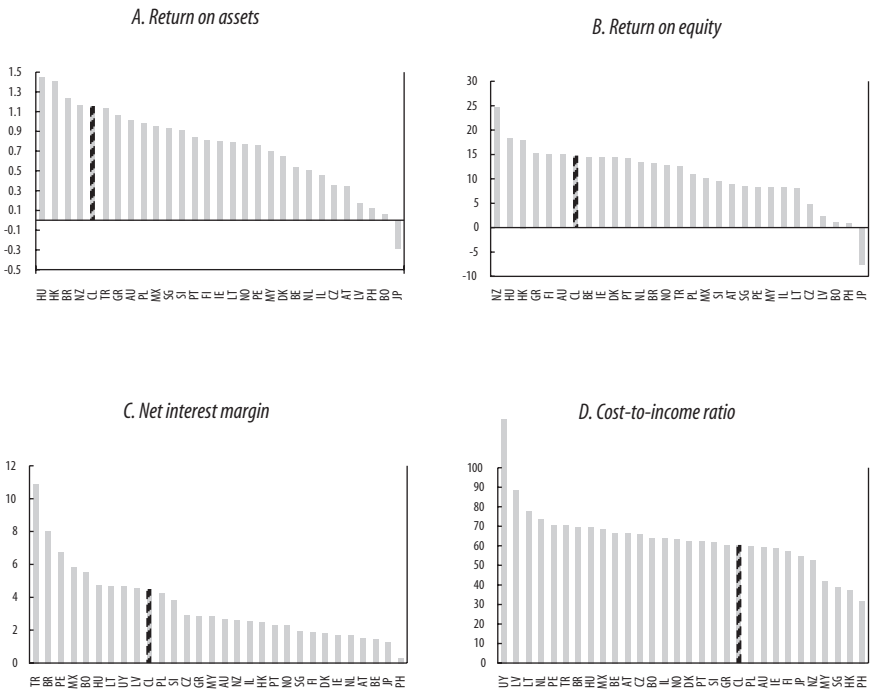
c. Share of foreign ownership in a bank interacted with input prices.

FIGURE 2. Herfindahl-Hirschman Index and H Statistics



Source: Bankscope database.

FIGURE 3. Profitability Indicators^a



Source: Bankscope database.

a. See figure 1 for a list of the country codes.

differences among banks, rather than the variation within banks over time, I used the between-groups estimator.²¹ Table 5 provides selected results. The regressions controlled for the ratio of bank equity to total assets, loans to assets, total deposits to total funding, nonearning assets to total assets, and interest revenue to total operating income, as well as overhead costs, the liquid assets ratio, and the tax rate (defined as taxes over pretax profits). It further controls for foreign ownership and concentration in the sector. To account for cross-country differences, the regressions included the average interest rates (defined as the average of a short- and long-term interest rate), per capita income, the ratio of the total assets of deposit money banks to gross domestic product (GDP), inflation, and real GDP growth.²² In the absence of a better measure for credit risk—a key determinant of the net interest margin—the regressions included sovereign spreads to control for cross-country differences in risk.²³

Chilean banks have a net interest margin that is 1.50 to 2.25 points higher, on average, than the average bank in the sample. This difference is statistically significant in all specifications of the regression after controlling for various bank-specific and macroeconomic characteristics. This result is robust to excluding larger Chilean banks from the sample and corroborates earlier findings of less competition in the Chilean banking market.

Potential Sources of Market Power in Chile

The Chilean banking sector has several potential sources of market power. These stem from the characteristics of the financial system in general and the market structure of the banking system in particular, as well as from financial

21. In the sample, the variation of net interest margins across banks is more than double the average variation over time for a given bank, which further confirms the appropriateness of the between-groups estimator over a fixed-effects regression. The between-groups estimator is equivalent to using sample means of the variables for each bank, and it eliminates the complication of time dynamics in the sample. The country-specific time-varying macroeconomic variables should thus be interpreted as reflecting the sample mean differences between countries, rather than their respective variation over time. The regression specification should be considered a reduced form to account for differences in the sample averages of bank and country-specific factors, rather than a structural model of net interest margins.

22. Demirgüç-Kunt and Huizinga (1999) use a similar specification, estimating cross-country regressions to explain the determinants of commercial bank interest margins.

23. The Bankscope database does not consistently report loan-loss provisions, which would have been a better measure of bank credit risk.

TABLE 5. Regression Results for Chile: Between-Group Estimator with Weighted Least Squares^a

<i>Explanatory variable</i>	(1)	(2)	(3)	(4)	(5)	(6)
Equity-to-assets ratio	10.647*** (1.299)	10.037*** (1.281)	10.482*** (1.274)	10.614*** (1.167)	10.475*** (1.144)	9.639*** (1.168)
Total loans/total assets	2.375*** (0.554)	2.405*** (0.556)	1.922*** (0.554)	2.431*** (0.509)	2.413*** (0.508)	1.590*** (0.505)
Overhead/total assets	0.440*** (0.037)	0.446*** (0.038)	0.387*** (0.038)	0.419*** (0.034)	0.423*** (0.034)	0.449*** (0.035)
Liquid funds/total assets	-0.009*** (0.003)	-0.008** (0.003)	-0.008** (0.003)	-0.009*** (0.003)	-0.009*** (0.003)	-0.008** (0.003)
Tax rate	0.048 (0.108)	0.063 (0.108)	0.054 (0.113)	0.065 (0.105)	0.069 (0.105)	0.11 (0.112)
Nonearning assets/total assets	-0.036** (0.016)	-0.040** (0.016)	-0.034** (0.016)	-0.035** (0.015)	-0.037** (0.014)	-0.046*** (0.015)
Interest revenue/ operating income	0.014 (0.036)	0.005 (0.036)	-0.063* (0.036)	-0.013 (0.033)	-0.012 (0.033)	-0.015 (0.034)
Foreign ^b	-0.214 (0.259)	-0.285 (0.258)	-0.617** (0.258)	-0.306 (0.236)	-0.315 (0.235)	-0.600** (0.241)
Sovereign spreads	0.003*** (0.001)	0.002** (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.003*** (0.001)
Interest rate	-0.089*** (0.030)	-0.041* (0.023)	0.085*** (0.017)			
Inflation	0.200*** (0.026)	0.205*** (0.026)		0.171*** (0.020)	0.178*** (0.017)	
Chile dummy	1.492** (0.724)	2.257*** (0.661)	2.014*** (0.685)	2.058*** (0.663)	2.172*** (0.635)	1.610** (0.671)
Constant	-1.354 (0.893)	-1.731* (0.883)	-0.542 (0.866)	-1.471* (0.816)	-1.501* (0.814)	0.632 (0.799)
<i>Summary statistic</i>						
No. observations	3,273	3,273	3,609	3,618	3,618	4,009
No. banks	790	790	797	858	858	867
Adjusted R^2	0.47	0.46	0.43	0.47	0.47	0.42
Between-group R^2	0.48	0.47	0.44	0.48	0.48	0.42

Source: Bankscope database.

* Statistically significant at the 10 percent level.

** Statistically significant at the 5 percent level.

*** Statistically significant at the 1 percent level.

a. The dependent variable is the net interest margin. Standard errors are in parentheses.

b. Share of foreign ownership in a bank.

regulations. This section briefly discusses each argument and suggests venues for future research.

Banks in Chile face negligible competition from nonbank financial institutions. In most advanced economies, the liberalization of financial services has led to increased competition from nonbank financial intermediaries, which

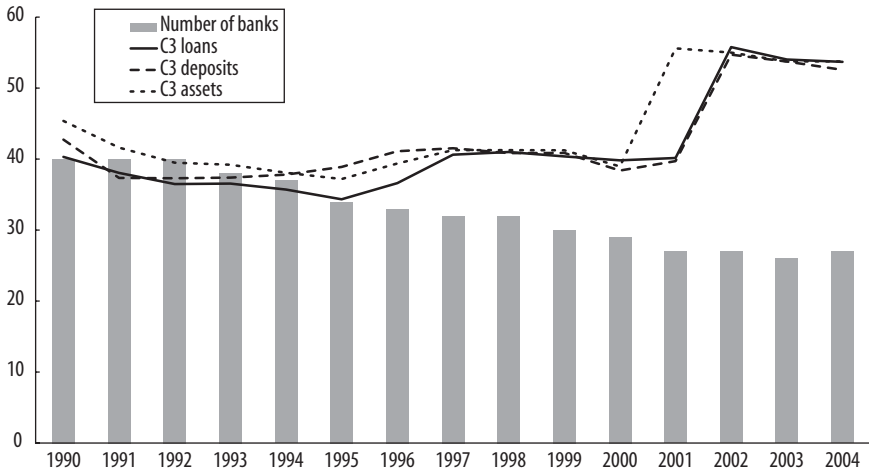
has tended to compress margins in the banking sector.²⁴ Chile, despite its large banking system, has only a handful of small nonbank financial institutions that are independent of banks. Data from the SBIF indicate that banks owned 62.6 percent of the total assets of the brokerage subsector, 98.2 percent of the securities agents subsector, 85.8 percent of mutual funds, 9.0 percent of investment funds, 99.9 percent of leasing, and 50.5 percent of securitization at year-end 2004. This could be a reflection of conglomeration in the overall economy, particularly in the financial sector. Ownership concentration in a few large conglomerates limits the supply of capital from independent sources. Honohan finds that countries with higher spreads and higher profitability in their main banking system tend to have fewer microfinance institutions.²⁵ Chile does not appear to be an exception in this regard. The fastest-growing segments of the nonbank credit sector, such as leasing and factoring, are owned by, and increasingly integrated into, banking groups. There are only three independent factoring companies outside of the banking system, and they have small market shares. The financial system also includes seventy-nine credit cooperatives, but their small size and narrow range of activities do not create any competitive pressures on the banking system.²⁶ The mutual fund sector is also dominated by banks, with over 60 percent of funds under management controlled by three large banks. Since 2004, insurance companies have been allowed to extend certain types of loans to their customers, which could potentially increase competitive pressures in some business lines. Competition from nonbanks also has a cyclical element in some business lines. For example, alternative financing to small and medium-sized businesses declined sharply following the slowdown in 1998–99. This economic sector has registered strong growth since 2004, and nonbanks are now aggressively moving into this segment of the market.

Over the past twenty years, the Chilean banking sector has grown increasingly concentrated. The decrease in the number of banking institutions is the result of the 1982 banking crisis and a series of mergers that took place in the last decade. The number of banks dropped from forty institutions in 1992 to 26 at year-end 2003 (figure 4). At year-end 2004, the three largest banks accounted for about 54 percent of total system assets and deposits

24. See Hackethal (2004); BIS (2001).

25. Honohan (2004).

26. Their market share in terms of total loans is 0.8 percent, with the majority of loans concentrated in microfinance lending (that is, loans of up to 200 UF, or *Unidades de Fomento*, equivalent to about U.S.\$6,700).

FIGURE 4. Chile: Number of Banks and Concentration Indexes^a

Source: Superintendency of Banks and Financial Institutions.

a. C3 loans, deposits, and assets are the share of total system loans, deposits, and assets, respectively, held by the three largest banks.

and 53 percent of loans. Twenty of the banks are privately held, and six are affiliates of foreign banks. The state-owned Banco del Estado is the third largest bank in the system. It manages the account of the General Treasury of the Republic and also conducts regular banking operations. The six foreign banks established in Chile (namely, ABN AMRO, BBVA, Deutsche Bank, Santander Chile, Scotiabank SudAmericano, and HSBC) are either majority owned (directly or indirectly) or controlled by foreign bank interests.²⁷ They account for about 34 percent of total assets and include the largest bank in the system (table 6). In addition, the local branches of foreign banks account for close to 6 percent of total bank assets.

Although the Chilean banking sector became increasingly concentrated, this trend is similar to the global trend experienced by the other countries in the sample and does not appear to reflect a significant increase in market power. In a cross-country comparison of the average concentration—measured as the share of assets (or loans or deposits) of the three largest banks, or the C3 ratio—Chile does not stand out for its level of concentration or its concentration trend since 1995 (figure 5). Concentration in the banking sector has

27. Dresdner Bank Sudamerika scaled back its presence to a representative office in September 2004.

TABLE 6. Market Share and Ownership in the Chilean Banking Sector^a

<i>Institution, by type</i>	<i>Controlling group</i>	<i>Market share (percentage of system total)</i>		
		<i>Total assets</i>	<i>Total loans</i>	<i>Total deposits</i>
<i>Banks established in Chile</i>				
Banco Santander—Chile	Santander ^b	21.8	22.7	20.6
Banco de Chile	Luksic	16.0	17.6	16.4
Banco del Estado de Chile	Government of Chile	15.9	13.3	15.5
Banco de Crédito e Inversiones	Yarur	11.9	12.0	11.8
Banco Bilbao Vizcaya Argentaria, Chile	BBVA ^b	7.1	7.7	8.3
Corpbanca	Saieh	5.7	6.5	5.9
Scotiabank Sud Americano	Scotia ^b	3.1	3.1	3.2
Banco Bice	Matte	3.0	2.7	3.4
Banco del Desarrollo	Norte Sur	3.0	3.7	2.8
Banco Security	Sigdo Koppers	2.9	3.1	3.3
HSBC Bank Chile	HSBC ^b	0.7	0.3	0.3
ABN AMRO Bank (Chile)	ABN ^b	0.7	0.6	0.3
Deutsche Bank Chile	Bankers Trust and Deutsche Bank ^b	0.7	0.0	0.7
Banco Falabella	Falabella	0.6	0.7	0.7
Banco Internacional	Furman	0.3	0.3	0.4
Banco Ripley	Calderón	0.2	0.3	0.3
París		0.2	0.3	0.3
HNS Banco	Ergas	0.2	0.2	0.2
Banco Penta		0.1	0.0	0.0
Banco Monex	Ergas Benmayor	0.1	0.0	0.0
<i>Foreign bank branches</i>				
Citibank N.A.		2.9	2.2	2.9
BankBoston N.A.		2.3	2.3	2.4
J. P. Morgan Chase Bank		0.4	0.0	0.2
Bank of Tokyo-Mitsubishi Ltd.		0.1	0.1	0.1
Banco do Brasil S.A.		0.1	0.1	0.0
Banco de la Nación Argentina		0.0	0.0	0.0

Source: Superintendency of Banks and Financial Institutions.

a. As of December 2004.

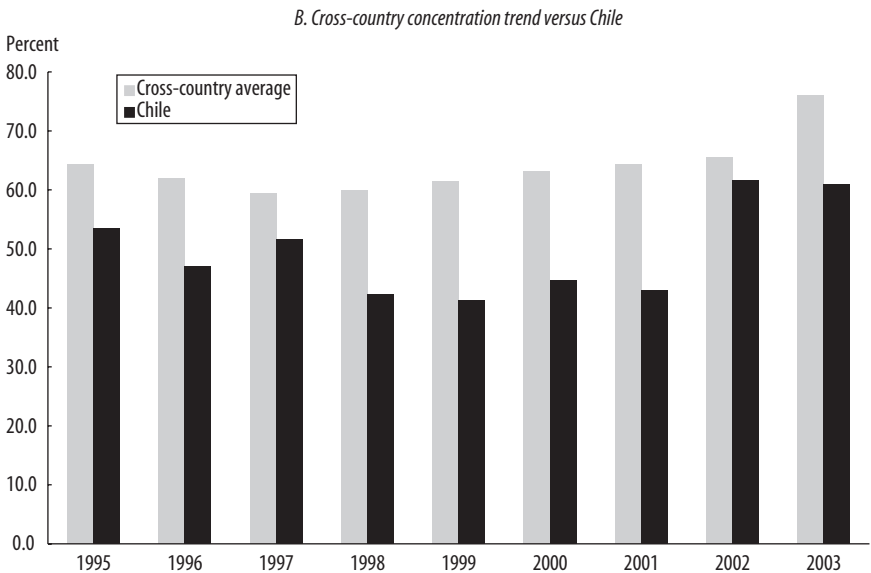
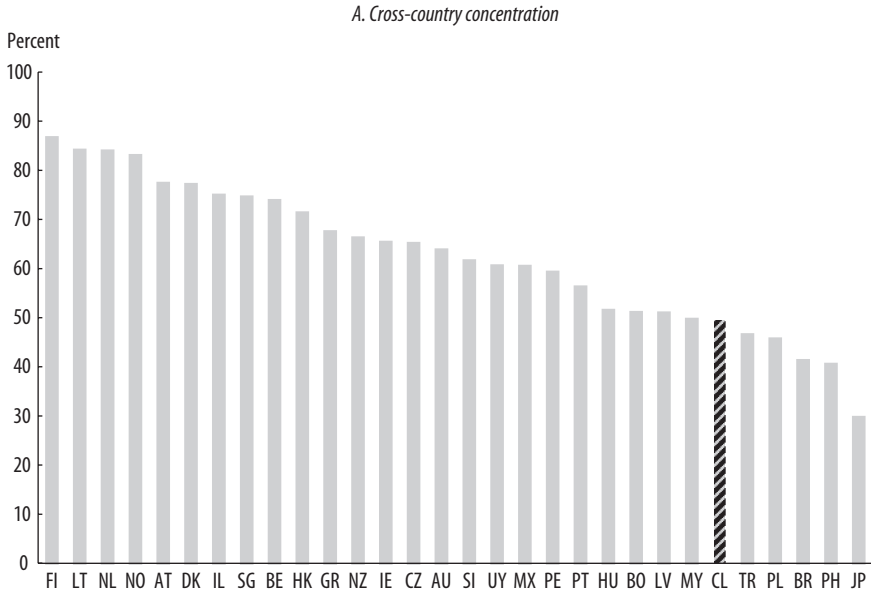
b. Foreign owned or controlled.

increased since the mid-1990s in virtually all countries in the sample. This partly reflects the liberalization of financial services, which has improved economies of scale in the banking sector and has thus increased incentives for mergers and international integration, and partly the use of consolidation as a means of dealing with banking crises, especially in emerging markets.²⁸

The contestability of the Chilean market may be limited by incentives for high capitalization. Regulatory barriers to bank entry in Chile are among the

28. See Gelos and Roldós (2004) and BIS (2001) for a discussion of concentration trends in emerging markets.

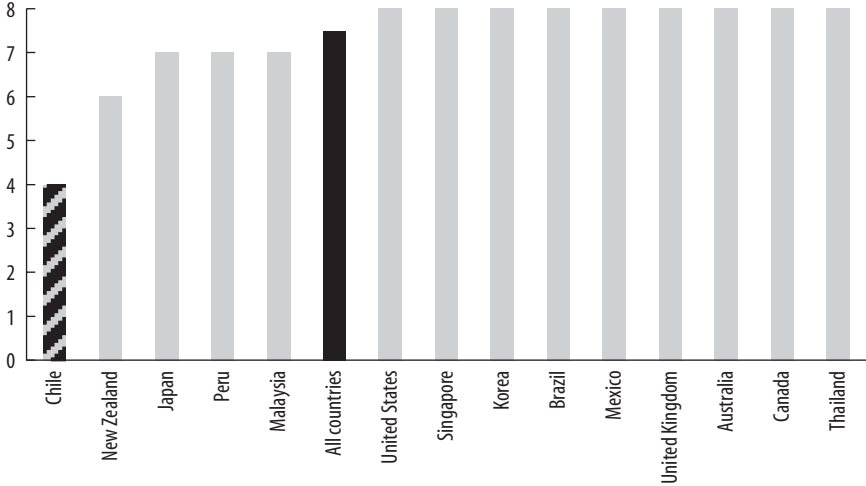
FIGURE 5. Cross-Country Concentration^a



Source: Bankscope database.

a. Cross-country concentration is measured by the C3 ratio. See figure 1 for a list of the country codes.

FIGURE 6. Entry Restrictions^a

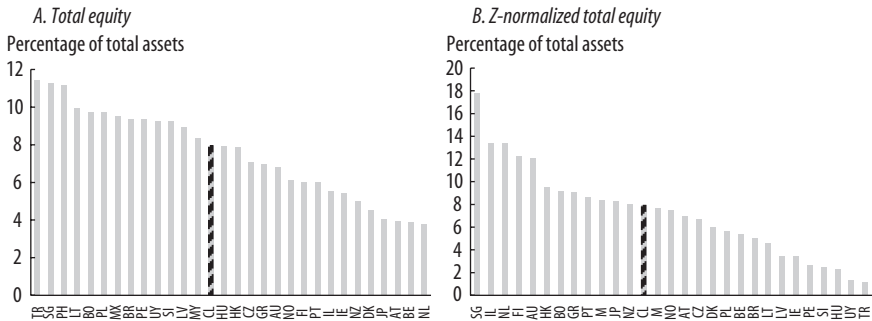


Source: Barth, Caprio, and Levine (2001).

a. Entry restrictions are calculated on the basis of the legal submissions required for a banking license. The index takes a value of 1 to 8, with 8 being the most restrictive. The full sample encompasses 151 countries.
y-axis: Index value.

lowest by international standards (figure 6).²⁹ The capitalization levels of the Chilean banking system, however, are higher than most countries and well above the minimum supervisory requirements; this may act as an effective entry cost, particularly given the relatively small size of the domestic banking market (figure 7). Based on the ratio of capital to non-risk-weighted assets, a 1 percent market share (in terms of non-risk-weighted assets) in the Chilean banking system would cost about 5 percent more in equity capital than the average across the countries in the sample. This simple equity-capital-to-assets ratio does not incorporate bank risk. A more appropriate indicator is the ratio of capital to risk-weighted assets, but this measure is not consistently reported in the Bankscope database. In Chile, the risk-weighted capital-asset ratio stood at 15 percent at the end of February 2005, which is above the supervisory minimum of 8 percent. To account for differences in bank default

29. Barth, Caprio, and Levine (2001) construct an index of entry restrictions, based on the legal submission requirements to obtain a new banking license. These requirements range from the submission of sources of funds to be disbursed in the capitalization of the new bank to the specification of the market differentiation intended for the new bank. The index can take a value of one to eight (with eight being the most restrictive).

FIGURE 7. Total Equity as Percentage of Total Assets^a

Source: Bankscope database.

a. See figure 1 for a list of the country codes.

risk across countries, I normalized the equity-capital-to-assets ratio using the Z score. The Z score measures a bank's systemic risk potential. It is defined as the ratio of the return on average assets plus the equity-capital-to-assets ratio to the standard deviation of the return on average assets. A larger value for the Z score indicates a lower risk profile, either through improved efficiency (a high return on average assets), greater diversification (a low variation of the return on average assets), or lower leveraging (an increasing equity-capital-to-assets ratio). The Z-score-normalized capital-to-assets ratios are comparable if the bank default risk in individual countries equals that of Chile. When adjusted for banking risks, the Chilean banks' equity is about 10 percent higher than the cross-country average in the sample. In other words, for comparable banking default risk, obtaining one percent of Chilean bank assets costs about 10 percent more in equity capital than the sample average. The high levels of bank capitalization in Chile may partly reflect the investment restrictions on private pension funds (AFPs). As the largest institutional depositors in the banking system, the AFPs are prohibited from investing in banks whose credit rating falls below BBB. This encourages banks to maintain risk-weighted capital-asset ratios above the required minimum level, to ensure high credit ratings to sustain a large base of institutional depositors.

The reduction of minimum paid-in capital requirements in recent years may have reduced the cost of entry at the margin. In late 2001, the SBIF lowered the minimum paid-in capital requirements to promote the development of niche banks and improve competition. Five banks have since entered the market, including two consumer-oriented commercial banks and the only

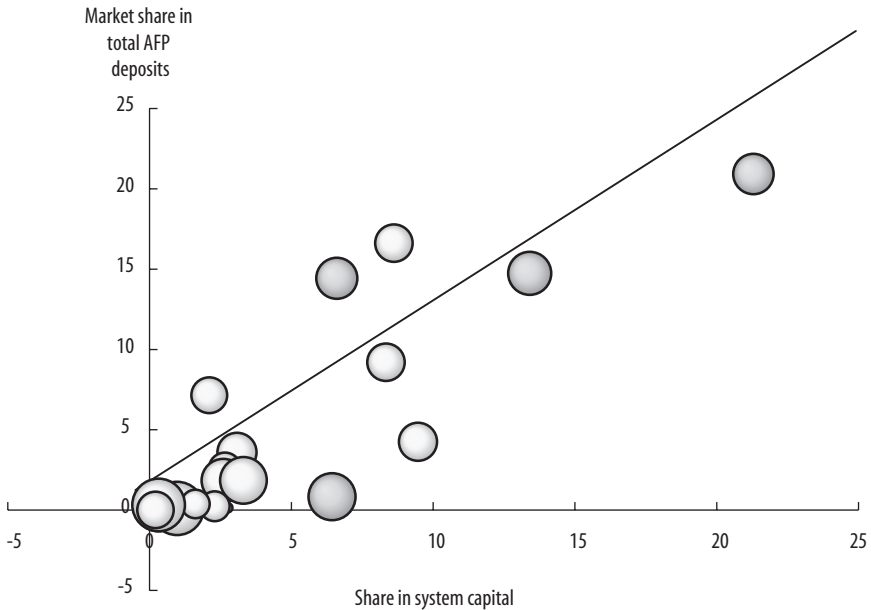
remaining finance company, which was reclassified as a full-fledged bank. The other two entrants are small banks specializing in financing for small and medium-sized enterprises and foreign exchange operations, respectively. Although all new entrants are niche players, they signal an intensifying competition, especially in retail banking, which has expanded significantly since 2004.

Chilean banks' reliance on pension fund deposits for funding could be creating a potential source of market power. A large, stable depositor base may help boost interest margins by reducing systemwide funding costs. More than 29 percent of AFP funds were invested in local financial institutions at year-end 2005, since investment abroad is limited to 30 percent of AFP assets and various other investment restrictions on AFPs quickly become binding in a small capital market. The remainder of their assets were invested in government and central bank securities (17 percent) and domestic corporations (24 percent). At year-end 2005, AFP deposits accounted for about 24 percent of total deposits in the financial system and 200 percent of the system's capital. Investment regulations limit the AFPs' exposure to any bank to 100 percent or less of the bank's capital. Consequently, AFP deposits appear to be broadly distributed across the system in proportion to bank capital (figure 8). Restrictions on foreign investments are aimed at fulfilling the AFPs' fiduciary duty to safeguard the first and only pillar of the pension system. Nevertheless, relaxing restrictions would allow AFPs to better diversify their risk, while increasing incentives for the domestic banking sector to compete more effectively for funds and to expand households' access to banking services.

Ownership linkages with AFPs may also provide a competitive advantage to banks. All the large pension funds in Chile belong to foreign banks. Using bank-by-bank panel data on interest rates and AFP deposits, Ahumada and Cetorelli find that banks affiliated with pension funds have higher deposit rates and a larger deposit base (controlling for bank size and other bank characteristics).³⁰ They conclude that banks affiliated with a pension fund may be offering above-market interest rates to this fund, which has the effect of stabilizing their deposit base and lowering their funding costs. The affiliated banks also tend to have higher interest margins than nonaffiliated banks, so they may be able to pursue riskier lending strategies than their counterparts.

The presence of foreign banks is often cited as an innovative force in that they introduce product innovation, cost efficiency, and better risk management practices. The evidence on the impact of foreign bank ownership on the level of spreads and competition is mixed, however. Martínez Peria and

30. Ahumada and Cetorelli (2003).

FIGURE 8. Bank Size, AFP Deposits, and Bank Risk (in percent)^a

Source: Superintendency of Banks and Financial Institutions (SBIF).

AFP = private pension fund.

a. The bubble size represents the bank's risk indicator as of December 2004, with a bigger bubble corresponding to higher risk, as defined by SBIF.

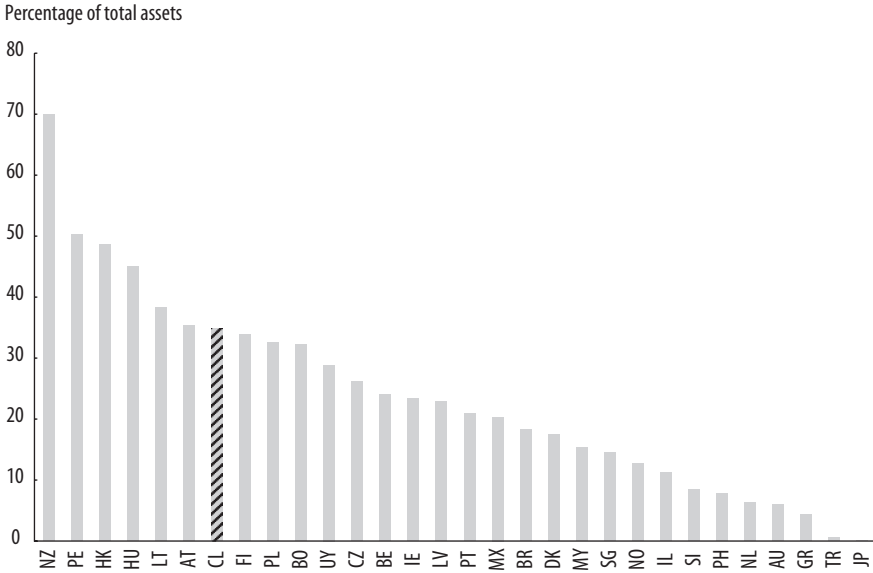
Mody find that foreign banks in Latin America, especially new entrants (as opposed to established banks acquired by foreigners), have lower administrative costs and charge lower spreads than domestic banks.³¹ In contrast, Claessens, Demirgüç-Kunt, and Huizinga report that foreign banks in developing countries tend to have higher net interest margins and overhead costs than domestically owned banks, contradicting the argument of efficiency gains from foreign bank entry.³² Detragiache, Tressel, and Gupta find that in poor countries, a large foreign bank presence is associated with shallow credit markets.³³ The Chilean banking sector has been open to foreign entry since the banking crisis of the early 1980s. Today, Chile has one of the highest ratios of foreign bank ownership in the region and among other emerging economies (figure 9). The presence of foreign banks in the sector appears to

31. Martínez Pería and Mody (2004).

32. Claessens, Demirgüç-Kunt, and Huizinga (2001).

33. Detragiache, Tressel, and Gupta (2006).

FIGURE 9. Foreign Ownership^a



Source: Bankscope database.
 a. See figure 1 for a list of the country codes.

have resulted in efficiency gains. Bank branch networks have been rationalized, and the employee-to-asset and cost-to-income ratios have declined significantly: the cost-to-income ratio, for example, fell from over 63 percent in 2000 to 52.5 percent in 2004 (table 7).

The taxation of credit operations could create a significant source of market power because it increases the switching costs faced by bank customers. One of the most important elements of financial taxation in Chile is a stamp tax levied as a general tax on financial transactions, including loans and other forms of credit (such as bills of exchange and promissory notes). The tax acts as a switching cost for bank customers who move across banks or financing instruments when initiating or refinancing loans. The current general tax rate is capped at 1.608 percent of the credit amount, but loans with a maturity under one year are subject to a lower monthly rate of 0.134 percent to avoid undue burden on short-term credit.³⁴ Mortgages are subject to a reduced rate

34. In the case of sight or overdraft accounts without a specified maturity date, the rate imposed is 0.67 percent. In addition to the general tax on credit, stamp duty is levied at a fixed amount on the issuance of checks and electronic transactions.

TABLE 7. Structural Banking Indicators for Chile

<i>Indicator</i>	1995	2000	2001	2002	2003	2004
Number of banks	34	29	28	26	26	27
Number of bank branches per 1,000 capita	11.5	11.8	11.7	10.9	11.2	11.2
Total bank assets per bank employee ^a	299.1	754.5	966.7	1,071.1	1,118.7	1,246.7
Cost-to-income ratio ^b	n.a.	63.3	60.6	56.8	56.3	52.5

Source: Superintendency of Banks and Financial Institutions.
n.a. Not available.

a. In millions of constant 1990 Chilean pesos.

b. Data from Bankscope.

of 0.5 percent, and they are exempt from the stamp tax during refinancing (since 2003). While the stamp duty is a fixed percentage of the loan amount, its incidence is best measured in terms of the all-in cost of borrowing and varies significantly depending on loan maturity and the prevailing interest rate (table 8). The lower the interest rate and the longer the term of the loan, the lower the impact of the stamp duty on costs, since the upfront costs associated with the duty are smoothed out over time. The differential incidence based on maturity is most likely to affect small and medium-sized enterprises, which tend to rely on short-term borrowing mainly from banks; it also adds to the traditional nonpecuniary switching costs associated with the relatively poor quality of information and the importance of relationship banking for this market segment. Since 2005, rolling over loans with the same bank is exempt from the stamp tax, which reduces the incentive to switch banks even further. In addition, the cost of creating and registering collateral

TABLE 8. Increase in the All-In Cost Associated with the Stamp Duty
Percent

<i>Maturity of loan</i>	<i>Interest rate (percent)</i>									
	1	2	3	4	5	6	7	8	9	10
1 year	1.651	1.667	1.683	1.700	1.716	1.732	1.749	1.765	1.781	1.798
2 years	0.826	0.838	0.851	0.863	0.876	0.888	0.900	0.913	0.926	0.938
3 years	0.553	0.564	0.575	0.586	0.597	0.608	0.620	0.631	0.643	0.654
4 years	0.416	0.427	0.437	0.448	0.458	0.469	0.480	0.491	0.502	0.513
5 years	0.335	0.345	0.355	0.365	0.375	0.386	0.396	0.407	0.418	0.429
6 years	0.280	0.290	0.300	0.310	0.320	0.33	0.341	0.352	0.362	0.373
7 years	0.241	0.251	0.261	0.271	0.281	0.291	0.302	0.312	0.323	0.334
8 years	0.212	0.222	0.231	0.241	0.251	0.262	0.272	0.283	0.294	0.305
9 years	0.189	0.199	0.209	0.218	0.229	0.239	0.249	0.26	0.271	0.282
10 years	0.171	0.181	0.190	0.200	0.210	0.221	0.231	0.242	0.253	0.265

Source: Superintendency of Banks and Financial Institutions.

is relatively high. The World Bank's 2002 Doing Business Index provides the cost of creating and registering collateral for credit operations. The index ranks Chile thirty-third in a group of 155 countries, with a cost of 5.3 times per capita income. Furthermore, collateral registered for a loan with one bank cannot be easily transferred to another bank, because the pledge without conveyance needs to be published in the Official Gazette. This makes it cumbersome and costly to control the pledging of new collateral, since it allows the initial bank to delay the shift of the collateral to the new lender.

Conclusion

This paper has analyzed the banking market in Chile and compared competition in the banking market with twenty-eight other emerging market countries using estimates of input price elasticities based on the application of Panzar and Rosse's methodology on bank level data for 1995–2004.³⁵ The analysis suggests that Chile's banking system—like most banking systems—can be characterized as monopolistically competitive, but the estimated competition index for Chile is statistically lower than the cross-country sample. Cross-country comparisons also show that the profitability of Chilean banks is above what can be explained by macroeconomic and banking sector characteristics in Chile. The estimation results suggest that, on average, the net interest margin of Chilean banks is 1.50 to 2.25 points higher than the average bank in the sample, after controlling for macroeconomic and sector-specific factors that may affect profitability. The higher profitability of Chilean banks is consistent with the lower estimated competition index for Chile.

The lower competition appears to be driven by lower revenue elasticity to funding costs. This suggests that the captive presence of the pension funds with large deposits in the banking sector may be distorting the incentives for banks to compete. In addition, high effective entry costs—in the form of higher capitalization ratios—despite low regulatory barriers to entry and relatively minor competition from nonbank financial intermediaries could be contributing to limited competition. These findings highlight the need for more in-depth future research across the financial sector, rather than in the banking sector alone, to assess the implications of the overall financial sector structure—especially the large institutional investors—on competition in specific segments of the financial sector.

35. Panzar and Rosse (1987).

Appendix: Description of the Data and Regression Specifications

Data were constructed using bank balance sheets and income statements for commercial banks for 1995–2004, obtained from Bankscope. The Bankscope database purges the data of exited or merged banks, so that only active banks are kept retroactively in the database. This exclusion, however, is not inconsistent with the Panzar-Rosse methodology, which assumes that the banking sector has reached its steady state after exits and mergers. The data from the Superintendency of Banks and Financial Institutions (SBIF) for Chile, on the other hand, include both the banks that have exited since the beginning of the sample period and the new entrants since 2002. Comparison of the results for Chile using these alternative sources of data shed some light on the impact of these exclusions, but these findings cannot be extended to the cross-country sample. The Bankscope database has another possible source of bias that cannot be addressed: only relatively larger banks are included in the database. Smaller banks that are excluded might potentially have more market power in local markets, which will be missed by the data.

The estimated revenue equations for each country take the following form:

$$(7) \quad \ln\left(\frac{\text{TR}}{\text{TA}}\right)_{i,t_i} = c_i + \beta_1 \ln\left(\frac{W}{\text{TA}}\right)_{i,t_i} + \beta_2 \ln\left(\frac{\text{INT}}{\text{TF}}\right)_{i,t_i} \\ + \beta_3 \ln\left(\frac{K}{\text{TFA}}\right)_{i,t_i} + \beta_4 \ln\left(\frac{\text{OC}}{\text{TA}}\right)_{i,t_i} + \eta X_{i,t_i},$$

for each $i = 1, 2, \dots, n_j$ and for each $t_i = 1, 2, \dots, T_i$; and where n_j is the number of banks in country j , and T_i is the total observations for bank i in the sample. W is personnel costs; INT is the interest cost; K is capital costs defined as total overhead minus personnel costs; OC is other operating costs; TA is total assets; TF is total funding defined as the sum of customer deposits, short-term funding, and other funding; and TFA is total fixed assets.³⁶ The unit labor costs would have been better approximated using the number of employees rather than total assets, but the Bankscope database does not provide consistent observations for the number of bank employees. X are other control variables intended to capture differences in the business mix across

36. De Brant and Davis (2000), Hempell (2002), Belaisch (2003), and Gelos and Roldós (2004) use similar specifications.

banks. In the estimations, these included total customer loans as a share of total assets (CLTA); total deposits as a share of total funding (TDTF), where total funding is defined as the sum of customer deposits, short-term funding, and other funding; and the ratio of total equity to total assets (EQTA). Bank size is calculated as the ratio of the bank's assets to industry assets, whereas foreign ownership is defined as the ratio of foreign-owned assets to total bank assets.

The pooled regression reported in table 4 uses the following control variables, obtained from the International Monetary Fund's International Financial Statistics (IFS) database: the ratio of the total assets of deposit money banks to GDP, per capita income, the annual consumer price index (CPI) inflation rate, and real annual GDP growth.

Comments

Ronald Fischer: Meral Karasulu provides a good, clear description of the Chilean banking sector and its imperfections. The paper lays out some of the potential reasons to believe that the sector may be characterized by imperfect competition. Among the most relevant are the stamp tax on credit operations, the concentration of wealth in vast conglomerates, the ownership of pension funds by the bank holding companies, and the high capital requirements for entering the sector (which were recently lowered). Two additional factors are also important: first, no new banks were allowed to enter for a long period after the crisis of the early 1980s, because the banking regulator apparently feared that excessive competition would reduce bank profitability and thus lead to excessive risk taking; second, the lack of a centralized guarantee system means that it can be very expensive for small companies and individuals to switch banks. There are thus good reasons to suspect a lack of strong competition, and the sector's profitability, measured as return on assets or on equity, is indeed among the highest in Karasulu's sample. This is so even though banking concentration is not high and new banks have entered the market since the regulator changed its restrictive policy in the late 1990s.

Karasulu uses Panzar and Rosse's methodology to study competition in the Chilean market over time, as well as to compare it with a sample of other emerging countries.¹ As Karasulu mentions, the traditional competitive analysis based on concentration ratios suffers from the fact that markets with intense competition can be concentrated since only a few firms can survive, while others that are cartelized may attract entry.² The Panzar-Rosse approach, on the other hand, makes very few assumptions and is based on the observation that different industrial organizational structures respond differently to changes in input prices. Competitive markets transmit input price changes into output

1. Panzar and Rosse (1987).

2. Sutton (1991).