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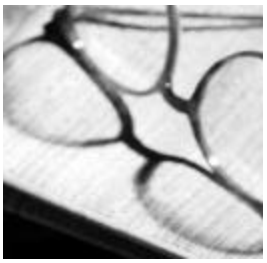


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CONCENTRATION AND FOREIGN PENETRATION IN LATIN AMERICAN BANKING SECTORS: IMPACT ON COMPETITION AND RISK

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Abstract

In recent years, Latin American banking sectors have experienced an accelerated process of concentration and foreign penetration that has prompted diverse views regarding its implications for the competitive behavior of banks and for the financial stability of the system as a whole. Exploiting a rich bank-level balance sheet database for eight Latin American countries, we examine the evolution of concentration and foreign penetration indicators and their impact on competition and risk. We find that, while concentration did not reduce competition in the industry, foreign penetration appears to have led to less competitive banking sectors. Moreover, we find banking sector fragility to be positively related to competition and, through this channel, negatively related to foreign participation, despite the fact that foreign banks in the region are associated with higher insolvency risk due to higher leverage ratios and more volatile returns.

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I. Introduction

The last decade witnessed important changes in the banking industry in most Latin American countries. While participation of foreign banks more than doubled in many cases (Figure 1), banking concentration increased (Figure 2) mainly due to a process of consolidation (Table 1) led by mergers that in many instances were triggered by financial crises and regulatory tightening.[2] These twin developments have raised concerns about (and elicited diverging views on) their impact on competition (in particular, borrowing costs and banking efficiency) and financial stability. The purpose of this study is to assess whether and how the consolidation and internationalization processes have affected the competitive environment and the stability of the banking sectors in the region.

Despite the general belief that bank consolidation generates a more concentrated system and, as a consequence, a less competitive one, there is no clear analytical argument supporting this view in the literature.[3] For example, a merger between firms serving overlapping or identical markets reduces competition and increases efficiency by eliminating duplication of activities. Alternatively, it is not at all clear whether competition and concentration should go in opposite directions. Elimination of branching restrictions, or a widespread use of ATMs that reduces the geographical barriers can be shown to enhance, rather than hinder, banking competition, while inducing consolidation as a result of narrower margins.[4] At any rate, a wide range of studies that analyze the US and EU experiences conclude that mergers seem to have been pro-competitive in general.[5]

The impact of consolidations and concentration on system stability is also an open question. From a theoretical point of view, competition may have a deleterious impact on stability if it causes banks' charter value to drop, thus reducing the incentives for prudent risk-taking behavior. According to this view, the promise of extraordinary profits associated with the presence of market power reduces the agency problem of limited liability banks (namely, their propensity to gamble). Stiffer competition, instead, could lead to more aggressive risk taking, as documented in some empirical studies.[6] On the other hand, a more concentrated system, inasmuch as it implies the presence of a few relatively large banks, is more likely to display a "too big to fail" problem by which large banks increase their risk exposure anticipating the unwillingness of the regulator to let the bank fail in the event of insolvency problems. (Hughes et al., 1998).

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[2] Regulatory tightening tended to affected proportionally more smaller (and more specialized) institutions.

3 Surveys of the analytical literature can be found in Kroszner (1998), Carletti et al. (2002), Yanelle (1997), Scholtens (2000) and Canoy et al. (2001).

[4] See Matutes and Vives (2000) and Cordella and Levy Yeyati (2002) for an analytical discussion along these lines. The increase in concentration as a result of the elimination of branching restrictions in the U.S. is studied, e.g., in Economides et al. (1995). See also Schargrodsky and Sturzenegger (2000) for a related study of the Argentine banking sector.

[5] For the US case, see Kroszner (1998), Avery et al. (1998), Kroszner and Strahan (1998), Strahan and Weston (1996) and Berger et al. (1997). For the EU case, see Vives (2001).

[6] See Cerasi and Daltung (2000), Keeley (1990), Bergtresser (2001), Carletti et al. (2002).

As noted, and unlike the case of financial centers like the U.S. or EMU, banking sector consolidation in Latin America appears to have been based to a large extent on the acquisition of local banks by bigger foreign institutions, a process underscored by episodes of financial distress and in part related to the lower perceived vulnerability of foreign banks to financial shocks.[7] Their impact on banking sectors in the region is still under discussion.

Claessens et al. (2001), for example, find that, in developing countries, the presence of foreign banks is typically associated with higher net interest margins and higher profitability than domestic banks. In addition, they find that foreign banks have higher overhead costs, contradicting the hypothesis that foreign banks' profitability is driven by efficiency.[8] Cull et al. (1998) find that, for Argentina, domestic banks' performance is negatively correlated with their relative exposure to manufacturing, where foreign banks have been particularly active, and argue that foreign competition has inflicted a negative shock on domestic bank profitability. In this case, as well as in the previous one, identifying efficiency effects is difficult as measures of bank services cannot be adjusted for factors such as difference in quality or transient versus permanent effects.

Regarding the link between foreign penetration and financial stability, Demirguc-Kunt et al. (1998) find that, other things equal, the presence of foreign banks is associated with a lower probability of financial crisis. This finding, again, is open to more than one interpretation. On the one hand, foreign penetration may be simply capturing a market liberalization effect, namely, the fact that highly protected banking sectors generate inefficient institutions and sub-standard regulation and supervision. On the other hand, if foreign-owned banks forestall liquidity shocks better aided by their highly capitalized parents, a country with an internationalized banking sector may be partially isolated from bank runs, irrespectively of the risk-taking behavior of their foreign-owned institutions. Indeed, the presence of foreign banks may act as an insurance preventing a bank run in the first place.

In this paper, we exploit a rich bank-level balance sheet and income database for eight Latin American countries to revisit these issues.[9] We estimate a competitive behavior parameter on a yearly basis to test whether and how competition changes relate to changes in concentration and foreign participation. We conclude that, while there is no evidence that concentration significantly reduced competition in the industry, foreign penetration appears to have led to a less competitive environment, a finding further confirmed by a positive link between foreign penetration and bank profits.

On the other hand, in terms of banking sector stability, we find that, while increased concentration again appears to have had virtually no influence on bank insolvency risk,

[7] Indeed, during episodes of financial turmoil, it is common to observe a flight to quality that tends to result in a larger concentration of deposits in foreign-owned banks.

[8] They attribute this to the fact that recent entrants have to incur an additional cost to make up for incumbent advantages and gain a reasonable market share. At any rate, the previous findings suggests that, at least in the short run, cost efficiencies are not likely to be visible.

[9] The sample includes all banks for Argentina, Brazil, Chile, Colombia, Costa Rica, El Salvador, Mexico and Peru. The source is, in all cases, the national central bank.

the latter is positively related with competition, and through this channel, with increased foreign participation, despite the fact that foreign banks in our sample exhibit higher risk indicators due to higher leverage ratios and more volatile returns.

The plan of the paper is the following. Section II describes the data and the estimation of the competition indicator, and presents related econometric results. Section III moves to banking fragility issues, addresses the link between competition, concentration and internationalization, on the one hand, and bank insolvency risk, on the other. Section IV concludes.

II. The Data

In this paper, we use a detailed balance sheet database comprising the banking sector of eight Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, El Salvador, Mexico and Peru. The source, in all cases, is the national central bank or the superintendence of banks, when autonomous.[10]

Measures of concentration and foreign penetration

While there is a wide array of concentration measures proposed in the industrial organization literature,[11] hardly any of them have been used in the empirical banking literature with the exception of the k-firm concentration ratio (CR_k) and the Herfindahl-Hirschman index (*HHI*).[12] For the sake of comparability, in this paper we use these two measures (CR_3 and CR_5 in the case of the concentration ratio) based on total bank assets.[13] In turn, we measure foreign penetration as the foreign-owned to total asset ratio (*FASSETS*), where foreign banks are defined as those controlled by institutions with headquarters in developed countries. [14]

Measures of competition

The literature on the measurement of competition can broadly be divided into two branches: the (non-formal) structural approach and the (formal) non-structural

[10] See Appendix for variable descriptions and sources.
[11] For a survey, see Bikker and Haaf (2001a) and Shaffer (1992).
[12] Defined, respectively, as

$$CR_k = \sum_{i=1}^{k} s_i$$

$$HHI = \sum_{i=1}^{m} s_i^2$$

where i is an index that orders banks from largest to smallest, and s_i is the market share of bank i, (typically measured in terms of total assets).
[13] In addition, we computed the concentration measures also for a subset of markets (private deposits, private credit, mortgage loans and consumer loans). As expected, concentration indicators in different markets are highly correlated, with the salient exception of mortgage, which in many countries has been supplied early on by specialized (often state-owned) institutions. These results, omitted here for conciseness, are available from the authors.
[14] Alternatively, we use the ratio of foreign to total banks. We refer the reader to Levy Yeyati and Micco (2003) for the results using this indicator.

approach.[15] The structural approach centers on the Structure-Conduct-Performance paradigm (SCP) or the efficiency hypothesis, according to which factor they assume to be the main driver of superior market performance.[16] Its application to the banking industry has been criticized, however, for the one-way causality (from market structure to market performance) implicit in the original model.[17] New developments in industrial organization and the refinement of formal models of imperfectly competitive markets, as well as the realization of the need to endogenize the market structure, led recent empirical work to rely increasingly on non-structural models.[18] Among the latter, in this paper we apply Panzar and Rosse's (PR) approach, which been used in several studies to test competition for the European banking industry.[19]

The PR's model starts by assuming profit maximizing individual banks, from which it derives a first order condition for profit maximization of the type:

$$R'_i\,(OUT_i,\, n,\, BSF_{i,\,rev}) = C'_i\,(OUT_i,\, FIP_i,\, BSF_{i,\,cost})$$

where *OUT* is output, *n* is the number of banks, *FIP* denotes factor input prices, and $BSF_{i,rev}$ and $BSF_{i,rev}$ are bank-specific factors affecting the banks' revenue and cost functions, respectively. Under these conditions, PR show that the sum of the elasticities of the reduced-form revenue function with respect to factor prices:

$$H \equiv \sum_j \frac{\partial R_i}{\partial FIP_{j,i}} \frac{\partial FIP_{j,i}}{\partial R_i}$$

is zero or negative under monopoly, or under monopolistic competition without entry. [20] In these two previous cases, it can be shown that, if the bank faces a demand with constant elasticity $e > 1$ and a Cobb-Douglas technology, $H = 1 - e$, and the magnitude of H can be interpreted as an inverse measure of the degree of monopolistic power (alternatively, a measure of the degree of competition).

Based on the comparative statics properties of the Chamberlinian equilibrium, and under the assumption that the market is in long-run equilibrium, so that the zero profit constraint:

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[15] See Bikker and Haaf (2001a).
[16] These drivers are, for the SCP, the collusive behavior among large players in a highly concentrated market, and for the efficiency hypothesis, the presence of economies of scale that enhance the efficiency of large firms.
[17] See Gilbert (1984) and Vesala (1995). For a survey of the literature applying the SCP to the banking industry see Gilbert (1984) and Molyneux et al. (1994).
[18] There are three main non-structural models proposed in the literature: Iwata's (1974), Bresnahan's (1982) and Panzar and Rosse's (1987) models. Of these, Iwata's model has not yet been applied to the banking industry, due to the lack of micro data needed for empirical estimation. Variations on Bresnahan's conjectural variation approach applied to developing countries include Barajas et al (1999) on Colombia, Nakane (2001) on Brazil and Burdisso et al. (2001) on Argentina.
[19] Bikker and Haaf (2001b) present a summary of early studies and results.
[20] See also Vesala (1995) for a formal derivation.

$R^*_i\,(OUT^*, n^*, BSF_{rev}) = C^*_i\,(OUT^*, FIP, BSF_{cost})$.

holds at the market level, PR shows that $0 < H \leq 1$ under monopolistic competition (arguably a more realistic characterization of banks' interaction). On the other hand, perfect competition, obtained as the limiting case of Chamberlinian competition with perfect product substitutability, corresponds to $H = 1$. Thus, values significantly different from zero or one would indicate monopolistic competition.

Most of the studies based on PR have computed a single country-specific *H* parameter for the whole period of analysis, to test whether the market exhibits a conduct consistent with a monopoly or with perfect competition. The exceptions are Molyneux et al. (1994) and Bikker and Haaf (2001b) for developed countries, and Gelos and Roldós (2002) for developing ones. In the first case, *H* is estimated for each year and found to be rather volatile over time, possibly because of the low precision associated with a year-by-year estimation. To address this concerns, Bikker and Haaf (2002) use the full period but correct for the possibility of an evolving market structure by multiplying the elasticities from which H is computed by a continuous time-curve.[21] Finally, Gelos and Roldós (2002) test for structural breaks over the period.

Estimating parameter changes over time is key to the purposes of our paper for two reasons. From a methodological perspective, the parameter *H* depends on industry-specific characteristics.[22] Thus, by extension, it is not straightforward to see to what extent cross-country variations reveal differences in long-run equilibrium. As a result, a simple cross-country comparison is likely to lead to misleading conclusions unless other country-specific characteristics are controlled for. A closer look at within-country parameter changes, by contrast, is more likely to provide useful information about the evolution of competition and its determinants.

From a practical perspective, on the other hand, since our interest lies in the correlation between the consolidation and foreign penetration *trends* and the evolution of competition, our emphasis lies clearly on the dynamic, as opposed to the cross-section, dimension.

With this in mind, and in order to avoid imposing restrictions on the way the parameter changes while maximizing precision, we compute time-varying *H*s using observations for the whole period. More precisely, we adopt the following standard specification of the reduced-form revenue equation that allows *H* to vary on a yearly basis:

[21] This correction may be subject to criticism inasmuch as the evolution of the parameter *H* may not be monotonic as the correction assumes. Moreover, the time-variation is often not statistically significant.

[22] As Bresnahan (1989) puts it when defining the four main elements characterizing the New Industrial Organization approach on which the PR model is based: "Individual industries are taken to have important idiosyncrasies. It is likely that institutional detail at the industry level will affect firms' conduct and even more likely that will affect the analyst's measurement strategy. Thus practitioners in this literature are skeptical of using comparative statics of variations across industries or markets as revealing anything, except when the markets are closely related."

$$\ln FINR_{it} = \alpha_i + \sum_y \left(\beta_y \ln AFR_{it} + \gamma_y \ln PPE_{it} + \delta_y \ln PCE_{it}\right) + \eta \ln OI_{it} + \sum_j \xi_j \ln BSF_{jit} + \sum_j \lambda_j X_{jt} + \nu_{it}$$

where:

- β_y , γ_y, δ_y, are set to 0 if quarter t does not belongs to year *y*
- *FINR* = ratio of total financial revenue to total assets
- *AFR* = ratio of annual interest expenses to total funds, or the Average Funding Rate
- *PPE* = ratio of personnel expenses to the total balance sheet, or the (approximated) Price of Personnel Expenses)
- *PCE* = ratio of physical capital expenditure and other expenses to fixed assets, or the (approximated) Price of Capital Expenditure
- *BSF* = bank specific exogenous factors (fundamentals), lagged one quarter, reflecting differences in risks, costs, and size of the bank:
    - risk component, proxied by equity (*EQ*) and loans (*LO*) ratios, and by the liquidity (*CASH*) ratio, all normalized by total assets
    - differences in the deposit mix, captured by demand deposits from customers to total customer and short-term funding (*DDC*)
    - size, proxied by the log of total real assets (*LASSETS*), where assets are deflated by the CPI
- *OI* = ratio of Other Income to the Total Balance Sheet
- *X* = time-variant macroeconomic factors such as the reference interest rate (*INT*) and the inflation rate (*INF*)

In turn, we estimate competition as *H* defined, for each year *y*, as the sum of the elasticities of the reduced-form revenues with respect to factor prices:

$$H_y = \beta_y + \gamma_y + \delta_y$$

Measures of bank risk

We measure solvency risk as the probability that losses exceed the bank's equity capital (*EQ*) or, using the Chebishev inequality:[23]

$$P(ROA \le -\frac{EQ}{A}) \le \frac{\sigma^2_{ROA}}{\left(\mu_{ROA} + \frac{EQ}{A}\right)^2} \equiv \frac{1}{Z^2}$$

where *ROA* is bank returns on assets, *E* is equity capital over total assets, and μ_{ROA} and σ^2_{ROA} are the mean and variance of the distribution of *ROA*.

Thus, the variable Z defined above is a proxy for the probability of insolvency of the bank or, more precisely, the probability of a negative shock to profits that forces the bank to default. A smaller Z (a larger risk exposure) can be associated with narrower returns (due, for instance, to greater inefficiency or reduced market power), larger return

[23] See Roy (1959).

volatility (due to poorer diversification or a less conservative choice of investments), or higher leverage (due to lower capitalization). For the tests reported below, we compute bank-specific *Z*s based on quarterly balance sheet data from the last three years.[24]

III. Econometric results

Our empirical testing proceeds in four steps. First, we estimate our measure of competition, the parameter *H*, for each year as well as for the period as a whole, according to our baseline specification. Second, we test whether and how this parameter correlates with the evolution of bank concentration and foreign participation over time. Next, we regress bank returns on the competition measure to check whether a more competitive environment, as measured by an increase in *H*, is reflected, as expected, in narrower margins and lower returns. Finally, we examine the link between concentration and foreign participation, on the one hand, and banking stability, as proxied by bank-specific *Z*s, on the other.

Concentration, foreign penetration and competition

In Table 2a-b, we report OLS estimates of a time-invariant *H* for each country, as well as weighted least squared (WLS) estimates where observations are weighted by the banks' asset share.[25] The former is closer to other estimates reported in the literature and is presented here for comparison. While most of the previous studies tend to focus on large banks, our dataset include all banks in the system. Therefore, the WLS procedure, by weighting larger banks more heavily, captures better the behavior of the representative bank, while making our findings comparable with those in the literature. WLS have a couple of additional advantages. First, by using banks' asset share as weights we can read our results as reflecting the average level of competition faced by borrowers in the system. Second, under the reasonable assumption that measurement errors are decreasing with bank size, WLS yield more precise estimates. Finally, if banks' behavior (in particular, their exercise of market power) differs significantly with size, the evolution of an unweighted estimate of H may be spuriously reflecting changes in the size distribution as a result of the consolidation process.

Reassuringly, OLS and WLS coefficients are comparable and of the expected sign, although estimates of *H* tend to be slightly higher using WLS. The perfect competition (*H* = 1) and monopoly (*H* = 0) hypotheses are rejected at conventional levels for all countries. Time-invariant *H*s reported at the bottom of the table are directly comparable with similar estimates found in the literature. Interestingly, our estimates of *H* for Latin American countries do not differ in range and cross-country variability for those found in more developed countries. However, as noted, cross-country comparisons of the *H* indicator can be highly misleading.

[24] For empirical applications of the Z index, see, among others, De Nicoló (2000) and De Nicoló et al. (2003).

[25] Time-invariant Hs are calculated by setting $\beta_y = \beta$, $\gamma_y = \gamma$, and $\delta_y = \delta$ for all *y*.

We henceforth center our analysis on the results that can be inferred from the dynamic dimension, for which we need to measure the evolution of the *H* parameter. WLS estimates of time-varying *H*s are presented in Table 3.[26] As can be seen, while the parameter is relatively stable and comparable with the time-invariant estimates, it still shows some variation over time. At this preliminary level, one thing to note is the fact that, with the exception of Mexico and El Salvador, all banking sectors appear to have moved towards more competition in recent years, suggesting that consolidation has not inflicted serious damage in terms of non-competitive practices.

Estimates of *H* can be directly used to address the link between *changes* in concentration and foreign penetration, on the one hand, and *changes* in competition, on the other. A first glance at the data is presented in Table 4, where we report simple correlations between *H*, measures of concentration (CR_3, CR_5 and *HHI*) and foreign participation (*FASSETS*), measured in terms of assets, for the full eight-country sample.[27] As can be seen in the Table, none of the correlation coefficients are statistically significant, possibly due to the wide cross-country variation of *H*.

A more rigorous look is presented in Table 5, where we report the results from panel regressions of *H* on different measures of concentration and foreign penetration. Once we control for country fixed effects and time trends (alternatively, time dummies), we find that, while changes in concentration seems to exert no significant influence on *H*, foreign participation shows a negative and significant correlation with competition.

Since the previous results rely heavily on our measure of competition, it is important to verify that this measure yields results that are at least consistent with what one would expect the influence of competition to be. To do that, we explore the link between *H* and bank returns, with the prior that increases in competition should be reflected in narrowing intermediation margins and, through this, in declining bank profits.

Pooling our bank-level panel data for the eight countries in our sample, we run a regression private bank returns on competition (*H*) controlling for bank fixed effects and time trend (alternatively, time effects). Is important to note that, since our competition measure (*H*) is the same for all banks in each country at any given year, our bank-year observations are independent across countries and years but not across banks within any country-year pair, so that standard errors need to be computed clustered by country.

[26] Coefficients for other controls are similar to those reported in the previous table and are omitted for brevity. Complete regression results are available from the authors.

[27] Note that the concentration indices can be rewritten as a function of the size distribution and the number of banks. For example, $HHI = (\mu_2 + 1) / n$, where μ_2 is the variation coefficient of the size distribution, and n is the number of banks. As a result, they tend to be inversely correlated with the number of banks (or, more generally, with the banking sector depth, independently of the distribution of bank size), suggesting that both the index and the number of banks should be used to control for the distribution. Hence, our inclusion of the number of banks as an alternative explanatory factor here as well as in the next table.

Table 6 reports the results.[28] As the table shows, *H* is indeed significantly and negatively correlated with returns of assets (*ROA*).[29] The result is robust to the inclusion of additional macroeconomic controls such as GDP growth and exchange rate volatility (column 3).[30]

As an alternative way to check the robustness of our finding of a negative link between foreign penetration and competition, in column (4) we include our measure of foreign participation, *FASSETS*. As expected, once changes in competition are controlled for, the influence of foreign participation is not significant. However, once the direct measure of competition is excluded (column (5)), the coefficient of *FASSETS* becomes four times larger and significant, reflecting its negative impact on competition and, through it, its positive impact on returns.

To test whether the previous effect is due to above-market returns for foreign banks or to positive spillovers on incumbent domestic banks, in columns (6) - (8) we include a foreign ownership dummy (*DFOR*). Since foreign banks in Latin America tend to be relatively large, the foreign dummy may be spuriously capturing size rather ownership. To avoid this potential omitted variable problem, we also include the log of real assets (*LASSETS*) to control for bank size.

The foreign dummy has the opposite sign and is not significant, even after dropping bank effects (columns (7) and (8)). On the other hand, the results on foreign participation remain virtually unchanged, confirming that its influence on returns is not specific to foreign banks but rather works through its general impact on competition. This result is consistent with the view that, either by introducing new and more sophisticated products or, in the particular case of developing countries, simply by exploiting their brand name, foreign banks increase product differentiation and, through this channel, the scope for oligopolistic practices.

As a final check, we rerun the previous regressions substituting returns on equity (*ROE*) for returns on assets. The underlying hypothesis is that *ROE*, rather that *ROA*, should better capture the presence of non-competitive profits in the industry. Indeed, the results appear to confirm this view, as can be seen by comparing column (9) with column (4), and column (11) with column (8). In both cases, the coefficients of *H* improve their significance level. The same is true for foreign participation when the competition measure is excluded in column (10).

Thus, the two main findings of this section appear to be quite robust: i) foreign participation is associated with weaker competition, and ii) bank returns are, as expected,

[28] We exclude state-owned banks because they are less affected by market conditions. Most results are robust to their inclusion.
[29] The columns show regressions results using a time trend and time dummies, respectively.
[30] Real GDP growth is expected to be positively correlated with returns, as expansions improve loan performance and reduce loss provisions. The second one, measured as the standard deviation of the nominal exchange rate over the past three years, is a proxy for nominal instability that we expect to be negatively correlated with returns. Coefficients are significant and of the correct sign in most cases.

negatively related to the degree of competition and, through the previous channel, positively related to foreign participation.

Foreign penetration and banking stability

We turn next to the impact of foreign penetration on banking stability, which we test by running bank-level regressions of our measure of bank risk, *Z*, against the share of foreign assets and the degree of competition as captured by *H*. We also include, as before, controls for real growth and exchange rate volatility (both measured over the three-year period over which the *Z*-score is computed). Finally, we control for bank fixed effect in all specifications except in columns (6)-(8) where we replace bank effects by a proxy for bank size and a foreign ownership dummy. All regressions include either a time trend or time dummies.

Table 7 reports the results. The macroeconomic controls have the expected sign (economic growth reduces bank risk whereas exchange rate volatility increases it) and are significant in most cases. Competition, in turn, increases bank risk, while the coefficients of bank concentration (measured here as CR_3) and foreign participation fail to be significant.

As before, the results bear the question of whether the incidence of foreign penetration on risk confirms its reported impact on competition. To tackle this question, in columns (4) and (5) we replicate the exercise in columns (1) and (3) this time excluding the competition measure. As expected, the coefficient of foreign competition are positive and larger than before, albeit not significant.

To explore this link further, in columns (6)-(8) we replace bank effects by a foreign ownership dummy and a size variable. This time, the positive link between foreign penetration and risk is positive and significant when the competition indicator is dropped in column (8). Interestingly, the foreign dummy is negative and strongly significant in both cases, suggesting that, while foreign penetration tend to increase the market power of the representative bank, foreign banks are individually characterized by a higher risk profile than their national counterparts. The results in this table are robust to the use of a semi-logarithmic specification (Table 7b).

How specific is this higher risk profile to foreign banks and where is it coming from? We examine this issue more closely in Table 8, where we run regressions of Z and its individual components on a foreign bank dummy, a size variable, and a country-year fixed effect that controls for all country-specific (time-varying or invariant) effects. The results confirm the previous finding in a quite general way. Column (1) shows that the *Z*-score is significantly higher for foreign banks. Expected returns on assets, however, are not influenced by foreign ownership (column (2)), in line with results in Table 6. By contrast, columns (3) and (4) show that foreign banks exhibit higher leverage ratios and

larger return volatility than national banks. The same is true when we use a semi-logarithmic specification (columns (5)-(7)).[31]

It is possible that, since many foreign banks entered the Latin American market purchasing formerly national banks in distress, these findings may be capturing the transitorily higher risk of the recently acquired bank. To test this hypothesis, in columns (8) and (9) we revise our foreign dummy to single out banks that were owned by foreign institutions at least for four and five years (that is, were acquired one and two years before the beginning of the period over which Z is computed). The results confirm our previous findings in both cases: foreign banks appear to be associated with a higher risk profile, due to higher leverage ratios and more volatile returns.

Turning back to the link between foreign penetration and banking sector fragility, in Table 9 we report results of country-level regressions in which we recover (and confirm) the findings in Table 7. The table presents the results based on three alternative measures of country-specific banking sector fragility: the weighted average of *Z* and that of its log, and the *Z* based on aggregate data for the system as a whole (*System Z*), which broadly corresponds to systemic risk (that is, risk that cannot be diversified away within the baking sector). Controls for country and year effects are always included.

The coefficients display the expected sign, with risk positively correlated with economic growth and negatively correlated with exchange rate volatility. Concentration, once again, has no influence on bank risk. Size, on the contrary, is positively related, with large (and presumably more diversified) banks exhibiting lower risk profiles. Foreign penetration, in turn, is positively and significantly correlated with risk only through its effect on competition. Once *H* is included, the coefficient of foreign penetration ceases to be significant and even turns negative in some cases. For all three banking fragility measures the results are comparable, although *System Z* appears to be the less sensitive to the presence of foreign banks. In sum, we can conclude that, while foreign banks in Latin America are characteristically more risky than the rest, foreign penetration was accompanied by a decline in competition that, possibly through the disciplining effect of a higher charter value due to increased profitability, exerted a positive influence on banking sector fragility.

V. Conclusions

In this paper, we used a detailed balance sheet database for eight Latin American banking sectors to explore the consequences of the recent consolidation and internationalization process on competition and banking sector fragility. We found that increased concentration appears to have had no influence in either front. On the contrary, we found that foreign penetration weakened banking competition, that the latter is negatively related with bank risk and that, as a result of the previous two findings, foreign penetration has indeed induced lower levels of risk. Somewhat surprisingly, these lower

[31] Here, we report the log of the whole numerator, Log ($\mu_{ROA} + EQ/A$), to avoid missing observations due to negative returns. Regressions using Log (μ_{ROA}) as dependent variable yield similar results at the expense of a smaller sample. Results are available from the authors.

risk levels were not driven by the presence of safer foreign banks. Indeed, foreign-owned banks in Latin American markets are found to be more risky than national banks, due to higher leverage ratios and more variable returns.

The evidence presented here suggests an interpretation. In recurrently shaken emerging Latin American markets, national banks may be seen as imperfect substitutes of foreign branches or subsidiaries, because of actual differences in their menu of products as well as in terms of the value of the brand name and the perception of an implicit insurance provided by their parents. If so, by increasing the degree of product differentiation, foreign penetration in emerging economies would reduce competition and, through higher profits and charter value, the representative bank's risk appetite, notwithstanding the fact that foreign banks can reap these oligopolistic rents while choosing a higher risk profile. Reconciling the findings of this paper along these or alternative lines appears a fruitful topic for future research.

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Table 1. Decline in the number of banks

	1996	2002	Change	%Change
Argentina	117	80	-37	-32%
Brazil	253	177	-76	-30%
Chile	31	25	-6	-18%
Colombia	39	27	-12	-31%
Costa Rica	30	21	-9	-29%
México *	40	32	-9	-21%
Peru	22	15	-7	-32%
El Salvador	18	13	-5	-28%

Source: Superintendencia de Bancos.
* in 1994 there were 19 banks

Table 2-a. Estimates of time-invariant *H*
(Bank-level panel data, OLS)

	Argentina	Brazil	Chile	Colombia	Costa Rica	México	Peru	El Salvador
AFR	0.221	0.653	0.502	0.443	0.613	0.644	0.323	0.434
	(0.047)***	(0.018)***	(0.035)***	(0.036)***	(0.029)***	(0.025)***	(0.035)***	(0.029)***
PPE	0.213	0.188	0.278	0.015	0.068	0.058	0.284	-0.030
	(0.043)***	(0.018)***	(0.048)***	(0.033)	(0.026)***	(0.024)**	(0.036)***	(0.053)
PCE	0.025	0.048	0.041	0.112	-0.004	-0.008	0.011	0.015
	(0.021)	(0.005)***	(0.019)**	(0.023)***	(0.009)	(0.011)	(0.016)	(0.031)
OI	0.004	-0.020	-0.032	-0.004	-0.032	0.005	-0.024	0.018
	(0.021)	(0.006)***	(0.008)***	(0.008)	(0.017)*	(0.021)	(0.011)**	(0.012)
EQ	0.048	-0.047	0.220	0.054	-0.071	0.043	-0.233	0.045
	(0.028)*	(0.022)**	(0.034)***	(0.023)**	(0.022)***	(0.031)	(0.035)***	(0.060)
LO	0.285	0.001	0.074	0.050	0.085	0.041	0.410	0.267
	(0.060)***	(0.008)	(0.022)***	(0.083)	(0.027)***	(0.021)*	(0.077)***	(0.098)***
DDC	0.056	0.021	0.040	-0.016	0.001	-0.004	-0.025	0.037
	(0.017)***	(0.005)***	(0.021)*	(0.011)	(0.003)	(0.011)	(0.012)**	(0.019)*
CASH	-0.028	0.000	-0.001	-0.118	-0.020	-0.000	0.041	-0.006
	(0.009)***	(0.000)	(0.000)***	(0.026)***	(0.018)	(0.000)***	(0.051)	(0.046)
LASSETS	0.010	0.044	0.012	-0.115	-0.069	0.013	-0.077	0.023
	(0.029)	(0.022)**	(0.033)	(0.037)***	(0.014)***	(0.040)	(0.019)***	(0.037)
INT	0.048	0.002	-0.002	0.005	0.001	0.006	-0.000	0.002
	(0.006)***	(0.001)***	(0.001)	(0.001)***	(0.002)	(0.002)***	(0.001)	(0.003)
INF	-2.610	1.506	5.403	0.453	0.374	-0.520	1.076	0.815
	(1.271)**	(0.390)***	(1.636)***	(0.242)*	(0.239)	(0.529)	(0.480)**	(0.711)
Constant	-1.662	-0.596	0.216	0.565	0.313	-0.733	-0.647	-1.834
	(0.272)***	(0.316)*	(0.341)	(0.556)	(0.241)	(0.188)***	(0.195)***	(0.582)***
Observations	2337	4808	968	831	716	832	766	326
R-squared	0.740	0.820	0.962	0.825	0.932	0.923	0.912	0.898
H [1]	0.460	0.889	0.821	0.570	0.677	0.695	0.618	0.418

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%
[1]All coefficients are significantly different from zero at 1% and significantly different from 1 at 1 %.

Table 2-b. Estimates of time-invariant *H*
(Bank-level panel data, WLS)

	Argentina	Brazil	Chile	Colombia	Costa Rica	México	Peru	El Salvador
AFR	0.327	0.778	0.591	0.436	0.555	0.740	0.398	0.490
	(0.047)***	(0.014)***	(0.043)***	(0.031)***	(0.018)***	(0.023)***	(0.019)***	(0.026)***
PPE	0.191	0.075	0.186	0.051	0.081	0.106	0.233	0.077
	(0.044)***	(0.052)	(0.066)***	(0.030)*	(0.029)***	(0.028)***	(0.036)***	(0.041)*
PCE	0.013	0.070	0.102	0.111	0.019	-0.026	0.009	0.061
	(0.022)	(0.010)***	(0.033)***	(0.032)***	(0.010)*	(0.012)**	(0.023)	(0.032)*
OI	0.048	-0.026	-0.004	-0.007	-0.035	0.046	0.010	0.016
	(0.027)*	(0.011)**	(0.009)	(0.009)	(0.018)*	(0.015)***	(0.012)	(0.011)
EQ	0.071	-0.042	0.152	0.093	-0.212	0.008	-0.164	0.033
	(0.023)***	(0.021)**	(0.034)***	(0.026)***	(0.033)***	(0.027)	(0.036)***	(0.041)
LO	0.237	-0.015	0.077	0.008	0.164	-0.033	0.391	0.321
	(0.051)***	(0.011)	(0.033)**	(0.066)	(0.021)***	(0.024)	(0.052)***	(0.059)***
DDC	0.030	0.011	0.074	-0.008	-0.003	0.039	-0.034	0.053
	(0.024)	(0.007)	(0.030)**	(0.014)	(0.008)	(0.008)***	(0.018)*	(0.020)***
CASH	-0.010	-0.000	-0.001	-0.102	-0.048	-0.000	0.270	0.065
	(0.002)***	(0.000)**	(0.000)***	(0.030)***	(0.032)	(0.000)***	(0.082)***	(0.071)
LASSETS	0.004	-0.123	-0.028	-0.063	-0.117	0.044	-0.095	0.045
	(0.024)	(0.031)***	(0.035)	(0.043)	(0.022)***	(0.023)*	(0.020)***	(0.031)
INT	0.025	-0.002	-0.004	0.005	0.001	0.001	-0.000	-0.002
	(0.005)***	(0.001)*	(0.001)***	(0.001)***	(0.002)	(0.001)	(0.001)	(0.002)
INF	-1.078	-0.520	4.920	0.834	0.147	0.443	0.281	0.188
	(1.071)	(0.680)	(1.848)***	(0.284)***	(0.337)	(0.304)	(0.414)	(0.402)
Constant	-1.016	2.261	1.047	-0.007	1.069	0.059	-0.075	-1.248
	(0.276)***	(0.457)***	(0.439)**	(0.671)	(0.421)**	(0.186)	(0.247)	(0.456)***
Observations	2337	4808	968	831	716	832	766	326
R-squared	0.7810	0.9399	0.9777	0.8787	0.9497	0.9582	0.8895	0.9253
H[1]	0.5315	0.9229[3]	0.8794[2]	0.5982	0.6553	0.8194	0.6405	0.6281

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%
[1]H = 0 (monopoly), and H = 1 (perfect competition) rejected at the 1% significance level unless otherwise indicated.
[2] Significantly different from 1 at 5%
[3] Significantly different from 1 at 20%.
Note: Observations are weighted using banks' assets share.

Table 3 Estimates of time-varying *H*
(WLS)

	Argentina	Brazil	Chile	Colombia	Costa Rica	México	Peru	El Salvador
1993							0.512	
1994			0.856			0.830	0.544	
1995	0.482	0.811	0.909	0.552	0.636	0.864	0.535	
1996	0.507	0.847	0.878	0.515	0.626	0.864	0.529	
1997	0.521	0.859	0.871	0.520	0.625	0.850	0.535	0.695
1998	0.517	0.860	0.841	0.564	0.651	0.866	0.563	0.674
1999	0.504	0.842	0.900	0.576	0.667	0.814	0.582	0.703
2000	0.501	0.837	0.836	0.582	0.642	0.805	0.550	0.719
2001		0.828	0.851	0.571	0.645	0.792	0.588	0.734
2002		0.859	0.870	0.591	0.641	0.800	0.568	0.672
Average	0.506	0.843	0.868	0.559	0.642	0.832	0.551	0.699
St. Dev.	0,014	0,017	0,025	0,028	0,014	0,030	0,024	0,025
Period	1995-2000	1995-2002	1994-2002	1995-2002	1995-2002	1994-2002	1993-2002	1997-2002

In all cases, H = 0 (monopoly), and H = 1 (perfect competition) are rejected at the 5% significance level, based on robust standard errors.
Note: Observations are weighted using banks' assets share.

Table 4. Concentration, foreign penetration and competition measures - Correlation matrix

	H	CR_5	CR_3	*HHI*	*FASSETS*
H	1				
CR_5	0.040	1			
	(0.754)				
CR_3	-0.018	0.993	1		
	(0.886)	(0.000)			
HHI	-0.070	0.975	0.980	1	
	(0.581)	(0.000)	(0.000)		
FASSETS	0.101	-0.194	-0.261	-0.255	1
	(0.429)	(0.124)	(0.038)	(0.042)	

Note: p values in parentheses.

Table 5. Concentration, foreign penetration and competition
(Country-level panel data)

	H						
	(1)	(2)	(3)	(4)	(5)	(6)	(7) [1]
Log # Banks	-0.017	-0.003	-0.002	-0.009		-0.052	0.004
	(0.021)	(0.021)	(0.021)	(0.021)		(0.027)*	(0.027)
FASSETS		-0.095	-0.095	-0.091	-0.096	-0.096	-0.104
		(0.030)***	(0.031)***	(0.032)***	(0.031)***	(0.029)***	(0.035)***
CR_3	0.008	0.014			0.018	0.032	0.052
	(0.094)	(0.099)			(0.078)	(0.093)	(0.095)
CR_5			0.017				
			(0.093)				
HHI				-0.103			
				(0.254)			
Year	0.001	0.006	0.006	0.005	0.006		0.006
	(0.002)	(0.002)**	(0.002)***	(0.002)**	(0.002)***		(0.002)**
Observations	64	64	64	64	64	64	64
R-squared	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Fixed effects	Country	Country	Country	Country	Country	Country and year	Country

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%
[1] Estimated using robust regression (see Hamilton 1992).

Table 6. Concentration and bank returns
(Bank-level panel data, WLS)

	ROA								*ROE*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
H	-3.632	-3.561	-3.403	-3.225				-2.989	-30.396		-28.480
	(1.485)**	(1.255)***	(1.593)**	(1.795)*				(1.355)**	(13.418)**		(10.576)***
Δlog (*GDP*)			1.632	1.700	1.960	1.782	1.999	1.793	11.372	13.793	11.805
			(0.808)**	(0.735)**	(0.968)**	(1.122)	(1.044)*	(0.867)**	(6.800)*	(9.134)	(7.269)
σ_{ER}			-0.260	-0.261	-0.349	-0.336	-0.359	-0.270	-2.075	-2.903	-1.940
			(0.066)***	(0.066)***	(0.069)***	(0.065)***	(0.074)***	(0.072)***	(0.675)***	(0.815)***	(0.664)***
FASSETS				0.097	0.434	0.424	0.335	0.015	2.186	5.363	1.705
				(0.214)	(0.183)**	(0.242)*	(0.155)**	(0.197)	(2.376)	(2.006)***	(2.218)
DFOR						-0.043	-0.038	-0.039			-0.261
						(0.073)	(0.031)	(0.031)			(0.365)
LASSETS						-0.080	0.039	0.038			0.580
						(0.171)	(0.033)	(0.032)			(0.284)**
Year	0.007		0.012	0.008	-0.006	0.002	0.010	0.024	0.001	-0.131	0.103
	(0.015)		(0.012)	(0.020)	(0.020)	(0.034)	(0.019)	(0.022)	(0.207)	(0.186)	(0.208)
Observations	2331	2331	2331	2331	2331	2331	2331	2331	2328	2328	2328
R-squared	0.46	0.48	0.47	0.47	0.45	0.45	0.07	0.08	0.50	0.48	0.14
Fixed effects	Bank	Bank & Year	Bank	Bank	Bank	Bank	Country	Country	Bank	Bank	Country

Robust errors clustered by country in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%
Note: Z is computed based on quarterly data over the last three years. Observations are weighted using banks' assets share at the country level (each country has the same weight in the regressions). ROE and ROA are measured in percentage points and exclude the 2% tails. σ_{ER} is the standard deviation of monthly exchange rate changes over the previous three years. DFOR takes the value one whenever a bank has been foreign-owned for (at least) the last year. By construction Bank fixed effect includes country fixed effect.

Table 7-a. Concentration and banking fragility
(Bank-level panel data, WLS)

	Z							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
H	-22.030	-20.893	-19.193			-17.031	-13.198	
	(11.054)**	(9.632)**	(10.660)*			(8.564)**	(7.963)*	
FASSETS_AVG	-0.406	-0.226	0.179	2.744	2.955	0.747	1.589	3.519
	(2.114)	(1.898)	(1.741)	(2.829)	(2.529)	(1.601)	(1.387)	(1.737)**
Δlog (*GDP*)	0.079	0.087	0.091	0.117	0.131	0.110	0.132	0.162
	(0.056)	(0.054)	(0.066)	(0.049)**	(0.056)**	(0.046)**	(0.054)**	(0.048)***
σ_{ER}	-0.604	-0.643	-0.998	-0.606	-1.147	-0.612	-1.144	-1.280
	(0.339)*	(0.323)**	(0.446)**	(0.428)	(0.056)**	(0.321)*	(0.415)***	(0.446)***
CR_3_AVG		-4.101						
		(7.087)						
DFOR_3						-0.553	-0.539	-0.552
						(0.190)***	(0.178)***	(0.171)***
LASSETS_AVG						0.414	0.417	0.416
						(0.148)***	(0.151)***	(0.153)***
Year	-0.085	-0.082		-0.228		-0.139		
	(0.169)	(0.148)		(0.225)		(0.128)		
Observations	2279	2279	2279	2279	2279	2261	2261	2261
R-squared	0.78	0.78	0.78	0.76	0.77	0.39	0.40	0.40
Fixed effects	Bank	Bank	Bank and year	Bank	Bank and year	Country	Country & year	Country & year

Robust errors clustered by country in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%
Note: Z is computed based on the last three years, excluding observations from the 2% tails of ROA. Observations are weighted using banks' assets share at the country level (each country has the same weight in the regressions). All control variables are measured based on the three-year period over which Z is computed. *LASSETS_AVG* : average of the log of bank assets. *FASSETS_AVG*: average share of foreign-owned over total bank assets. Δlog (*GDP*): cumulative growth. σ_{ER}: standard deviation of monthly exchange rate changes. *DFOR_3*: dummy that takes the value one whenever a bank has been foreign-owned for (at least) the last three years.

Table 7-b. Concentration and banking fragility
(Bank-level panel data, WLS)

	Log(*Z*)				
	(1)	(2)	(3)	(4)	(5)
H	-12.194	-7.757	-5.861		
	(4.505)***	(3.158)**	(2.533)**		
FASSETS_AVG	0.271	0.835	1.116	1.874	1.923
	(1.071)	(0.734)	(0.607)*	(1.379)	(0.626)***
log (*GDP*)	0.039	0.069	0.074	0.059	0.087
	(0.031)	(0.019)***	(0.019)***	(0.026)**	(0.014)***
σ_{ER}	-0.329	-0.352	-0.553	-0.321	-0.606
	(0.157)**	(0.150)**	(0.208)***	(0.240)	(0.237)**
CR_3_AVG					
DFOR_3		-0.260	-0.255		-0.258
		(0.105)**	(0.104)**		(0.102)**
LASSETS_AVG		0.221	0.223		0.224
		(0.064)***	(0.067)***		(0.068)***
Year	-0.051	-0.070		-0.121	
	(0.085)	(0.052)		(0.102)	
Observations	1896	1883	1883	1896	1883
R-squared	0.76	0.37	0.38	0.74	0.37
Fixed effects	Bank	Country	Country & year	Bank	Country & year

Robust errors clustered by country in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%
Note: log(*Z*) is computed based on the last three years, excluding observations from the 2% tails of ROA. Observations are weighted using banks' assets share at the country level (each country has the same weight in the regressions). All control variables are measured based on the three-year period over which Z is computed. *LASSETS_AVG* : average of the log of bank assets. *FASSETS_AVG*: average share of foreign-owned over total bank assets. Δlog (*GDP*): cumulative growth. σ_{ER}: standard deviation of monthly exchange rate changes. *DFOR_3*: dummy that takes the value one whenever a bank has been foreign-owned for (at least) the last three years.

Table 8. Concentration and banking fragility – Z-components
(Bank-level panel data, WLS)

	Z	*ROA*	*EQ/A*	σ_{ROA}	Log (*Z*)	Log ($\mu_{ROA} + \mu_{EQ/A}$)	Log (σ_{ROA})	*Z*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DFOR_3	-0.551			0.059	-0.271	-0.133	0.169		
	(0.113)***			(0.020)***	(0.066)***	(0.056)**	(0.042)***		
LASSETS_AVG	0.398			-0.116	0.215	0.043	-0.196	0.360	0.362
	(0.039)***			(0.007)***	(0.022)***	(0.020)**	(0.014)***	(0.042)***	(0.042)***
DFOR_1		-0.039	-0.014						
		(0.032)	(0.004)***						
LASSETS		0.036	-0.014						
		(0.012)***	(0.001)***						
DFOR_4								-0.417	
								(0.122)***	
DFOR_5									-0.377
									(0.124)***
Observations	2261	2331	2331	2287	1883	1886	2287	1811	1811
R-squared	0.46	0.14	0.26	0.42	0.41	0.33	0.63	0.45	0.45

Robust errors clustered by country in parentheses. All regressions include fixed effects for each country-year pair.
* significant at 10%; ** significant at 5%; *** significant at 1%.

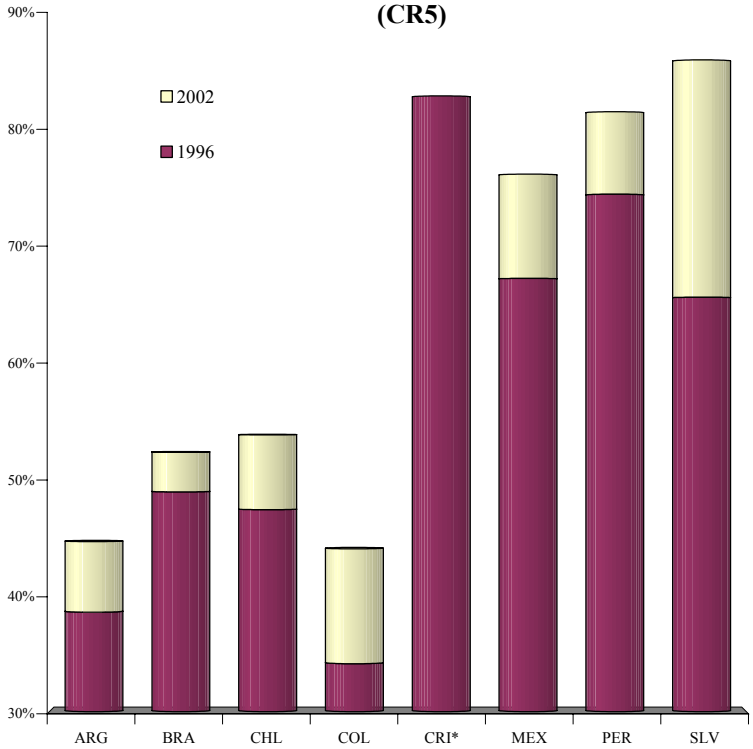
Note: Z, μ_{ROA} , $\mu_{EQ/A}$ and σ_{ROA} are computed based on the last three years excluding extreme values of ROA. Observations are weighted using banks' assets share at the country level (each country has the same weight in the regressions). *DFOR_n* is a foreign bank dummy that takes the value one whenever a bank has been foreign-owned for the last n years. *LASSETS_AVG* computed as the average of the log of bank assets over the last three years.

Table 9. Concentration and banking fragility
(Country-level panel data, WLS)

	Z				ln(*Z*)		*System Z*	
	(2)	(3)	(4)	(5)	(6)	(7)	(13)	(14)
FASSETS_AVG	2.744	2.872	4.288	0.678	2.014	0.547	5.691	-0.477
	(1.302)**	(1.157)**	(1.295)***	(1.417)	(0.576)***	(0.662)	(3.123)*	(4.659)
Δlog (*GDP*)	0.153	0.164	0.185	0.120	0.085	0.059	0.632	0.512
	(0.065)**	(0.059)**	(0.062)***	(0.066)*	(0.020)***	(0.025)**	(0.143)***	(0.165)***
σ_{ER}	-1.204	-1.383	-1.573	-1.059	-0.705	-0.502	-3.776	-2.630
	(0.540)**	(0.539)**	(0.566)***	(0.471)**	(0.231)***	(0.183)**	(1.338)***	(1.553)
CR_3_*AVG*		-7.140						
		(4.271)						
LASSETS_AVG_CTRY			1.268		0.488		3.466	
			(0.536)**		(0.168)***		(1.026)***	
H				-14.206		-5.998		-13.380
				(7.493)*		(2.663)**		(17.571)
Observations	47	47	47	47	47	47	47	47
R-squared	0.83	0.85	0.87	0.85	0.91	0.90	0.91	0.88

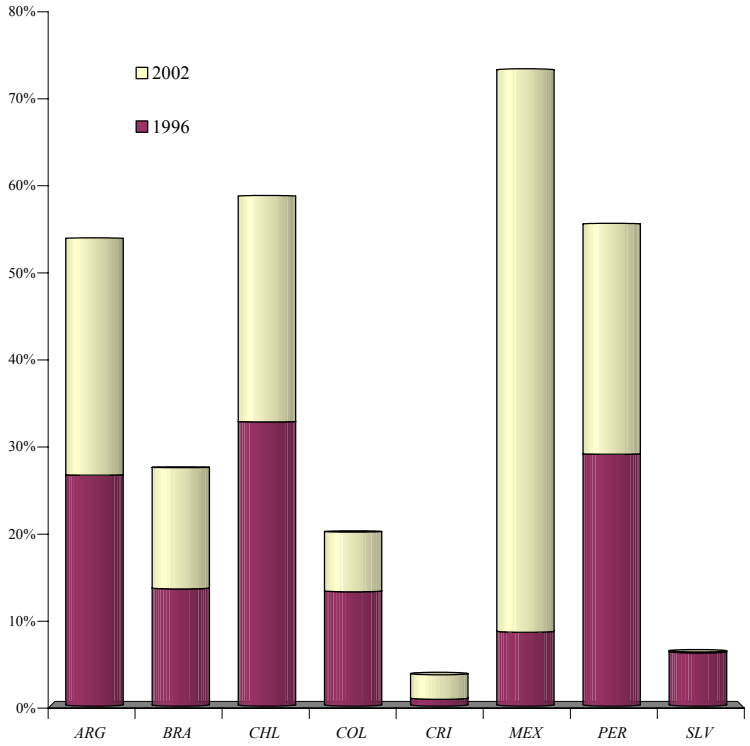
Robust errors clustered by country in parentheses. All regressions include country and year effects.
* significant at 10%; ** significant at 5%; *** significant at 1%.
Note: *Z* is the average *Z* weighted by bank' assets share, at the country level. *System Z* is computed by aggregating bank level data at the country level.
All control variables are measured based on the three-year period over which Z is computed. *LASSETS_AVG_CTRY* : country average of *LASSETS_AVG* (defined as the average of the log of bank assets over the last three years). *FASSETS_AVG*: average share of foreign-owned over total bank assets. Δlog (*GDP*): cumulative growth.
σ_{ER}: standard deviation of monthly exchange rate changes.

Figure 1.a. Increase in Bank Concentration
(CR5)



*CRI presented a decrease of 10% in its C.

Figure 1.b. Increase in Foreign Participation
(foreing bank assets over total assets)



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