

# Market structure, competition and intermediation in the banking industry

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## Abstract

We explore competition and efficiency in intermediation in six Latin American banking systems. The period 1995-2000 is particularly interesting to analyze because it was characterized by a decrease in the cost of financial intermediation, an increase in foreign participation and a process of consolidation that led to a decrease in the number of banks. In conjunction to traditional indicators used to assess the overall performance of banking systems, we construct measures of efficiency and competition from the literature of industrial organization, using bank-level data. Our results suggest that most banking systems did not fulfill their role of intermediation efficiently, and that the structure of the markets were not directly associated with the level and efficiency of intermediation. Regarding the relationship between structure and competition, our results do not provide clear evidence, mainly because of the difficulties in obtaining a measure of competition that is comparable across banking systems. Consequently, our study exposes the potential measurement and misinterpretation problems of recently used measures of competition, that arise from the differences in cost and revenue structures across countries.

**JEL Classification:** G21-Banks; Other Depository Institutions; Mortgages

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# 1 Introduction

Since 1995, Latin American banking systems have experienced a trend towards consolidation. However, unlike banking systems in developed countries, where consolidation was mainly a result of mergers and acquisitions motivated by potential efficiency gains from economies of scale and scope, consolidation in Latin America was initially triggered by economic stabilisation, liberalization of financial services and banking crises. All these factors contributed to reshape an industry that only some years before had been characterized by government controls on credit allocation and interest rates, and by poor regulation and supervision.

In this new context, the analysis of the relationship between the changing structure of these banking systems, their degree of competition and their efficiency in fulfilling their role of intermediation has become a relevant empirical issue. Different lines of reasoning describe the relationship between market structure, competition and efficiency in a banking system.

One of the most common arguments known as the structure-conduct-performance hypothesis (on which banking antitrust is based) asserts that greater concentration of payment and settlement flows among fewer parties can result in less competition, with detrimental effects to borrowers, who might be charged with higher interest rates. This in turn, could lead to inefficient credit allocation. In other words, the structure of a market influences how firms in that market will act, affecting their overall performance<sup>1</sup>.

The other common argument is known as the efficiency hypothesis and postulates the opposite causality relationship in the sense that firms with superior management or production technologies compete for larger market shares, and this process eventually results in high levels of concentration (Demsetz,1973).

Consequently, if regulators base their decisions on the structure-conduct-performance hypothesis and introduce measures aimed at discouraging concentration and market power to promote competition and more intermediation, the final results might be completely different, i.e., they might end up reducing the incentives of banks to compete and operate efficiently.

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<sup>1</sup>The structure of the market is not only associated with concentration, but also with the number and relative size of firms within an industry, entry/exit barriers, and the degree of intra-industry product differentiation.

The empirical evidence for developed banking systems fails to support both hypotheses (Gilbert, 1984 and Berger, 1995). This in turn, suggests that new models are required to correctly understand the complexity of the banking industry.

In fact, there exist other lines of reasoning that associate the structure of the market with efficiency and competition. Allen & Gale (2000) show that a concentrated market can be more efficient than a competitive one. The "static" efficiency gains that arise under competition (such as a reduction in operational costs) might be offset by excessive risks that banks take in order to gain larger market shares (such risks might in turn lead to financial instability). The authors argue that instead, in a concentrated market, banks might be able to invest in new technologies and gains would come from innovation (Schumpeterian view of "dynamic" efficiency).

Hauswald & Marquez (2000) suggest that concentration may reduce asymmetric information and enhance the role of banks as information producers in their lending activity, resulting in better screening (borrower-specific information becomes less dispersed than under competition), less risk of default, a reduction of loan rates, and a more efficient allocation of credit.

Other authors put emphasis on the barriers of entry in a contestable market. In the case of no barriers, a single firm dominating such a market does not necessarily have monopoly power and will be driven out by a potential rival unless it produces as efficiently as possible and does not earn excess profits.

These possible lines of reasoning are just some examples of the vast (and mostly theoretical) literature aimed at finding the most desirable market structure in the banking industry.

In the case of developing countries, there is an important reason to be concerned about the the structure of banking systems. If the ultimate effects of a highly concentrated market are those suggested by the structure-conduct-performance hypothesis, there would be detrimental effects in the way banking systems fulfill their role of financial intermediation, a role that is crucial in finding pathways to sustainable growth<sup>2</sup>.

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<sup>2</sup>The link between financial development and economic growth is well documented. For a review of the lines of thought and evidence, the reader can refer to Levine (1997) and the World Bank compilation "Finance for Growth: Policy Choices in A Volatile World" (2001)

Consequently, in this paper we try to answer three basic but relevant questions: has competition in the banking systems changed? have there been substantial efficiency improvements in the way banks fulfill their role of intermediation? and has the structure of the market been associated with competition and efficiency? To answer these questions we will analyze the commercial banking systems of Argentina, Brazil, Chile, Colombia, Mexico, and Peru for the period 1995 - 2000 using traditional financial ratios, and will present measures of competition and efficiency for each banking system.

The paper is organized as follows: the second section describes stylized facts about banking systems in Latin America, in this section we also compare the performance of these banking systems with that of developed ones; the third section explains measures of efficiency and competition proposed in the industrial organization literature; the fourth section presents the implementation and results for the selected banking industries; and the last section concludes.

## **2 Stylized facts about banking systems in Latin America**

Before analysing the banking systems, a few general warnings should be given.

In general, differences in regulations, institutions and market structure across countries mean that conclusions drawn from the analysis of one country should be cautiously generalised to others. Likewise, in countries with a heavily bank-oriented financial system, the banking industry may evolve differently than in countries where there is more scope for securities markets. In these last countries banks rely less on the traditional intermediation business and provide more services than just loans and deposits, which allows them to transfer risks to other business units, thus maintaining more liquid balance sheets. All this should be kept in mind when comparing cost and revenue structures. Likewise, because of differences in regulation, commercial and investment banks are (or have been) strictly separated in some countries, while in others they can operate jointly as universal banks and even have cross-shareholdings with industrial companies. These differences make for different market structures and internal organisations, again hampering

international comparisons.

In the specific case of Latin America, banking systems have historically been the predominant source of finance, while capital markets have remained underdeveloped. In the 90s, the banking industry experienced a considerable transformation. This transformation did not occur in all countries at once, but at least in two stages. The first stage was that of financial liberalization that took place between the end of the 80s and the first half of the 90s and was predominantly associated with the elimination of interest rate ceilings, subsidized loans, obligatory lending to public sector, the introduction of new financial instruments, greater central bank autonomy, banks privatization, and access to foreign investors<sup>3</sup>. A second stage of reforms took place between 1995 and 2000 and was triggered by periods of financial distress. This stage brought consolidation in the sector (through a second wave of liquidations, mergers and acquisitions) and important measures to improve accounting standards as well as regulation and supervision in each country. However, the specific circumstances in which this sequence of events took place were different across countries. In particular, the way banking crises were managed were considerably different and in some cases entailed large costs with significant and prolonged effects on the performance of the banking systems. The most notorious cases were the costly rescue programs undertaken by Mexico and Venezuela after the banking crises of 1994 and 1995<sup>4</sup>.

It is also important to mention that in countries like Argentina and Peru, banking systems were highly dollarized (more than half of the total amounts of loans and deposits were denominated in US dollars) as a result of past episodes of hyperinflation. This dollarization imposed additional transaction costs (inefficient barter mechanisms) with no trivial effects on banking intermediation.

The one exception in the region is Chile. This country introduced major structural reforms throughout the 80s, and in the 90s its banking system operated in a healthy macroeconomic and institutional environment that allowed it to scape

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<sup>3</sup>However, in Mexico, foreigners were not allowed to participate in privatizations that took place in the beginning of the 90s. After the crisis of 1994-1995, foreigners were allowed to participate in a new wave of privatizations.

<sup>4</sup>The lasting effects of the bad crisis management in Mexico is also confirmed in Moody's Banking System Outlook (2003) for Mexico: "We would describe full-year 2002 as the definitive closing of the last chapter of the 1995 banking system crisis".

unscathed from major episodes of regional financial distress.

In sum, most banks in Latin America had to face a very particular political, economic and regulatory environment that we have to keep in mind in the subsequent analysis.

In the following lines we try to identify the main characteristics of the selected banking systems, by highlighting the differences in financial indicators and comparing them with banking systems in more developed countries. The selection of indicators is primarily based on those proposed by Beck et al.(2000) for the analysis of financial development and structure across countries and over time. As mentioned in the introduction, the main focus of this study will be on commercial banks, as they are the major financial institutions in Latin America. Specialized banks such as investment banks, development banks, long term credit institutions, leasing companies and mortgage institutions are excluded (except for those that fall in the category of universal banks).

Regarding the depth of intermediation, Table 1 shows that the ratio of deposits to GDP increased in Argentina, Chile and Peru. However, by international standards, intermediation in the region remained low: by the end of 2000 deposits in most countries were equivalent to no more than 30% of GDP (except for Chile with a 42%), compared with 55%-168% in developed countries.

The ratio of banks assets to GDP, a measure of the size of the banking system, shows that Chile, Brazil, Argentina and Mexico were the biggest systems in the region with 60%, 42%, 34% and 34% in year 2000. However, compared with the international standards of 80%-149%, these systems remained small<sup>5</sup>.

When comparing size and lending activities in year 2000, we notice that Chile provided credit to the private sector (59% of GDP) that was "in-line" with the size of its banking system (60% of GDP). Instead, in Brazil, Argentina and Mexico, credit was considerably lower than the size of their banking systems. This suggests that commercial banks in Chile were relatively more efficient in fulfilling their role as financial intermediaries.

Regarding alternative sources of finance, the measures of size for the stock and

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<sup>5</sup>Historically, Germany has been a bank-oriented financial system, while the U.S. has been a capital market-oriented system. This is the reason why the ratio of banks assets to GDP is considerably higher in Germany than in the U.S. Allen & Gale (2000, Chapter 1) provide a detailed analysis on the historical development of these financial systems.

bond markets (stock market capitalization to GDP and bond market capitalization to GDP) reveal that these alternatives became increasingly important in the region, but they still were not as important as in developed countries. Particularly notorious is the growth of the Brazilian bond market: by 2000 it already represented more than 40% of the GDP. This growth, however, does not necessarily mean that the banking system has been losing predominance in the economy and that the capital market is becoming the main source of finance.

According to data from the Bank for International Settlements (BIS) shown in Table 2, the Brazilian public sector issued 70% of the total debt, while financial institutions issued 29.5%, and the corporate sector only 0.1%. This suggests that Brazilian banks have also been raising funds by issuing important amounts of debt. If we add the fact that banks have also acquired short-term government debt, the idea that banks have been facing increasing "competitive" pressures from the bond markets as a financing alternative starts to become doubtful. Instead, in this new context, banks actually appear to have benefited from the development of capital markets. Moreover, notice that the corporate issues in the bond market is very low, suggesting a crowding-out effect from the public sector. In fact, according to different country reports from the Economist Intelligence Unit, not only Brazilian banks, but most banks in the region have been investing in safe and profitable government bonds, leaving credit to the private sector unattended<sup>6</sup>.

Regarding the structure of the banking systems, Table 3 shows that the number of commercial banks in all Latin countries has tended to decline. Likewise, in year 2000, the 5-firm concentration ratio (in terms of value of total assets) suggests that Mexico, Peru and Chile were the most concentrated systems in the Latin region (63%-75%). However, by some international standards, those levels of concentration were not considerably high: Germany and Spain registered a concentration ratio of 71% and 78%, respectively. The case of Chile is particularly interesting. Its banking system is among the most concentrated systems in the Latin region, but still, its general performance is comparable to that of more developed banking systems, and it appears to fulfill its role of financial intermediation better than the

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<sup>6</sup>Excessive government borrowing has been blamed for low private-sector borrowing and, consequently, low investment. In such a context, private firms could only be able to borrow at higher interest rates. In turn, higher interest rates discourage financial intermediation.

rest of countries in the region.

	<b>Deposit Money Banks (Commercial Banks)</b>								
	<b>Deposits</b>			<b>Assets</b>			<b>Private Credit</b>		
	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>
Argentina	0.16	0.23	0.27	0.25	0.30	0.34	0.20	0.22	0.24
Brazil	0.24	0.27	0.25	0.38	0.46	0.42	0.30	0.30	0.28
Chile	0.32	0.37	0.42	0.47	0.56	0.60	0.46	0.54	0.59
Colombia	0.14	0.19	0.20	0.20	0.28	0.27	0.16	0.22	0.19
Mexico	0.23	0.22	0.18	0.34	0.37	0.34	0.28	0.16	0.12
Peru	0.16	0.25	0.26	0.15	0.28	0.29	0.13	0.25	0.26
U.S	0.51	0.52	0.55	0.70	0.75	0.80	0.62	0.66	0.71
Germany	0.59	0.64	1.68	1.30	1.47	1.49	1.01	1.14	1.18
Spain	0.64	0.58	1.33	1.02	1.06	1.15	0.72	0.81	0.93
	<b>Capital Markets: market capitalization</b>								
	<b>Stock market</b>			<b>Public bond market</b>			<b>Private bond market</b>		
	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>
Argentina	0.15	0.19	0.50	0.08	0.08	0.11	0.03	0.04	0.05
Brazil	0.24	0.22	0.30	0.18	0.35	0.41	0.11	0.12	0.09
Chile	1.11	0.69	0.77	0.28	0.31	0.28	0.13	0.17	0.17
Colombia	0.18	0.11	0.07	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Mexico	0.39	0.16	0.12	0.09	0.07	0.09	0.02	0.02	0.02
Peru	0.19	0.21	0.18	0.01	0.01	0.02	0.01	0.03	0.04
U.S	0.81	1.35	1.43	0.58	0.51	0.44	0.81	0.93	1.03
Germany	0.21	0.43	0.64	0.23	0.28	0.33	0.51	0.59	0.62
Spain	0.30	0.56	0.74	0.43	0.52	0.51	0.14	0.11	0.15

Source: World Bank, IFS, Standard & Poor's

Table 1: Evolution of Financial System Indicators (% of GDP)

	<b>Financial</b>			<b>Public</b>			<b>Corporate</b>		
	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>
Argentina	0.79	0.96	0.99	0.21	0.04	0.01	0.00	0.00	0.00
Brazil	0.51	0.36	0.29	0.49	0.63	0.70	0.00	0.01	0.01
Mexico	0.00	0.00	0.00	0.84	0.75	0.80	0.15	0.22	0.23
U.S.	0.39	0.53	0.60	0.54	0.40	0.32	0.07	0.07	0.09
Germany	0.72	0.72	0.72	0.27	0.26	0.25	0.01	0.01	0.03

Source: own calculations, BIS

Table 2: Domestic debt securities with remaining maturities up to one year, by sector (% of total)

	<b>Number of Banks</b>			<b>Concentration-5</b>			<b>Herfindahl<sup>7</sup></b>		
	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>
Argentina	80	90	72	0.41	0.47	0.50	522.3	582.8	679.6
Brazil	128	133	114	0.52	0.49	0.50	899.9	795.5	744.4
Chile	28	27	26	0.58	0.65	0.63	935.1	1012.9	942.1
Colombia	28	29	27	0.56	0.51	0.47	835.5	755.5	659.5
Mexico	36	38	35	0.69	0.75	0.73	1234.1	1413.6	1502.2
Peru	22	23	18	0.76	0.69	0.75	1673.6	1399.9	1463.8
U.S.	397	371	317	0.22	0.26	0.27	178.0	221.4	239.1
Germany	220	222	167	0.67	0.77	0.71	1044.8	1518.5	1969.8
Spain	88	84	87	0.63	0.63	0.78	992.2	1127.3	2105.4

Source: Bankscope

Table 3: Indicators of Market Structure

Additionally, there was a trend towards acquisitions (specially through privatizations) that led to a higher foreign control of banks in most countries (see Figure 1). The business press has usually claimed that this increase in foreign ownership has been associated with efficiency gains from a reduction in operational costs and from the introduction of new technology. While this argument is valid, the

<sup>7</sup>To calculate it, take the market share of loans or deposits for each bank in the industry, square it, and finally sum those squares. The U.S. Anti-Trust Department uses the changes in the Herfindahl Index to decide if a merger is anti-competitive or not. The Department takes the increase in Index value by 100 or any increase in the overall value to over 1,000 seriously.

reduction in operational costs and the increase in new technology do not appear to have been associated with an increase in financial intermediation.

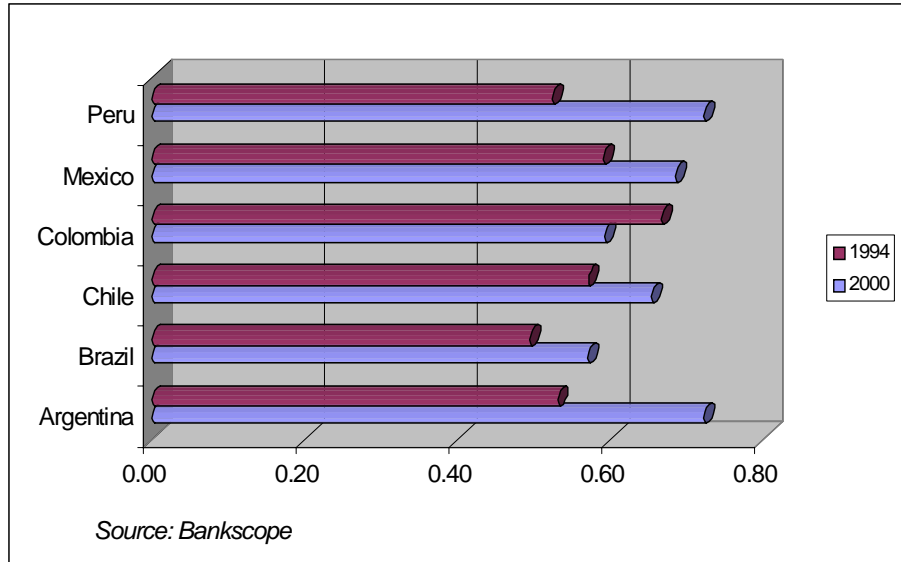


Figure 1: Percentage of banks with at least 50% of foreign shareholders

Regarding the cost of financial intermediation, Table 4 shows that net interest margins declined in four countries (particularly in Colombia) but still remained high by international standards. Only Chile exhibited low margins. The reduction in net interest margins, however, was not associated with an increase in lending activity across the region.

Regarding operational efficiency, the ratio of overheads to total assets remained higher than the international standards of 1%-3%, and although there was a decline in some countries through 1995-2000, it did not appear to be substantial. Again, only in Chile overheads were at the international level. In Argentina, Brazil and Peru, overheads declined to 5%-6%, while in Colombia they increased to 9%. At first glance, the relative higher operational costs might be indicative of a less competitive environment in most of these markets (this is because competition is expected to give rise to "static" efficiency gains).

	Overhead Costs			Net Interest Margins			Non-performing loans		
	1995	1998	2000	1995	1998	2000	1995	1998	2000
Argentina	0.07	0.05	0.05	0.06	0.04	0.04	0.12	0.06	0.13
Brazil	0.08	0.07	0.06	0.08	0.06	0.05	0.11	0.09	0.05
Chile	0.03	0.03	0.03	0.05	0.05	0.05	0.01	0.02	0.02
Colombia	0.08	0.08	0.09	0.09	0.07	0.03	0.06	0.10	0.08
Mexico	0.04	0.05	0.06	0.06	0.06	0.07	0.16	0.10	0.05
Peru	0.06	0.05	0.05	0.08	0.07	0.06	0.04	0.07	0.10
U.S.	0.03	0.03	0.03	0.04	0.05	0.04	n.a.	n.a.	n.a.
Germany	0.02	0.01	0.02	0.01	0.01	0.01	n.a.	n.a.	n.a.
Spain	0.02	0.02	0.02	0.03	0.02	0.02	n.a.	n.a.	n.a.

Source: Bankscope, Felaban, The Economist

Table 4: Indicators of Efficiency and Asset quality

Regarding asset quality, the ratio of non-performing loans to total loans<sup>8</sup>, shows that Argentina's asset quality deteriorated substantially from year 1998 to year 2000 (right before the crisis of 2001) and that Chile had the lowest ratio of overdue loans in the region.

	ROAA (%)			ROAE (%)		
	1995	1998	2000	1995	1998	2000
Argentina	-2.98	-0.04	-0.32	-21.21	2.97	0.01
Brazil	1.69	1.48	1.91	7.93	7.41	10.12
Chile	0.76	1.08	1.25	7.83	6.28	8.81
Colombia	1.74	-1.65	-1.41	10.49	-13.17	-6.45
Mexico	1.99	-1.18	-0.18	6.64	-0.39	0.36
Peru	1.38	0.24	0.11	13.24	3.88	2.32
U.S.	1.32	1.56	1.35	15.42	16.15	14.36
Germany	0.34	0.95	1.34	4.38	8.08	10.78
Spain	1.06	1.43	0.42	4.85	8.05	4.23

Source: Bankscope

Table 5: Indicators of Profitability

<sup>8</sup>Previous studies have set a breakpoint of 8% in this ratio, in order to predict banks failures. See Gilbert, Meyer and Vaughan (1999)

Finally, regarding banks profitability in the region, Table 5 shows that the returns on average assets (ROAA) and the returns on average equity (ROAE) were not only volatile, but in many cases they were negative. Only in Brazil and Chile, profitability was relatively stable across time and did not differ substantially from the profitability of banks in developed countries.

In sum, the Latin banking industry was characterized in the period 1995-2000 by:

- an increase in foreign ownership.
- a process of consolidation that led to a gradual decrease in the number of banks (and a gradual increase in the levels of concentration).
- a reduction in the cost of financial intermediation (but still high by international standards, except for Chile)
- relatively low intermediation levels (except for Chile).
- relatively higher operational costs (except for Chile)
- relatively lower profitability (except for Brazil and Chile)

Up to this point, however, our analysis does not clearly show whether the structure of the markets might have been associated with competition or efficiency in intermediation. In the following section we try to shed light on these issues by constructing measures of efficiency and competition for the banking systems.

## **3 Measuring efficiency and competition of banking systems**

### **3.1 Efficiency**

Efficiency is a broad concept that can be applied to many dimensions of a bank's activities. In the introduction we referred to "dynamic" and "static" efficiency,

which are difficult to quantify. This is why such concepts have remained in the sphere of theoretical models<sup>9</sup>.

In the literature of industrial organization, which views banks as firms using inputs to produce outputs, the definitions of efficiency focus on how production factors are combined (the optimisation of existing resources)<sup>10</sup>. The selection of inputs and outputs has been a subject of frequent disagreement, and this in turn reflects the lack of consensus that exists among researchers when it comes to describe the way banks function<sup>11</sup>.

Although the selection of inputs and outputs is arbitrary, there are some guidelines or approaches that most studies have used<sup>12</sup>. The first approach is called the production approach, and views banks as *service-producing* organizations that use labor, capital and equipment to produce payments, loans, and other financial services (in this approach some bank outputs and inputs have also been defined as number of units or quantities, such as number of accounts, number of loan applications, number of employees, etc.). The second approach is called the revenue or profit approach, and emphasizes the *profitability* of the bank in relation to the expenditures: interest paid on deposits, expenses of personnel, administration and depreciation are among the most commonly inputs used, while interest and non-interest incomes are among the most commonly outputs. The third approach is called the intermediation approach, and views banks as financial intermediaries

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<sup>9</sup>See for example Allen and Gale (2000, Chapter 8)

<sup>10</sup>This type of efficiency is closely related to the concepts of X-efficiency and technological efficiency. A firm is X-efficient if it produces outputs at the minimum possible cost. This is not enough to ensure other types of efficiency that are related to social welfare ("macroeconomic" efficiency). For instance, a monopoly can be an X-efficient producer, but in order to maximise its profit it may produce a different quantity of output than there would be in a market with perfect competition, in which consumer and producer surplus are maximised. X-inefficiency do not only arise from operative costs that are under the direct control of the management, but might also be a result of corporate governance and principal-agent problems. The concept of technological efficiency considers scale and scope economies. An efficient firm is one that reaches the optimal size for its industry (scale) and that produces the optimal mix of products given the prices of their production factors (scope). The minimum efficient size and optimal product mix vary with technologies, regulations and consumers' tastes. Therefore, there should be wide variations in firm structure across time, industries and countries if firms fully exploit scale and scope economies.

<sup>11</sup>Moreover, many authors are sceptical about the whole idea of using an input-output approach to describe the way banks operate. For example, see Allen and Gale (2000, Chapter 8).

<sup>12</sup>See Yeh (1996)

whose primary business is to *borrow funds from savers and lend those funds to others*. In this case, operating costs, labor costs, interest expenses and total deposits have been used as inputs, while total loans, interest and non-interest incomes have been used as outputs.

As mentioned in the introduction, in this paper we will focus on the concept of efficiency in intermediation, and therefore we will use this last approach to characterize the way banks function.

Finally, many authors (see for example Demirgüç-Kunt and Huizinga, 1999) have used interest rate spreads as a measure of banks "efficiency in intermediation". However, there are other authors who associate interest spreads with profitability more than with financial intermediation. Therefore, we think it is important to clarify the definition of interest spreads. There are two types of interest rate spreads that are used to measure efficiency in intermediation: ex-ante and ex-post. Ex-ante spread is the difference between the loan rate and the deposit rate. Ex-post spreads are equivalent to interest income minus interest expenses divided by total assets (net interest margins). The advantage of ex-post over ex-ante spreads is that ex-post spreads do not include the amounts that would have been earned by loans that defaulted.

In short, the input-output measure of efficiency in intermediation answers the question of how efficiently deposits and other inputs are transformed into loans and other outputs. In contrast, interest rate spreads show how costly financial intermediation is: high spreads reflect high loan rates and low deposit rates. In such a context, it is expected that intermediation is low or "inefficient"<sup>13</sup>.

We construct a measure of efficiency using a micro approach to infer the con-

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<sup>13</sup>In general, the main problem of using ex-ante or ex-post spreads as a measure of efficiency in intermediation is that they can be subject to different interpretations, particularly in emerging markets. On the one hand, relative narrow margins may not be indicative of an efficient banking system that has a low level of intermediation costs, but instead, may reflect the attempts of banks to gain market share, or to avoid default of risky borrowers. From a macro perspective, a reduction in spreads can be a result of gradual economic stabilization, particularly in countries with a history of high inflation, where banks kept nominal loan rates high in order to obtain positive real rates. From an accounting perspective, lower margins can simply reflect an increase in taxes. On the other hand, relative high margins are not necessarily indicative of a decrease in efficiency, but instead, might reflect more stability in the banking system: an increase in profitability and capital due to high margins could permit banks in emerging markets to insulate themselves from macro and other shocks.

ditions at the macro level. There are two widely used approaches to characterize a bank's performance from a multidimensional perspective (overcoming in this way the single dimensional disadvantages involved in the separate analysis of ratios): a linear programming approach (data envelopment analysis -DEA) and an econometric approach (stochastic frontier models)<sup>14</sup>. Broadly speaking, these techniques use data of inputs and outputs of banks to construct a production or cost frontier and then obtain a measure of how far each bank is away from its benchmark (which lies on the frontier). As in most situations, the choice of techniques involves tradeoffs. DEA is a nonparametric technique, while the stochastic frontier model is a parametric technique that requires the specification of a cost or production function. In the parametric technique, the measures obtained are the regression residuals, which are divided in two "components": the idiosyncratic component (stochastic shocks) and an inefficiency component. Instead, in the nonparametric technique, no distinction is made, and the whole measure represents inefficiency (stochastic shocks are not considered). The strength of DEA, however, lies in the fact that no cost function specification is required, and therefore, we do not have to worry about a potential misspecification error. As pointed out by Soares de Pinho (2001), there is no consensus among experts in this area about which of these two approaches is the best to measure efficiency. DEA is used by Seiford and Zhu (1999) to examine the performance of the top 55 U.S. commercial banks, while the stochastic frontier model is used by Soares de Pinho (2001) to measure the efficiency of Portugal's banking system.

We use the non-parametric approach called Data Envelopment Analysis (DEA). This technique was initially developed by Charnes et al.(1978). In the following lines we provide a concise explanation of this technique. For a detailed explanation of DEA and other methods used to measure productive efficiency, the reader can refer to Fried et al.(1993).

DEA consists in solving linear optimization problems, which can be formulated in two ways: minimization of input(s) subject to a given output(s), or maximisation of output(s) subject to a given input(s).

Formally, for period  $t$ , the efficiency measure for a given bank can be obtained

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<sup>14</sup>Berger and Humphrey (1999) provide a complete review of the methods and a compilation of the literature applied to financial institutions.

by solving the following input-oriented linear program:

$$\begin{aligned}
 F(y, x) &= \min \lambda \\
 &\text{s.t.} \\
 \sum_{k=1}^K z_k y_{km} &\geq y_{km}, \quad m = 1, \dots, M \text{ outputs} \\
 \sum_{k=1}^K z_k x_{kn} &\leq \lambda x_{kn}, \quad n = 1, \dots, N \text{ inputs} \\
 z_k &\geq 0, \quad k = 1, \dots, K
 \end{aligned}$$

where  $x_1, \dots, x_N$  and  $y_1, \dots, y_M$  represent  $N$  inputs and  $M$  outputs respectively,  $k$  are the Decision Making Units (bank 1, 2, ...,  $K$ ),  $z_k$  are called intensity variables which are constants that allow to map out the linear segments of the frontier, and  $\lambda$  is the objective value (the ratio of minimal feasible input usage to the current input usage). The left hand side of the inequalities "contains" the inputs and outputs of all banks (of a particular country) while the right hand side contains the inputs and outputs of the bank we want to analyze. Therefore, a linear program must be solved for each bank in order to obtain its respective  $\lambda$  (a total of  $K$  linear programs).

In figure 2 we see a two-dimensional representation of the efficient frontier, for the case of six banks, all of them using different amounts of input 1 and input 2 in order to produce one unit of output (the amounts of inputs used by each bank are shown in both axes, for example bank 1 uses two units of input 2 and one unit of input 1)<sup>15</sup>. The bold line represents the efficient frontier that has been mapped out after solving the linear optimization programs with the data of the six banks (it is now possible to see how the name data envelopment analysis arises - the efficient frontier "envelopes" or encloses all the available data). Notice that bank 1 and bank 2 are on the boundary of the frontier, while all the other banks are inside the boundary. Bank 1 and bank 2 are therefore benchmark banks as they are relatively efficient.

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<sup>15</sup>A frontier can be plotted only when we have two inputs and one output for input minimization, or one input and two outputs for output maximization. This is because of the fact that once we add more inputs and more outputs, the problem becomes multi-dimensional and can be no longer depicted in a graph.

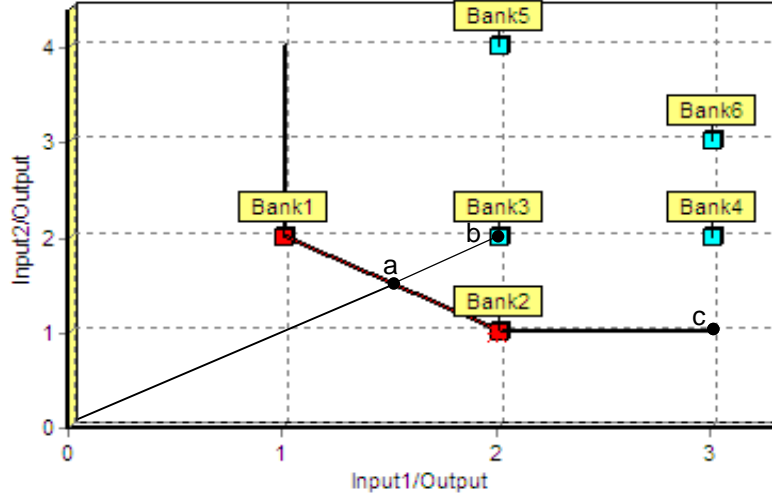


Figure 2: The input measure of technical efficiency

To determine how inefficient the other banks are, it is first necessary to find comparable benchmarks. This is done graphically by drawing a line from the origin to the point that corresponds to each bank. In the case of bank 3 (which is located at point "b"), its benchmark bank is located at point "a", exactly where the proportion of inputs used is the same as the proportion of inputs used at point "b". In theory, bank 3 should be able to scale down its inputs usage from point "b" to point "a" and still produce the same amount of output. Then, efficiency is measured as the ratio of minimal feasible input usage to the current input usage. In Figure 2, efficiency for bank 3 would be the ratio:

$$\lambda = \frac{\overline{0a}}{\overline{0b}} \quad , \lambda \in (0, 1]$$

This measure is usually referred to as the Farrell Input-Saving Measure of Technical Efficiency (Farrel, 1957).

In figure 2, it is straightforward to see that this ratio is equal to 1 for banks 1 and 2, i.e. they are operating efficiently. In sum, banks are efficient if they are on the boundary of the best practice frontier, i.e., they are benchmark banks. In some cases, however, these benchmarks may not be using the fewest possible inputs to produce their output. For example, if we add another bank, which uses three units of input 1 and one unit of input 2 (point "c"), we will find that it has

$\lambda = 1$ , i.e. it is a benchmark bank. However, we can see that this bank could actually produce one unit of output with less input 1, i.e. it could reduce input 1 by one unit (from three to two). Thus, it is possible that these measures may overstate efficiency. Since the scaling is radial, any slacks remaining in the solution of the DEA problem are not incorporated into the efficiency measures.

## 3.2 Competition

Measures such as the 5-bank concentration ratio and the Herfindahl index (shown in Table 3) have been widely used to infer competitive conditions from the structure of the market. However, these measures might not be directly related to competition: if markets are contestable, a highly concentrated market can still face high competition from potential entrants.

Other studies have used the geographical distance between competing banks in a local market (a measure of spatial competition). The problem with this measure is that the spatial delineation of the market may be inappropriate if customers' perception of the market for banking services varies with the particular banking product.

Due to these limitations, researchers have opted for other approaches that directly analyse the competitive conduct of banks without using explicit information about the structure of the market. One of the alternative measures that has been frequently used is the Lerner index, which is a measure of market power. Likewise, recent empirical applications have used approaches from the "new industrial organization literature": the Bresnahan-Lau model, which is a conjectural variations approach (how all other firms alter their output quantity in response to a variation by one firm); and the Panzar-Rosse model, which computes cost elasticities (how firms revenues change in response to changes in input prices).

Our access to bank-level data gave us enough flexibility to choose among approaches. We opted for the Lerner index. The theoretical framework most often used to derive it is the Monti-Klein imperfect competition model<sup>16</sup>. The basic idea is that under perfect competition, profit-maximizing firms will choose an output price that is equal to the marginal cost of producing it. Therefore, any difference

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<sup>16</sup>See Freixas and Rochet (1997, Chapter 3)

between output price and marginal cost measures a departure from a perfectly competitive benchmark.

In order to estimate the Lerner index, we first need to specify a cost function. We assume the total cost function to have a translog specification<sup>17</sup>:

$$\begin{aligned} \ln(C_j) = & c_0 + \beta_0 \ln(q_j) + \frac{\beta_1}{2} \ln(q_j)^2 + \sum_{i=1}^2 c_i \ln(\omega_{ij}) + \ln(q_j) \sum_{i=1}^2 \beta_{i+1} \ln(\omega_{ij}) + \\ & c_3 \ln(\omega_{1j}) \ln(\omega_{2j}) + \sum_{i=1}^2 c_{i+3} \ln(\omega_{ij})^2 + \epsilon_j \end{aligned} \quad (3.1)$$

where  $C_j$  = total operating expenses and interest expenses (proxy for total costs),  $q_j$  = total assets (proxy for total output or quantity produced),  $\omega_{1j}$  = interest expenses to total deposits and money market funding (proxy for input price of deposits),  $\omega_{2j}$  = total operating expenses to total assets (proxy for input price of labor and equipment), and the subscript  $j$  refers to bank  $j$ .

By solving equation 3.1 for  $C_j$ , and then differentiating with respect to  $q_j$ , we obtain the marginal cost:

$$\frac{C_j}{q_j} (\beta_0 + \beta_1 \ln(q_j) + \sum_{i=1}^2 \beta_{i+1} \ln(\omega_{ij})) \quad (3.2)$$

Now, we can specify the following equation that describes the relationship between the output price and marginal cost:

$$price_j = \alpha + \frac{C_j}{q_j} (\beta_0 + \beta_1 \ln(q_j) + \sum_{i=1}^2 \beta_{i+1} \ln(\omega_{ij})) + \epsilon_j \quad (3.3)$$

where  $price_j$  = total revenues to total assets (proxy for the output price).

In equation 3.3,  $\epsilon_j$  is assumed to have mean 0, be uncorrelated with  $C_j$ ,  $q_j$  and  $\omega_{ij}$ , and be homoskedastic. Then, the intercept  $\alpha$  represents the deviations from the competitive equilibrium. Dividing  $\alpha$  by the average price  $p$ , we obtain the

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<sup>17</sup>See for example an application to Italian banks by Angelini and Cetorelli (1999). Most studies have used the translog cost function because it allows a U-shaped average cost curve, does not impose a priori restrictions on the elasticity of substitution and allows the computation of measures that take into account the differences in banks size.

Lerner index for a banking system (the relative mark-up of price over marginal cost):

$$\frac{\alpha}{p}$$

An index equal to 0 reflects perfect competition, less than 0 reflects "super-competition" or predatory pricing, greater than 0 reflects monopolistic power, and equal to 1 reflects pure monopoly power.

## 4 Implementation and results

### 4.1 Data

We obtained annual data from Bankscope, which contains balance sheets and income statements of commercial banks. Our analysis spans the period 1995-2000. As in Claessens and Laeven (2004) we use data from consolidated accounts if available, and otherwise from unconsolidated accounts (to avoid double-counting). Through this period many small banks were either intervened or liquidated, and this was reflected in incomplete data in their balance sheets and income statements in the year of intervention or liquidation (these banks still "existed", but were not operating). We therefore have 1820 balance sheets and income statements with the required data. Table 6 shows the number of banks that were included in the analysis for each country as well as the share of total deposits that corresponds to each country. Notice that Argentina and Brazil have the largest number of banks in the region. Likewise, together with Mexico, they hold the largest amounts of deposits in the region.

Number of commercial banks						
	Argentina	Brazil	Chile	Colombia	Mexico	Peru
1995	76	116	28	28	33	22
1996	89	124	28	30	38	23
1997	83	121	28	31	36	23
1998	86	116	25	28	37	23
1999	76	111	24	24	36	17
2000	65	94	24	26	33	18

% of deposits held by each country						
	Argentina	Brazil	Chile	Colombia	Mexico	Peru
1995	0.25	0.38	0.09	0.09	0.11	0.07
1996	0.27	0.37	0.08	0.09	0.11	0.07
1997	0.26	0.38	0.09	0.10	0.11	0.07
1998	0.27	0.37	0.08	0.09	0.12	0.07
1999	0.26	0.39	0.08	0.08	0.13	0.06
2000	0.25	0.36	0.09	0.10	0.13	0.07

Table 6: Characteristics of the data set

## 4.2 Results

### 4.2.1 Efficiency

As mentioned before, selecting proper input and output variables is perhaps the most important issue when using DEA. We use the guidelines that were previously mentioned. For our purposes, we use the intermediation approach. The final criteria for the selection of outputs and inputs has been data availability for all banks. We obtained complete data for the following outputs: net loans and interest income, and for the following inputs: interest expenses, deposits and other expenses. These inputs and outputs have been included in a similar DEA analysis for U.S. commercial banks by Yue (1992).

In order to obtain an aggregate efficiency score for the banking systems, we computed arithmetic and geometric averages using the efficiency scores of each

bank<sup>18</sup>. Berger and Humphrey (1997) reviewed a vast number of studies applied to the banking industry, and noticed that the estimates of average efficiency obtained from studies that used parametric techniques were not substantially different from those that used nonparametric techniques. However, when ranking individual banks according to their respective efficiency scores, they noticed that these rankings varied across techniques. Consequently, the authors reached the conclusion that using the average as an aggregate of the banking system may be a more reliable guide for policy and research purposes.

These results should be approached with caution. Efficiency has been measured relative to a domestic benchmark and consequently, international comparisons are difficult (because the best banks of each country operate with different technologies that are not directly comparable). The scores represent changes in relative efficiency, not in absolute efficiency. That is, an increase in the average score means a reduction of the gap between local standard practice and local best practice banks.

Moreover, the reduction of the sample of banks across years might have some influence on the increasing proportion of banks being classified as efficient (if the sample of banks decrease, there are more chances that a bank is classified as efficient). We acknowledge that further and more systematic investigation will be required.

All these warnings notwithstanding, Table 7 presents summary results of the average efficiency scores for each country. First, for most countries, there is not evidence of substantial increase in average efficiency. Only in the Chilean banking system the gap between efficient and inefficient banks reduced substantially: in 1995 the average bank provided 79% of the services provided by best practice banks, while in 2000 the average bank provided 90%.

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<sup>18</sup>We also computed weighted averages, using the share of deposits and loans of each bank as weights. However, there were not notorious differences with the arithmetic and geometric averages.

	Argentina			Colombia		
	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>
Avg. Efficiency score	0.69	0.70	0.56	0.73	0.46	0.69
Number of banks	76	86	65	28	28	26
# of efficient banks	12	13	6	4	1	5
% of efficient banks	0.16	0.15	0.09	0.14	0.04	0.19
Standard deviation	0.18	0.17	0.22	0.15	0.16	0.19

	Brazil			Mexico		
	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>
Avg. Efficiency score	0.59	0.57	0.52	0.83	0.91	0.85
Number of banks	116	116	94	33	37	33
# of efficient banks	7	11	10	12	13	12
% of efficient banks	0.06	0.09	0.11	0.36	0.35	0.36
Standard deviation	0.18	0.20	0.24	0.16	0.09	0.17

	Chile			Peru		
	<b>1995</b>	<b>1998</b>	<b>2000</b>	<b>1995</b>	<b>1998</b>	<b>2000</b>
Avg. Efficiency score	0.79	0.89	0.90	0.85	0.94	0.91
Number of banks	28	25	24	22	23	18
# of efficient banks	6	8	7	7	8	7
% of efficient banks	0.21	0.32	0.29	0.32	0.35	0.39
Standard deviation	0.12	0.12	0.09	0.15	0.06	0.09

Table 7: Summary results of Average Efficiency scores

Colombia registered a substantial decrease in average efficiency, from 73% in 1995 to 46% in 1998. Such decrease can be associated with the recession faced by that country in 1998. In this case, the macroeconomic context appears to be crucial in explaining how efficiently the banking system fulfilled its role of intermediation. A similar pattern is found in Argentina, where the gap between inefficient and efficient banks increased substantially in 2000: from around 70% in 1995 and 1998 to 56% in 2000. The decrease in average efficiency in Argentina can be associated with a recession that ultimately triggered a banking crisis in 2001. Finally, unlike

Chile, Colombia and Argentina, average efficiency in Brazil, Mexico and Peru did not register wide changes.

In sum, for most countries, our analysis does not provide evidence of substantial gains in efficiency in intermediation through this period. However, our results for Chile provide additional support to some conclusions of section 2, in that the Chilean banking system appears to fulfill its role of intermediation in a relatively efficient way.

#### 4.2.2 Competition

Regarding the estimation methodology, notice that we first need to estimate  $\beta_0, \beta_1, \beta_{i+1}$ . These parameters appear both in equation 3.1 and in equation 3.3. Therefore, we estimated these equations simultaneously. The cross-sectional estimation was performed with bank-level data, for each year and for each country, using weighted least squares. Likewise, in order to account for potential endogeneity of  $C_j$  and  $q_j$  in equations 3.1 and 3.3, we also performed the analysis using 2SLS, with the lags of  $C_j$  and  $q_j$  as instrumental variables. However, the final results did not differ substantially from those initially obtained by WLS.

Table 8 presents the results of the Lerner index for each banking system. Additionally, for the sake of comparison, we included the results of the Lerner index for the German and Spanish banking systems, obtained by Guevara et al.(2002).

Except for Chile, the indices for Latin American countries are clearly lower than those of selected European countries. Moreover, they are closer to 0 and in three cases negative indices were obtained. Likewise, there is not a clear pattern in the evolution of market power across time for any country. Yet, we notice that the results for the Chilean banking system fall in an "international" range. This should not be seen as a mere coincidence, as many of the performance indicators of the Chilean banking system (reviewed in section 2) were more similar to the international standards than the rest of Latin banking systems.

	<b>1995</b>	<b>1998</b>	<b>2000</b>
Argentina	-0.14	0.01	0.03
Brazil	0.05	0.02	0.06
Chile	0.14	0.13	0.16
Colombia	0.02	0.02	0.03
Mexico	-0.17	-0.33	-0.30
Peru	-0.05	-0.04	-0.10
Germany*	0.13	0.11	0.09
Spain*	0.10	0.15	0.16

\* Estimates from Guevara et.al (2002)

Table 8: Lerner index

The low indices in most Latin banking systems could be a result of high competition among banks due to excessive risk taking or predatory strategies aimed at gaining market share. Gruben and McComb (2003) used a conjectural variation approach to study competition in the Mexican banking system before 1995 and found that marginal prices were set below marginal costs. The authors suggested that this finding reflected "super-competition" and that it was consistent with excessive risks taken by Mexican banks after the 1991-1992 privatizations.

However, we doubt that this explanation is suitable for the results of the Lerner index obtained for the same country between 1995 and 2000. During this period the Mexican banking system was in very bad shape, as a result of the banking crisis of 1995. The drastic decline in credit (see Table 1) together with the fact that corporations did not have to repay their credits or had access to several debt restructuring programs sponsored by the government<sup>19</sup> had a direct negative impact on banks' total revenues (see profitability ratios in section 3.2). Since the banks' output price is being proxied by total revenues to total assets, it is not surprising that the output price has reached levels that are considerably lower than marginal costs. Therefore, in this period, the negative indices for the Mexican banking system had probably nothing to do with predatory strategies or fierce competition among banks but with very low revenues and high costs that these banks faced as a result of the deteriorated macroeconomic conditions from 1995

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<sup>19</sup>See Barajas and Steiner (2001)

onwards<sup>20</sup>.

Likewise, that the indices of Argentina, Brazil, Colombia and Peru are lower than those of Chile and selected European countries is not necessarily indicative of higher competition (or excessive risk taking), but most probably it is reflecting a context of relatively lower revenues and higher operational costs, in which banks find it more difficult to increase the relative mark-up of price over marginal cost.

In an attempt to provide an alternative micro-founded measure of competition to compare with, we computed Panzar and Rosse's measure of competition (also called "H-statistics") which has been used in other cross-country studies<sup>21</sup>. This measure is constructed by analysing how banks' revenues change in response to changes in input prices. From the standard textbook in microeconomics, we know that a negative change in banks' revenues (in response to changes in input prices) is consistent with the existence of pure monopoly. Using comparative statics properties of a Chamberlinian equilibrium model of monopolistic competition, Panzar and Rosse (1987) also showed that in the long run and in the presence of actual or potential rivals, a positive but less than proportional change in revenues is associated with monopolistic competition, and a positive and proportional change reflects perfect competition.

We replicated the cross-country study of Claessens and Laeven (2004), and computed the Panzar-Rosse measure for the Latin countries, for the whole period 1995-2000<sup>22</sup>. The measure is derived from a regression equation using bank-level data, in which the dependent variable is the log of the ratio of gross interest revenue to total assets (proxy for output price) and the independent variables are the log of interest expenses to total deposits (proxy for input price of deposits), the log of personnel expenses to total assets (proxy for input price of labor), the log of other operating and administrative expenses to total assets (proxy for input price

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<sup>20</sup>In fact, the existence of predatory strategies or excessive risk taken by banks can be discarded due to the fact that banking supervision was strongly tightened across Latin America after the "tequila crisis" of 1995.

<sup>21</sup>See for example Molyneux et al. (1994), Bikker and Haaf (2001b), and Claessens and Laeven (2004).

<sup>22</sup>Claessens and Laeven run panel regressions to obtain a measure of competition for each country (50 countries in total), for the whole period 1994-2001. In other international studies, other authors have also tried to obtain yearly estimates. Molyneux et al. (1994) computed yearly estimates for European countries, which turned out to be rather volatile across time. For the case of Latin America, we found volatile estimates as well.

of fixed capital), and other control variables. Then, the measure of competition is obtained by summing the coefficients of the input prices (cost elasticities)<sup>23</sup>.

Table 9 presents a summary of these results. A negative measure reflects pure monopoly, a positive measure (between 0 and 1) reflects monopolistic competition, and a measure equal to 1 reflects perfect competition. For all countries we found measures between 0 and 1. These results also confirm our previous findings from the Lerner index, in that there appears to exist less competition in the Chilean banking system than in the rest of Latin banking systems. Moreover, our results for the U.S. and selected European banking systems appear to support the existence of "more competition" in most Latin banking systems.

<b>1995-2000</b>	
Argentina	0.74
Brazil	0.80
Chile	0.61
Colombia	0.73
Mexico	0.79
Peru	0.93
U.S.	0.60
Germany	0.65
Spain	0.64

Table 9: Panzar-Rosse measure of competition

However, we suspect that the differences between most Latin banking systems and developed banking systems are not precisely a result of more competition in the Latin systems. Our scepticism is strengthened by the stylized facts about these banking systems reviewed in section 3.2 and by our results of the Lerner index<sup>24</sup>.

<sup>23</sup>Notice that the dependent variable is  $\log(\text{Revenue}/\text{Assets})$  and not  $\log(\text{gross revenue})$ , as the theory suggests. However, this is not a problem (as pointed out by Shaffer, 2004) because the equation to be estimated can also be written as:  $\log(\text{Revenue}) = f(\text{input prices, control variables}) - \log(\text{Assets})$ . Therefore, the coefficients of the input prices and control variables remain the same.

<sup>24</sup>Shaffer (2004) concedes that in general, the Panzar-Rosse measure might not be appropriate to draw strong conclusions from cross-country comparisons.

Another reason is that the results for the models of perfect competition and monopolistic competition used by Panzar and Rosse depend crucially on the assumption that firms are observed in long run equilibrium. In the short term, however, banks' response to changes in input prices can be substantially different across countries due to the different context and circumstances in which banks had to operate. For example, we could expect that in the short term, and in a context of relatively higher operational costs and lower revenues, banks might try to avoid losses and would therefore prefer to increase output prices proportionally and almost immediately in response to an increase in input prices. However, such a behavior does not imply the existence of "perfect competition". In other words, the conduct of banks might not be directly related to the action of competitors, at least in the short run. Likewise, in a context of relatively lower operational costs and higher revenues, banks might be relatively more "indifferent" to changes in input prices, as they are still able to remain profitable.

Although these measures of competition are theoretically sound, they are not meant to capture the different dynamics that exist in banking industries that evolve under considerably different circumstances. Specifically, the notorious differences in revenues and cost structures between emerging and developed banking systems appear to make the cross-country analyses of competition (based on these measures) ineffective.

## 5 Conclusions

Banking systems in Latin America experienced a considerable transformation in the 90s. The period 1995-2000 is particularly interesting to analyze because it has been characterized by a decrease in interest spreads, an increase in foreign participation and a process of consolidation that led to a decrease in the number of banks in all of the selected countries. In the search for the most desirable market structure, recent literature applied to the banking industry of developed and emerging markets has tried to determine how changes in structure may affect the level and efficiency of intermediation as well as the degree of competition in the banking systems. We first compared indicators of six Latin American banking systems with selected developed markets in order to determine whether there are

notorious differences in the structure of the banking systems and in their overall performance. Additionally, we constructed measures of efficiency in intermediation and of competition using balance sheets and income statements from commercial banks.

Regarding the relationship between structure and efficiency in intermediation, our results suggest that the structure-conduct-performance hypothesis does not hold for this specific concept of efficiency. In particular, we noticed that the Chilean banking system is as concentrated as other systems in the region, but unlike the other systems, it fulfills its role of intermediation more efficiently than the rest of Latin countries. Moreover, this banking system has gradually become more consolidated and concentrated, and it also appears to have become more efficient. For the other countries, intermediation remained low in spite of the decrease in the cost of financial intermediation. We also noticed that a decrease in the level and efficiency of intermediation in Argentina and Colombia was clearly associated with unstable macroeconomic conditions.

In fact, there are other factors that affect banking intermediation and that are probably more relevant than the market structure in most of these countries. Deteriorated macroeconomic fundamentals, unstable institutional and regulatory environments, high required reserves, and low domestic savings tend to reduce credit supply. A specific and interesting feature of banks in the region is their increasing desire to invest in "safe" government bonds, which reduces the capacity and willingness to lend to the private sector. However, a complete assessment of the determinants of the supply and demand of credit is outside the scope of this study.

Regarding the relationship between structure and competition, our results do not provide clear evidence, mainly because of the difficulties in obtaining a measure for the degree of competition that is comparable across banking systems. Consequently, our study exposes the potential measurement and interpretation problems of recently used measures that try to infer the competitive behavior of banks from the analysis of the relationship between prices and costs. These problems arise from the differences in cost and revenue structures across countries, which might be due to different management and accounting practices, and also to very different economic environments. While we do not rule out that there are banking

industries that might operate in similar environments, and that might share some structural features as well (such as in the case of Chile with some developed countries), the fact that most banks in emerging countries face very different political, economic and regulatory environments introduces new aspects that are necessary to keep in mind before reaching immediate conclusions from these measures. Controlling for these differences is a formidable task that requires experience and good judgement. Only then, it would be possible to obtain a measure of competition that can be comparable across countries.

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