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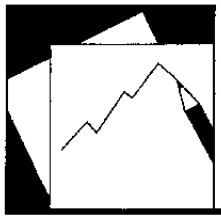

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Do Brazilian Banks Compete?

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Do Brazilian Banks Compete?

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Abstract

More developed financial systems are associated with higher investment and better economic performance. This paper discusses possible factors that may inhibit a deepening of bank intermediation and more efficient banking in Brazil, two aspects that are found to be significantly different than in leading banking systems in other parts of the world. Using panel data, it finds positive evidence of the presence of a noncompetitive market structure in the Brazilian banking system, a factor that could explain why intermediation may be relatively low and costly. When banks behave like local monopolies or oligopolies, incentives to improve efficiency are weak and the interest rate spread is large, discouraging higher lending volumes.

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Contents Page

I. INTRODUCTION

More developed countries have more developed financial systems. Developed financial systems adequately channel savings into investment and are often associated with better economic growth performance. In a world of uncertainty, financial sectors tend to develop around a banking system able to achieve economies of scale in the collection and processing of costly information, facilitating the allocation of finance. Banks serve as the quality controllers that lead to more successful investments. As a result, the quality of investment improves, and output growth accelerates.

In many emerging market economies, where uncertainty is also related to a relatively recent experience with stability, the size of bank credit relative to economic activity is often surprisingly small. The Brazilian banking system includes some of the largest banks in Latin America. It is sound, profitable and well-capitalized. Yet, bank credit remains small compared with that in industrialized economies. This paper discusses possible factors that may inhibit a deepening of bank intermediation and a more efficient banking system in Brazil, two aspects in which Brazil lags significantly behind leading banking systems in other parts of the world.

Reasons why intermediation may be low could include demand, supply, and institutional factors. Some of these factors can be ruled out, while others merit more careful testing. One of the latter is market structure, which is discussed and tested in this paper. Indeed, the presence of a noncompetitive market structure may explain why intermediation may be relatively low and inefficient. If banks behave like local monopolies or oligopolies, incentives to improve efficiency would normally be weak, and the interest rate spread—the differential between the interest paid by banks on deposits and that received on loans—would be large, discouraging higher deposit and lending volumes. This hypothesis is confirmed by the empirical investigation, which indicates that Brazilian banks behave oligopolistically.

Current reforms to revamp the administrative and legislative framework in which banks operate will strengthen the basis for competition in the system. The recent decision to set up a database of large borrowers will help reduce lending costs and lower the risk premium embedded in high lending rates. This will also reduce informational barriers for new entrants to the banking system, contributing to make lending a more attractive, competitive business.

The reminder of the paper proceeds as follows. Section II investigates the depth and quality of bank intermediation in Brazil, comparing profitability and efficiency indicators of the banking system with those of other emerging market economies, the United States, Japan, and the euro area. Section III discusses the factors that may have an impact on bank intermediation and could explain the differences across countries, including savings levels, the intensity of ongoing structural reform, information asymmetries, institutional factors, and the degree of competition. Section IV focuses on this last potentially important factor, the degree of competition, and investigates empirically the level of competition in the Brazilian banking system. Section V summarizes the results and concludes.

II. Stylized Facts

This section characterizes the size and structure of the financial system in Brazil, before reviewing more specifically the characteristics of Brazilian banks, highlighting the main differences between Brazil and other major emerging market economies of Latin America, the United States, Japan and the euro area.

The Brazilian financial system is large and bank-dominated, but the depth of intermediation—the extent to which banks intermediate financial flows by collecting deposits to extend credit—is low. The Brazilian banking system is comparable to the U.S. system in asset size relative to GDP but it provides only half the loans in proportion to GDP (Table 1). It is also much smaller than bank-based financial systems in the euro area and Japan.

Table 1. Brazil's Financial System and Selected Comparators, 2000 (percent of GDP)

	Banking system 1/			Outstanding domestic debt securities by issuer				Stock market capitalization	**Total Financial Assets**
	Deposits	Loans	Assets	Total	Corporates	Financial instit.	Public sector		
Brazil	29.3	24.8 2/	77.1	49.4	0.4	7.8	41.2	35.0	**161.5**
Argentina	27.8	21.4	57.4	29.9	n.a.	19.8	10.1	58.2	**145.5**
Mexico	18.3	21.6	25.0	6.3	0.4	1.5	5.0	22.1	**53.4**
Chile	54.9	70.0	98.4	n.a.	19.1	n.a.	16.7 3/	86.4	**221.6**
Memo									
U.S.	42.6	45.3	77.3	146.5	24.0	41.1	81.4	152.0	**376.9**
Japan 4/	94.8	84.7	142.0	127.9	16.1	16.1	95.6	68.0	**338.9**
Euro area	78.9	103.7	258.3	110.4	6.6	48.8	55.0	89.0	**458.7**

1/ Only deposit-taking, universal banks are considered.
2/ Data include commercial leasing.
3/ At market value. For other countries, amounts are at book value.
4/ Bank data for Japan are as of March 2001.

Sources: Banco Central do Brazil; Federal Reserve Bank; Bank of Japan; ECB; BIS (outstanding domestic debt securities, except for Chile); Federacion Iberoamericana de Bolsas de Valores (market value of outstanding domestic debt securities for Chile, and stock market capitalization).

The Brazilian system also appears very large when compared to those in other advanced Latin American economies.[1] However, despite being larger than the Argentine and Mexican systems—more than three times larger than that of Mexico in terms of assets to GDP—the Brazilian banking system provides about the same proportion of loans as banks in these countries. Chile has a somewhat larger banking system than Brazil and lending activities make up more than two-thirds of banks' assets, compared with less than a third in Brazilian banks.

Brazilian intermediaries participate actively in the capital markets, investing their resources in large holdings of securities. Balance sheet data show that Brazilian banks hold an almost equal share of loans and investment securities in their portfolios, each representing around 30 percent of assets in mid-2001. Security financing is mainly directed to the public sector, as most of these securities are government debt bearing attractively high yields. Bank-specific data at mid-2001 show that large banks (those with assets above R$5 billion or 0.5 percent of GDP) are in fact more invested in securities than in loans, while the opposite is true for smaller banks. Banks also raise a large part of their resources on the markets and are, as Table 1 shows, virtually the only nongovernment issuers on the bond market.

The Brazilian bond and equity markets are still in their infancy compared with those in more industrialized economies. At end-2000, equity finance through stock market issues represented 35 percent of GDP in Brazil, about one-quarter the level in the U.S. Still, in Brazil, the private economy raises more finance through equity and debt issues (about 43 percent of GDP) than through bank loans (25 percent of GDP). In fact, financial markets represent a major source of funds for banks themselves. Even though bond markets do not play a large role in private sector financing in Latin America, financial institutions have been active participants in this market in Brazil and even more so in Argentina. However, nonfinancial private sector issues remain very small, at about half a point of GDP in both Brazil and Mexico, two countries for which data are available. In contrast, the public sector has tapped the bond market in a much larger proportion. This is especially true in Brazil, the largest issuer on this market among advanced Latin American economies, where the outstanding stock of public debt securities exceeded 40 percent of GDP at end-2000.

The number of banks has gradually declined, by a quarter since 1995, and concentration has remained strong and stable (Table 2). About two-thirds of bank assets are concentrated in ten institutions, which hold about 70 percent of deposits and provide 75 percent of loans. The process of consolidation in the number of institutions is associated with a decline in the number of employees per branch, from 38 in 1995 to 30 in mid-2001 (still a high figure) and an expansion of the branch network. Indeed, although the Brazilian banking system is large,

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[1] In this paper, the banking system refers only to universal banks, which are deposit-taking institutions able to provide loans and investment services to their clients. Purely investment banks are excluded, as are development banks, long-term credit institutions, leasing companies, and mortgage institutions.

Table 2. Brazil: Structure of the Banking System, 1993–2001.

Institutions

	1995	1998	2001 1/
Number of banks	184	157	135
Number of branches in top 50 banks	14,458	14,146	16,265
Number of employees in top 50 banks	550,698	446,712	484,210

Concentration

	1993	1995	2001 1/
Top 10 banks			
Share of total assets	65.8	64.4	70.3
Share of total deposits	n.a.	75.1	76.6
Share in total credit	n.a.	71.4	70.2

Foreign bank penetration 2/

	1995	1998	2000
Number of foreign banks in the top 50	n.a.	26	27
Share in total assets	8.4	18.4	28.3
Share in total deposits	5.4	15.1	21.1
Share in total credit	5.7	14.9	25.2

Source: Banco Central do Brazil and Fund staff calculations.

Note: This table considers only deposit-taking, universal banks.

1/ Data for 2001 are as of June.
2/ Banks with foreign participation or control.

it is also geographically concentrated, leaving populated regions without much bank coverage. Only about half of the potential market is estimated to have banking services (Palmeira, 2001). The concentration is also changing hands, with a rising foreign participation in the Brazilian banking system. Foreign banks have gained large market shares, mostly by taking control of domestic banks rather than opening new institutions. From a nearly insignificant presence in the mid-90s, they grew to hold one-fifth of deposits and provide one-fourth of credit by end-2000. By June 2001, 28 of the top 50 banks had some foreign participation in their capital, in most cases with controlling interest.[2]

The picture that emerges in Brazil is one of a financial system where the traditional role of banks as savings intermediaries, collecting deposits to extend credit, does not predominate. Banks are a significant player in capital markets, where they invest in securities as a major

[2] See Belaisch *et al.* (2001) for a comparable analysis of the banking systems in the industrialized countries of the euro area.

source of business. The increased foreign participation in recent years has not dramatically changed the *modus operandi* of the banking system.

Brazilian banks have been more profitable in recent years. Their returns on assets (ROA, or the ratio of pre-tax profits to assets) and returns on equity (ROE, or ratio of pre-tax profits to equity) have been increasing (Table 3).[3] This is probably a result of the greater attention that commercial banks have paid to profitability since the disappearance of the returns guaranteed by high inflation, as well as a consequence of the region's economic recovery since the Asian and Russian crises. In 1995, the aggregated profitability ratios for the banking system were negative, influenced by the poor performance of large-sized banks. During 1993–96, medium-sized banks were the ones performing generally better.[4] Profitability indicators in Brazil have evolved similarly to those in other major Latin American economies; however, they remain well below those for U.S. banks.

Banks rely on interest-earning activities as a major source of income despite the relatively small size of their loan portfolio.[5] With the process of disinflation, banks' profits from the asymmetric indexation of loans and deposits have fallen; the econometric section of the paper will allow us to assess the extent to which this decline in interest margins also reflects an increase in competition in recent years. But net interest margins as a ratio of bank assets still stand high compared with other Latin American economies. They are even higher when compared to the United States, Japan and the euro area, where heightened competition triggered by the opening of financial systems and the globalization of banking services has driven spreads down on banks' most traditional income-generating activities. To remedy this trend, banks in these countries have greatly diversified their income sources toward trading activities and securitization operations, while on the liabilities side, deposits have shrunk to the benefit of money market mutual funds and other liabilities. It is not possible to assess how Brazilian banks compare internationally regarding this process, as data on net fee and commission incomes are not reported in Bankscope. The next section will assess whether the decline in Brazilian banks' banking margins can be linked to an increase in competition in the recent years.

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[3] The ratios reported in the paper may differ from official statistics. First, they are calculated using Bankscope, a database of balance sheets and income statements which covers only the larger banks in each country. Second, ratios have been recomputed to improve comparability by abstracting from tax and provision regimes, which are very country-specific. The order of magnitudes and ranking of the ratios are however generally in line with official statistics.

[4] For more details on the respective performance of banks by size, see Banco Central do Brasil (1998).

[5] Interest earned on bond holdings are classified separately as securities income, as is the standard accounting practice.

Table 3. Brazil: Commercial Banks, Profitability Indicators, 1995–2000 1/

		Brazil	LATAM 2/	USA	EU-11 3/	Japan
Source of revenue						
Net interest margin/Assets	2000	5.2	4.2	3.1	n.a.	1.2
	1998	5.8	4.5	3.2	1.9	1.3
	1995	7.4	5.1	3.3	1.9	1.4
Total loans/Earning assets	2000	36.8	68.0	67.8	n.a.	63.5
	1998	32.9	69.8	65.5	51.5	73.2
	1995	45.8	71.2	64.9	52.2	72.2
Asset quality						
Non performing loans/Total Loans	2000	3.9	8.6	0.9	n.a.	6.1
	1998	16.9	12.2	0.7	1.2	5.6
	1995	9.5	11.5	0.9	1.3	3.0
Efficiency						
Operating costs/Operating income	2000	88.8	69.0	60.5	n.a.	60.9
	1998	80.0	71.7	62.8	67.1	67.8
	1995	76.1	65.1	62.8	68.4	60.0
Of which:						
Personnel costs/Op. income	2000	33.9	27.8	24.1	n.a.	6.9
	1998	32.9	31.7	24.9	35.9	13.7
	1995	42.4	25.6	26.3	38.3	16.1
Profitability						
ROA	2000	1.12	1.08	1.83	n.a.	0.08
	1998	0.62	0.58	1.85	0.66	-1.14
	1995	-0.03	0.82	1.81	0.59	-0.32
ROE	2000	11.17	12.05	22.03	n.a.	1.73
	1998	7.24	6.84	22.69	16.80	-30.40
	1995	-0.38	9.09	24.62	23.80	-8.81

Source: Bankscope and Fund staff calculations.

1/ Based on banks that publicly disclose their balance sheets and income statements. Selected sample includes only commercial banks. For a complete list, see Bankscope.
2/ Aggregation of Argentina, Chile, Colombia , Mexico and Peru.
3/ Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain.

Notes: Performance indicators may differ from traditional definitions to improve cross-country comparability. For this reason, operating costs exclude provisions, which are often year- and bank-specific; ROA, or return on assets, is the ratio of pre-tax (instead of the usual post-tax) profits to average assets to abstract from differences in taxation across countries. Similarly, ROE, or return on equity, is the ratio of pre-tax profits to average equity.

There has been a major improvement in the quality of banks' lending compared both to the past and to other emerging Latin American economies. The ratio of nonperforming to total loans for Brazil in the Bankscope sample has declined from about 10 percent in 1995 to 3.9 percent in 2000, almost half that in major Latin American countries but still above the level in industrialized countries.[6]

However, the efficiency of the banking system lags that in other Latin American countries. Operating expenses absorb about 90 percent of operating income in Brazil, 30 percent higher than in the large Latin American countries where the level is above even the euro area, a region where banks suffer from traditionally high labor costs. The cost ratio for Brazilian banks is also almost 50 percent higher than in the United States, the most efficient system in the sample. However, foreign banks in Brazil have been better at streamlining personnel: between June 1997 and June 2001 (a period during which the sample of banks in the top 50 remained essentially unchanged), a larger proportion of foreign banks have reduced their workforces, and by a larger amount, than domestically-owned banks. In fact, individual bank data show that during 1997–2001 the number of employees has on average increased in banks with domestic ownership. Finally, it should be noted that personnel expenses as a share of total costs have declined since the mid-1990s, from more than half to about a third of them. The anomaly of rising operating costs but falling personal expenses points to increasingly lax overhead cost management in Brazilian banks. These high overhead costs can be partly explained by a low leverage of banks (as high macroeconomic risks have required banks to hold large capital) and limited competition within the banking system. As the legal framework does not allow for quick recovery of collateral, setting up large collection and legal departments has also added to banks' costs (see Beck, 2000).

III. Factors that Affect the Level and Efficiency of Intermediation

This section discusses possible factors that may inhibit a deepening of bank intermediation and more efficient banking in Brazil, the two areas in which the Brazilian system was found to be significantly different from leading banking systems in other parts of the world. Demand, supply, and institutional factors are considered. Some of these factors can be ruled out, while others merit more careful testing. Among the latter is market structure, which is discussed and tested in the following section.

One possible factor for low bank intermediation identified in the literature is low overall saving and investment.[7] Cross-country data give some evidence that countries with higher

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[6] The figure reported by the Central Bank is slightly higher, at 5.8 percent for end-2000, since the Bankscope sample is biased toward large banks. This is presumably also the case for other Latin American countries in the sample, so that the comparative analysis of the ratios likely still holds across countries.

[7] See Pazarbasioglu (1997) and Ghosh and Ghosh (1999) on the Finnish banking crisis and the Asian crisis, respectively.

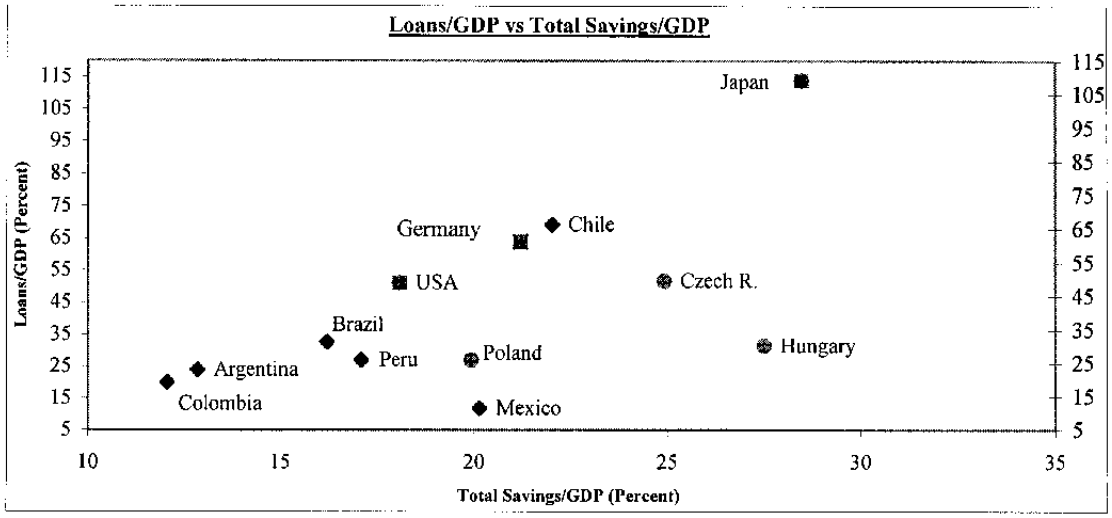
saving rates also have larger loans to GDP ratios (Figure 1). Across emerging market economies, however, low bank intermediation coexists with a wide range of saving rates. Including the principal emerging market economies of Eastern Europe in the analysis confirms this evidence. In addition, loan ratios and saving rates do not seem consistently determined by the level of GDP per capita in the country. This suggests that other factors, more microeconomic and possibly banking system-specific, must play an important role in determining the depth of bank intermediation.

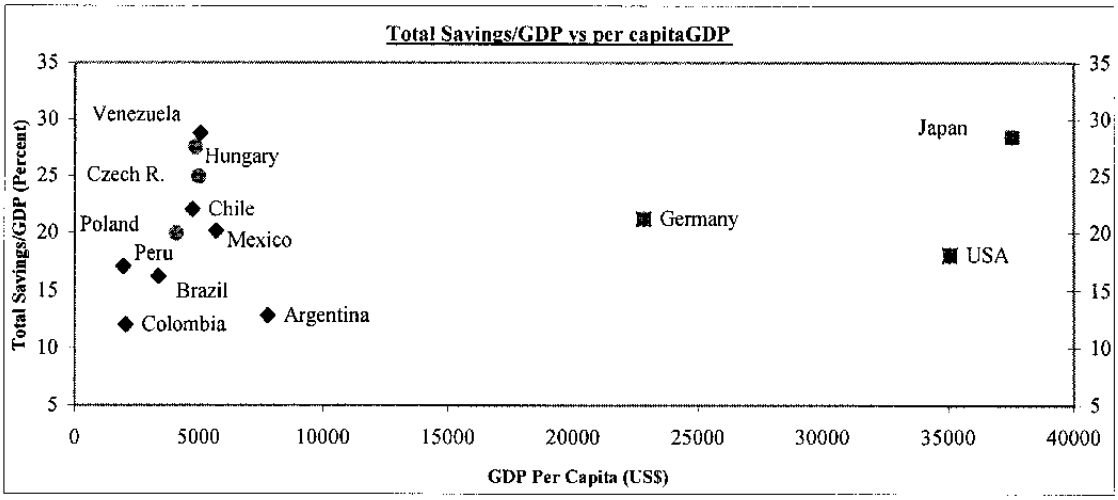
In most cases, the underlying cause of low credit to the real sector is an unstable macroeconomic situation.[8] This is a relevant factor in Brazil: chronic inflation was associated with economic instability until the mid-1990s. After the implementation of the *Real* Plan in 1994, despite drastically reduced inflation and major structural reforms, macroeconomic instability persisted, putting pressure on the exchange rate system until it finally collapsed in 1999. In such an unstable economic environment, then, it may not be surprising that private sector saving and investment in Brazil have traditionally been low by international standards, at around 15 and 17 percent of GDP in the latter half of the 1990s. The *Real* Plan revealed pockets of inefficiencies in the productive sector that resulted in high default rates on bank loans. It was also associated with a restructuring program in the banking sector (PROER) that led to the consolidation, closure or liquidation of many private banks. In parallel, another government program (PROES) targeted the consolidation of the state-owned intermediaries, leading to a wave of restructuring in this segment of the banking system.[9] Finally, the monetary stabilization that resulted from the success of the *Real* Plan eliminated banks' profits from inflation and reduced the participation of the financial system to GDP from 12 to 7 percent between 1994–95 (see IBGE, 1997).

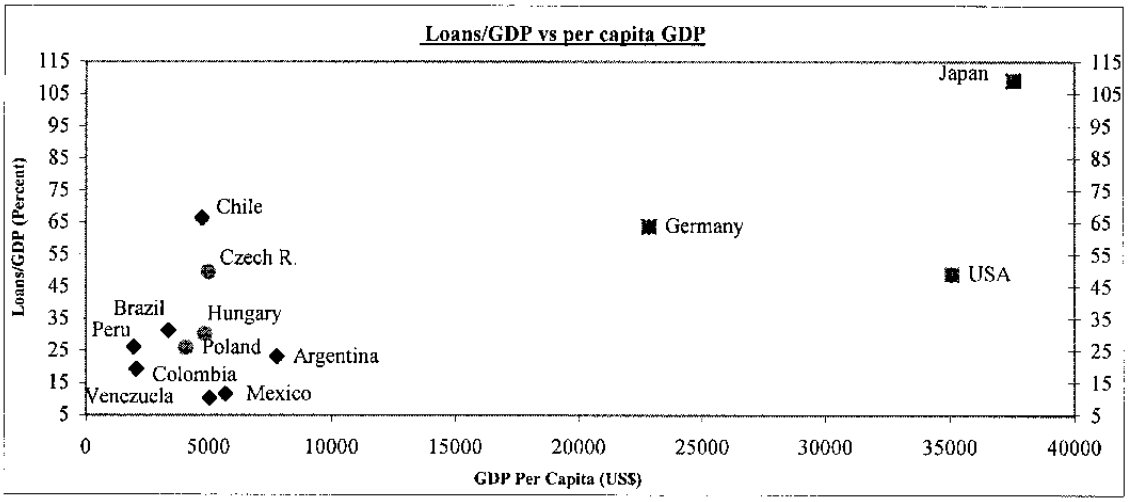
[8] See Barajas and Steiner (2001) for a recent paper on this topic applied to Latin American countries. The paper also contains a review of the literature.

[9] In this paper, both banks owned by the state governments as well as the federal government are referred to as state-owned banks, without distinction.

Figure 1. Brazil: Savings and Loans Ratios in a Cross-Section of Countries, 2000







Note: Loans are to the private sector only. Total savings refer to gross national savings.
Sources: International Financial Statistics; World Economic Outlook; and Fund staff calculations.

Thus, although the demand for credit may be high, the associated risk may also be high, so that the supply of loans does not fully satisfy demand.[10] This is typical in economies that are still maturing, where markets are incomplete and institutions are changing. All these factors increase project and country risk. Risk may also be high because of a lack of adequate information on potential borrowers. This, in turn, may be a reflection of deep restructuring in the real sector, when many old bank customers disappear and new ones emerge that do not have long credit histories, are not able to present sound business plans, or do not have good collateral. Finally, risk may be high if auditing and accounting standards are inadequate, or the legal framework does not allow for quick recovery of collateral. As Brazil is still an emerging market economy, these factors are certainly relevant in explaining the relatively low degree of intermediation, but a full assessment of the credit risk facing Brazilian banks is outside the scope of this study. However, it should be noted that Brazil's intermediation ratio is similar to that of emerging market economies in Eastern Europe although investment ratings differ widely in this group of countries, which suggests that, at a minimum, additional factors are also at work.

Impediments to the development of financial intermediation in Brazil may also relate to the status of the legal and regulatory environment in which financial institutions operate. Besides the legislative environment that determines the transparency of bank information and the enforceability of creditors' rights (referred to in the previous paragraph), the policy environment also affects the efficiency of bank intermediation. In Brazil, the high unremunerated reserve requirements (for example, 75 percent on demand deposits in 1997–99, and some 68 percent today) undeniably increases the costs of intermediation.

Another reason why intermediation may be relatively low and inefficient is the presence of a noncompetitive market structure. If banks behave like local monopolies or oligopolies, incentives to improve efficiency would normally be weak, and the interest rate spread—the differential between the interest paid by banks on deposits and that received on loans—would be large, discouraging higher deposit and lending volumes.

The concentration in the Brazilian banking sector indeed suggests the possibility of noncompetitive forces at play. As mentioned before, ten large banks, of which two are state-owned and five foreign-controlled, dominate the market, accounting for 70 of total banking system assets. At end-2000, the market share of the two largest state-owned banks was more than 35 percent, and a bank belonging to the top 10 largest group was on average five times the average size of banks ranked 11 to 20. Also, a recent paper found evidence of a non-competitive market structure in the banking system using aggregate time series data during the period 1994–98 (Nakane, 2001). In explaining the large banking spreads in Brazil, that paper finds that the aggregate supply of loans increases in response to a small increase in an individual bank's loan supply. This contradicts the assumption of "atomistic" individual

[10] The relatively low rate of nonperforming loans in the data is consistent with the selection of "best" credits by banks.

agents under perfect competition and is evidence of the presence of market power. The finding that the aggregate supply of loans is independent of interest rates in the long run however excludes the possibility of a perfectly monopolistic market structure. More analysis is needed to derive firm conclusions about the market structure in the Brazilian banking system.

IV. Market Structure of the Banking Sector

This section uses individual bank data to investigate the structure of Brazil's banking sector. First, the theory is reviewed to yield testable hypotheses on whether banks behave monopolistically, oligopolistically, or competitively; and then these hypotheses are tested against the data.

The empirical methodology for assessing the market structure, as developed by Panzar and Rosse (1987), is based on microeconomic theory (see Coccorese, 1998 for an application to the Italian banking system). The key point is that a monopolist's output and total revenue decline when his marginal cost curve shifts upward. On the contrary, in a perfectly competitive sector, an increase in marginal costs would be fully reflected in prices, thus increasing total revenues one-to-one for the sector as a whole. In between these two extremes is the case of oligopolistic structure: as the marginal cost curve shifts upward, total revenues increase by less than one-to-one with the increase in costs.

More specifically, total revenues may generally be described as

$$y_{it} = q(x_{it}, z_{it}), \quad i = 1, 2, \ldots N, \quad t = 1, 2, \ldots T$$

where y is total revenues, x is a vector of input factor prices, and z is a vector of all other factors that affect revenues—notably cost and demand side variables. Panzar and Rosse show that if the sum of the coefficients associated with input prices is less than zero, then the firms under investigation are behaving like monopolies; if the sum of the input coefficients is between zero and one, then the firms behave like oligopolies; and if the sum of the input coefficients is one, then the firms operate in a fully competitive environment. A sum greater than one is not compatible with this methodology, and indicates a misspecification. As the variables are all in logarithms, the coefficients can be interpreted as elasticities.

In the case of the Brazilian banking sector, the production function of banking services is specifically modeled as follows:

$$tr_{it} = q(i_{it}, w_{it}, o_{it}, z_{it}; b), \qquad i = 1, 2, \ldots N, \quad t = 1, 2, \ldots T$$

where, tr_{it} is the total revenue, i_{it} is the unit price of funds, w_{it} is the unit labor cost, o_{it} is the unit price of other costs, z is all other variables that affect total revenue, and b is the vector of

estimated coefficients.[11] Specifically, the unit price of funds is calculated as the ratio of total interest expenses to total deposits and the unit labor cost is proxied as the ratio of total expenditure on labor to number of employees, i.e., as the labor cost for each employee. The latter proxy is similar to that in Coccorese (1998); another specification for unit labor costs would have been to divide total expenses on labor by the bank's output, but measuring a banks' output is difficult and requires judgment calls. The unit price of other costs is the ratio of other operating costs to the system-wide number of branches. Other variables included in the specification are total deposits (*td*), used as a proxy for demand; total administered funds (*taf*), to assess the role of scale economies from revenue-generating operations; the ratio of branches to total number of branches (*btb*), to capture the fact that the larger and maybe more geographically dispersed the bank is, the larger, on average, total revenues should be; the loans to administered funds ratio (*lnaf*) to assess the return to intermediation risk; and the risk capital to administered funds ratio (*rcaf*) to measure capitalization against this risk. Finally, two dummy variables are alternatively included. The first one (*Dfor)* is added to distinguish banks with foreign participation in their capital, including with majority control. The second (*Dpub*) proxies for state ownership. If there exists a market power associated with banks' foreign or public ownership pattern, in addition to any size effect, these dummy variables should be significant. Variables are in logarithms.

The tests are as follows: let $H = b_i + b_w + b_o$, where the three coefficients correspond to unit cost of funds variable, unit labor cost variable, and unit price of other costs variable, respectively. If the hypothesis that H is less than or equal to zero is rejected, this implies that the market structure is not monopolistic. In addition, if the hypothesis that H is between zero and one is rejected, then the market structure is not oligopolistic either. If the hypothesis that H is less than or equal to 1 is rejected, then the results would be inconsistent with the theory, implying that there is misspecification in the model or the estimated equation.

Individual bank balance sheets and income statements for the top 49 Brazilian universal banks are used to construct the required variables.[12] Frequency of the data is semi-annual and the sample period runs from 1997 to 2000. This provides a maximum number of 392 observations for each explanatory variable. For panel regressions, the choice between fixed and random effect estimations is usually arbitrary, but because the data used here concern institutions operating in the same field of business and in the same country, fixed effects are most adequate to capture idiosyncrasies in individual data.[13] A random effect model was

[11] This specification closely follows that in Coccorese (1998).

[12] The data comes from the COSIF database (Plano Contábil das Instituicões do Sistema Financeiro Nacional) of the central bank (BCB). The top 50 banks in the BCB classification include a development bank that is excluded from this analysis.

[13] In fixed effect models, differences between pool members (here banks) are captured by a constant intercept term specific to each member. In random effect models, these differences are assumed to be random and estimated with the error term in the regression.

however also estimated to check the consistency of results. Finally, the panel regressions were run on pooled cross-sections for each year as well as over the whole sample period to pick up the time-series component of the data.

The results show that Brazilian banks behave oligopolistically (Table 4).[14] The sum of the input factor price coefficients of the panel data estimation is significantly larger than zero, thus rejecting the hypothesis that banks behave monopolistically. At the same time, the sum of the coefficients is significantly less than one, rejecting the hypothesis of perfect competition in the banking system. Banks' revenues are not sufficiently sensitive to their costs to signal that they are under the pressure of perfect competition. The individual years regressions show no clear pattern of an increase in competition during the last few years. Competition cannot then be taken as a significant driving force behind the fall in banks' interest margins reported in Table 3 for Brazil. As regards the nature of Brazilian banks' costs, the coefficients on the price of funds and on other costs are significantly greater than zero, while unit labor costs are not correlated with total revenues. This is consistent with the stylized fact that overhead costs bear a heavier burden on total costs than personnel costs. The results from fixed and random effects models are very similar.

Other coefficient estimates also support the claim that Brazilian banks behave oligopolistically. Variables that are used to capture scale economies—total administered funds (*taf*) and the number of branches in total branches (*btb*)—are strongly significant and have the expected positive sign. This implies that, as the size of a bank increases, other things being equal, total revenues increase. The significance of the estimated coefficient of the number of branches also implies that geographical diversification is an advantage for banks in terms of revenue. The existence of scale economies is consistent with an oligopolistic environment since it reduces the costs of production for firms producing large amounts of output, making it impossible for small firms to compete and be profitable. The coefficients on *rcaf* and *lnaf*—the ratio of risk capital to total administered funds and the ratio of loans to total administered funds—have positive signs, indicating that those banks that intermediate more and are well-capitalized have higher revenues (although the coefficient on loans is not significantly different from zero within a standard margin of error). In most individual year

[14] If the regressions are run for each year separately, the results also reject the hypothesis that Brazilian banks behave competitively. However the annual regressions cannot significantly differentiate between competitive and oligopolistic behavior in 1999.

Table 4. Brazil: Market Structure Regression Results, 1997–2000

Variables 1/	Coefficient estimates 2/								R2	Market structure tests 3/			
	Costs		Demand		Scale		Risks			Monopolistic	Oligopolistic	Perfect competition	Mis-specified
	i	w	o	td	taf	btb	rcaf	laf		Ho: H≤ 0	Ho: 0 < H < 1	Ho: H≥ 1	IIo: II > 1
1997	0.17	-0.02	0.69	0.19	0.11	0.69	-0.01	-0.02	0.97	Reject	Not Reject	Reject	Reject
	(2.93)	(-0.72)	(18.97)	(3.74)	(1.68)	(17.52)	(-0.48)	(-0.85)					
1998	0.17	-0.04	0.68	0.18	0.14	0.68	0.03	-0.02	0.96	Reject	Not Reject	Reject	Reject
	(3.08)	(-1.48)	(18.91)	(4.89)	(2.50)	(16.33)	(1.03)	(-0.90)					
1999	0.12	0.01	0.83	0.12	-0.02	0.87	0.00	-0.01	0.97	Reject	Not Reject	Not reject	Reject
	(2.86)	(0.49)	(25.89)	(3.12)	(-0.32)	(22.70)	(-0.04)	(-0.52)					
2000	0.16	0.00	0.68	0.17	0.11	0.71	0.03	-0.01	0.93	Reject	Not Reject	Reject	Reject
	(2.00)	(0.01)	(13.67)	(3.01)	(1.36)	(12.48)	(0.56)	(-0.33)					
1997-2000	0.16	-0.02	0.76	0.17	0.10	0.75	0.05	0.01	0.98	Reject	Not Reject	Reject	Reject
Random	(5.94)	(-1.00)	(49.46)	(6.13)	(3.40)	(33.66)	(2.56)	(0.55)					
1997-2000	0.17	-0.03	0.76	0.18	0.13	0.72	0.08	0.03	0.98	Reject	Not Reject	Reject	Reject
Fixed	(-5.79)	(-0.99)	(45.71)	(5.17)	(3.75)	(19.07)	(3.38)	(1.41)					

Source: Fund staff estimates.

1/ *i* is the unit price of funds, *w* is the unit labor cost, *o* is the unit price of other costs, *td* is total deposits, *taf* is total administered funds, *btb* is the ratio of branches to total number of branches, *rcaf* is the risk capital to administered fund ratio, and *laf* is the loans to administered funds ratio. All variables are in natural logarithms.

2/ Results pertain to fixed effects panel data estimation for individual year regressions. Random effects results are similar and not reported. T-statistics are in parenthesis.

3/ H = b_i + b_w + b_o, where b_x is the coefficient estimate of variable x. The tests use 5 percent significance levels.

regressions, however, the size of the coefficient on the loan ratio is negative. This "credit risk" effect possibly explains why banks have preferred not to expand more their loan portfolio. Finally, the coefficient estimates of total deposits (*td*) is positive and highly significant in all regressions, indicating they are an acceptable proxy for demand changes.

Panel regressions on the whole sample of banks are not conclusive about the market behavior of foreign banks. When the dummy variable *Dfor* is added to the equation, it has no significance at the 5 percent level (Table 5). However, introducing this additional variable slightly raises the explanatory power of the coefficient on *i*, the unit cost of funds, in the regression. Also, this coefficient, although non significant, is negative. These results hint that foreign banks' revenue are more sensitive to costs than others in the system, a sign interpreted here as evidence of competitive behavior. State ownership has a significant but negative effect on bank revenues, as indicated by the coefficient on the dummy variable *Dpub*. Individual bank balance sheet data show that, in June 2001, the eight state-owned banks represented more than a fourth of the sector's assets, shared more than a fourth of the market for loans and held 50 percent of total bank deposits. Still, for an average bank in this category, income statements show that operating costs absorbed more than 80 percent of operating revenues, an indication of the high operational inefficiency of these banks.

To assess whether the overall market results are skewed by the behavior of a particular category of banks, be it ownership structure or size, separate sets of panel estimations were run on four subsamples: banks that are state-owned; those with a foreign participation in capital; small- and medium-sized banks; and large banks (Table 6).[15] The results show that the hypothesis of competitive behavior cannot be rejected for foreign banks, while that of oligopolistic behavior can. On the other hand, small- and medium-sized banks and state-owned banks are found to behave oligopolistically. It may be the case that many small banks operate in regions of Brazil that have few banks and where they enjoy local market power. Finally, it is not possible to differentiate between oligopoly and competition in the segment of the loan market where large banks operate. On the sign and significance of coefficients, the results remain broadly valid for all subgroups, with a few noteworthy differences. First, the effect of labor costs (*w*) on bank revenues becomes significant for small- and medium-sized banks, as well as for public banks: this is consistent with the finding of their non-competitive behavior and may reveal the particular weight of personnel costs at these banks. Second, the size of the loan portfolio (*laf*) now affects significantly and positively the revenues for foreign and state-owned banks. It is possible that "credit risk" is better screened in foreign banks and more easily covered in state-owned banks, so that more loans are not associated with larger default costs and lower revenues.

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[15] As mentioned before, small- and medium-sized banks are those with asset size below R$5 billion or 0.5 percent of 2000 GDP. Banks above this asset size are considered large. There is always some arbitrariness in such a threshold, but this one also has the advantage of keeping a balanced number of banks in each asset class.

Table 5. Brazil: Market Structure Regression Results with Dummies, 1997–2000

Variables	Coefficient estimates										R2	Market structure tests 1/			
	Costs			Demand	Scale		Risks		Ownership			Monopolistic	Oligopolistic	Perfect competition	Mis-specified
	i	w	o	td	taf	btb	rcaf	laf	Dpub	Dfor		Ho: H≤ 0	Ho: 0 < H < 1	Ho: H ≥ 1	Ho: H > 1
1997-2000	0.12	0.00	0.76	0.14	0.07	0.78	-0.01	-0.01	-0.12		0.96	Reject	Not Reject	Reject	Reject
	(4.48)	(-0.34)	(47.12)	(6.71)	(2.59)	(38.52)	(-0.51)	(-1.16)	(-2.78)						
	0.14	-0.01	0.76	0.15	0.08	0.76	0.01	-0.01		-0.03	0.96	Reject	Not Reject	Not Reject	Reject
	(5.12)	(-0.88)	(45.56)	(7.11)	(2.99)	(39.21)	(0.54)	(-0.73)		(-1.04)					

Source: Fund staff estimates.

Note: The variables' names are the same as in table 4. In addition, *Dpub* is a dummy that distinguishes banks with state ownership (referring both to ownership by state governments and foreign participation in its capital). Estimation is done using fixed effect regressions. T-statistics in parenthesis.

1/ At 5 percent significance level.

Table 6. Brazil: Market Structure, Specific Sample Regression Results, 1997–2000

	Coefficient estimates								R2	Market structure tests 1/			
Variables		Costs		Demand	Scale		Risks			Monopolistic	Oligopolistic	Perfect compt.	Misspecified
	i	w	o	td	taf	btb	rcaf	laf		Ho: H≤ 0	Ho: 0 < H < 1	Ho: H ≥ 1	Ho: H > 1
State-owned Banks													
1997-2000	0.27	-0.21	0.44	0.25	0.16	-0.07	-0.01	0.51	0.99	Reject	Not Reject	Reject	Reject
	(4.08)	(-2.21)	(7.84)	(2.43)	(1.81)	(-0.80)	(-0.09)	(3.36)					
Foreign Banks													
1997-2000	0.13	-0.04	0.80	0.14	0.13	0.09	0.04	0.79	0.98	Reject	Reject	Not Reject	Reject
	(3.03)	(-0.98)	(34.94)	(3.12)	(2.67)	(2.96)	(1.25)	(11.74)					
Large Banks													
1997-2000	0.25	-0.10	0.68	0.39	0.14	0.63	0.15	-0.00	0.98	Reject	Not Reject	Not Reject	Reject
	(5.01)	(-1.62)	(22.6)	(5.18)	(2.11)	(8.70)	(3.22)	(-0.07)					
Small- and Medium-Sized Banks													
1997-2000	0.12	-0.07	0.79	0.10	0.12	0.76	0.02	0.03	0.98	Reject	Not Reject	Reject	Reject
	(3.80)	(-2.31)	(47.9)	(2.90)	(3.48)	(19.8)	(0.80)	(1.32)					

Source: Fund staff estimates.

Note: Large banks have assets larger than R$5 billion, banks with less assets are classified as small- and medium-sized institutions. The variables' names are the same as in table 4. Fixed effect panel estimations. T-statistics in parenthesis.

1/ At 5 percent significance level.

V. Summary and Conclusions

This paper showed that Brazilian banks are profitable but less efficient than banks in other Latin American countries, and especially those in the United States, Japan, and the euro area. Operational costs represent a very large proportion of earnings, and banks intermediate savings and investment in the same proportion to GDP as banks in other Latin American countries, even though they are much bigger.

There may be several reasons why the depth and efficiency of bank intermediation in Brazil lags that elsewhere. An undeniable explanation is that credit risk has been high during decades of trials in reform and restructuring, and that banks have been able to afford their risk aversion thanks to the availability of high-yielding, risk-free government securities as an alternative investment to private sector lending. This study focused on another possible explanation: that the banking sector is not fully competitive. This is suggested by the stylized facts, and indeed is confirmed by the empirical investigation, which indicates that Brazilian banks behave oligopolistically.

There are very different views on the desirability of different banking structures in the economic literature.[16] In the environment of asymmetric information between lenders and borrowers in which banks operate, there are trade-offs between competition and concentration. Competition ensures that costs are minimized and resources allocated efficiently, promoting efficiency and sharing the benefits of the financial system with the rest of the economy. However, it is generally agreed that banks need to earn a rent to make evaluating and monitoring borrowers worthwhile. It is also argued that some degree of market power guarantees banks' profitability and makes them less fragile in the face of shocks. The existence of large banks may however increase systemic risk and again be detrimental to financial stability. And non-competitive practices may result in excessively high prices and quantity rationing for customers.

It will probably take a few more years for current reforms, which are also revamping the administrative and legislative framework in which banks operate, to strengthen the basis for competition in the Brazilian banking system. The recent setup by the central bank of a database of large borrowers will be key to reducing informational barriers for new entrants to the banking system. In addition to reducing information asymmetries in the system, thereby lowering risk for financial intermediaries, it will remove an obstacle to more intense competition. And completion of the on-going reform in prudential supervision will ensure that heightened competition will be associated with a sound, stable, and more efficient banking system in Brazil.

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[16] For a summary of these views, see Allen *et al.* (2001).

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