IMF Staff Papers
Vol. 46, No. 2 (June 1999)


# Interest Spreads in Banking in Colombia, 1974–96

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*This paper examines the determinants of the high intermediation spread observed in the Colombian banking sector for over two decades. A reduced-form equation is estimated on the basis of a bank profit maximization model that permits a decomposition into operational costs, financial taxation, market power, and loan quality. Although the average spread did not change between the preliberalization (1974–88) and postliberalization (1991–96) periods, its composition did, with market power being significantly reduced and the responsiveness to loan quality increased. Colombia's progress in reducing operational costs and financial taxation and improving loan quality will determine whether it can narrow the spread.* [JEL E43, G21, L13]

A key variable in the financial system is the spread between lending and deposit interest rates. When it is too large, it is generally regarded as a considerable impediment to the expansion and development of financial intermediation, as it discourages potential savers with low returns on deposits and limits financing for potential borrowers, thus reducing feasible investment opportunities and therefore the growth potential of the economy.

Financial systems in developing countries have been shown to exhibit significantly and persistently larger intermediation spreads on average than those in

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developed countries (Hanson and de Rezende Rocha, 1986). These high spreads have frequently been attributed to such factors as high operating costs, financial taxation or repression, lack of competition, and high inflation rates. However, with some notable exceptions,[1] there has been a scarcity of direct tests of the relevance of these factors, and a lack of a consistent theoretical banking model on which to base the statistical analysis. In this paper we adopt a "new empirical industrial organization" (Bresnahan, 1989) approach, which has been used to examine competitiveness in banking,[2] and we apply it specifically to the determination of the intermediation spread, allowing for certain peculiar characteristics of banking systems in developing countries.

Colombia provides an interesting case study. During the 1970s and 1980s intermediation spreads traditionally were high, both compared to world levels (Clavijo, 1991) and to those in Latin America (Morris and others, 1990). The financial system appeared to be highly repressed, inefficient, and noncompetitive, as banks were subject to high rates of financial taxation and exhibited high operating costs and a high degree of concentration and state ownership (Barajas, 1996). Starting in the early 1990s, however, Colombian policymakers embarked on an ambitious and far-reaching economic reform program, and took several actions aimed at redefining the structure and operation of the financial system.[3] They eased entry restrictions, relaxed the specialization of intermediaries by moving toward a multibanking scheme, reduced financial taxation by eliminating mandatory investments and simplifying reserve requirements, phased out directed credit programs, undertook substantial privatization of financial institutions, and strengthened prudential norms. These measures sought to increase financial intermediation and facilitate efficiency, competitiveness, and stability of the domestic financial system, and to increase private participation, both domestic and foreign.

However, these reforms do not appear to have reduced spreads significantly in Colombia. As we will show, bank spreads remained relatively constant on average between the preliberalization (1974–88) and the postliberalization (1992–96) periods. Furthermore, throughout 1988–95, spreads and overhead expenses continued to be high by international standards: as a percentage of total assets, spreads averaged 6–8 percent, compared to 2–3 percent in industrialized countries, while overhead expenses in relation to total assets averaged 7–8 percent, compared to 2–3 percent in industrialized countries and 6 percent on average in Latin America (Table 1).[4]

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[1]See Fuentes and Basch (1997) in the case of Chile, Randall (1998) in the case of the Eastern Caribbean countries, Catão (1998) in the case of Argentina, and Yu (1995) in the case of Canada.

[2]See Shaffer (1989 and 1993) for applications to the United States and Canada, respectively, Hannan and Liang (1993) for an application to local deposit markets in the United States, Suominen (1994) for an application to Finnish banking, Gruben and McComb (1996) as applied to Mexico, and Gruben and Koo (1997) as applied to Argentina.

[3]The economic reform program is summarized in Lora (1991).

[4]It has been suggested that certain nonmanagerial factors external to the banking firm (such as high security and/or transportation costs) contribute to the high observed overhead expenses in Colombia. While the study by Suescún and Misas (1996) showed evidence of significant managerial *X*-inefficiency in banks, there is certainly scope for additional work to investigate how important the nonmanagerial factors may be.

Table 1. Bank Intermediation Spreads and Overhead Costs in Colombia as Compared with Latin American and Industrialized Countries: Average 1988–95

| | Net Interest Margin/ Total Assets (percentage) | Overhead/ Total Assets (percentage) |
|---|---|---|
| Colombia | | |
| Domestic banks | 6.2 | 8.0 |
| Foreign-owned banks | 7.6 | 6.9 |
| Latin America | | |
| Domestic banks | 5.8 | 6.1 |
| Foreign-owned banks | 7.4 | 6.3 |
| Industrial economies | | |
| Domestic banks | 2.8 | 2.6 |
| Foreign-owned banks | 2.3 | 2.3 |

Source: Claessens, Demirgüç-Kunt, and Huizinga (1998)

This contrasts with the recent international experience, where various aspects of financial liberalization have been linked to substantial reductions in spreads: enhanced competition within the banking system in Portugal (Honohan, 1999); competition with new nonbank intermediaries in Chile (Fuentes and Basch, 1997);[5] foreign bank penetration in Turkey (Denizer, 1999), Spain (Pastor, Pérez, and Quesada, 1999), and Argentina (Clarke and others, 1999); and increased openness to foreign investment in East Asia (Claessens and Glaessner, 1998). However, the Argentinean case is somewhat similar to Colombia's in that, although the forementioned narrowing of spreads did occur in specific segments of the market, overall banking spreads have been slow to converge to international levels during the 1990s (Catão, 1998).

By providing a framework for the decomposition of intermediation spreads into their key factors (bank costs, market power, and loan quality), the present study will also allow us to assess the impact of liberalization on each of these factors, to understand why liberalization did not narrow spreads as expected. As we will show, one element in the explanation is that the initial measures reducing financial taxation were reversed to some degree as policymakers attempted to sterilize the buildup of international reserves between 1989 and 1995 with restrictive monetary policy and imposition of exchange controls. Although policymakers were able to reduce reserve requirements and forced investments from their late-1970s peak levels of about 50 percent of total bank deposits to about 27 percent by the end of the 1980s, the sterilization policies pushed the levels back up to 32 percent by mid-1992, and in recent years this ratio remains at about 20 percent (Table 2).

[5]Namely, pension funds, which competed for resources, thus forcing banks to increase their efficiency and lower spreads.

Table 2. Indicators of Financial Taxation, Selected Periods

*(End-of-quarter percentages)*

| Quarter | Reserve Requirements and Forced Investments/ Total Deposits | Average Tax Rate on Deposits[a] |
|---|---|---|
| Preliberalization period | | |
| 1974:1 | 43.4 | 41.7 |
| 1979:3 | 49.5 | 74.9 |
| 1984:4 | 29.9 | 20.9 |
| 1988:4 | 26.5 | 20.6 |
| Postliberalization period | | |
| 1991:1 | 25.8 | 34.8 |
| 1992:2 | 32.4 | 47.9 |
| 1994:2 | 28.6 | 40.0 |
| 1996:3 | 19.0 | 23.4 |

[a]Defined as the additional cost of deposits from reserve requirements and forced investments. In the postliberalization period, in which forced investments and remunerated reserves are close to zero, the tax rate is equal to $1/(1-\varepsilon)-1$, where $\varepsilon$ is the average reserve ratio. In the preliberalization period, the measure includes forced investments as well, and is adjusted by the rate of remuneration of both required reserves and forced investments. A detailed description of this measure is contained in Barajas (1996).

The Colombian financial system has experienced considerable growth and restructuring during the 1990s. In real terms, banking system assets grew by an average annual rate of over 5 percent, while credit increased by over 10 percent during 1990–96. This expansion was captured by traditional financial depth indicators (M2/GDP) as well, which increased from 30 to almost 40 percent during the decade. Substantial privatization has also taken place during the 1990s, with the share of private banks in total assets increasing from 45 to 79 percent, and their share in capital rising from 62 to 81 percent (Table 3). However, what is not directly apparent is how much progress has been made in increasing efficiency and competitiveness of financial institutions. Since these factors are expected to be reflected in the banking intermediation spread, the study of spreads will allow us to assess the progress made in these areas.

There is a possible trade-off involved when analyzing spreads. While a high level is generally indicative of inefficiency, excessive risk taking, or lack of competition within the banking sector, it is also true that high spreads can contribute to high bank earnings, which, if channeled into the capital base of the system, may promote safety and stability in the system. This is particularly relevant in the case of developing countries, where the existence of an implicit government bailout commitment has frequently led to a moral hazard situation in the financial system. It is not entirely clear which is preferable from a social standpoint: a banking system with low spreads and (consequently) low capital, which may require a government-funded bailout, or a system with high spreads and a high capital base that

Table 3. Private and State-Owned Banks in Colombia
Distribution of Assets and Capital, 1991–96

| | June 1991 | | December 1994 | | June 1996 | |
|---|---|---|---|---|---|---|
| | Assets | Capital | Assets | Capital | Assets | Capital |
| State-owned banks | 55.0 | 38.6 | 22.1 | 20.6 | 20.6 | 19.3 |
| Private banks | 45.0 | 61.5 | 77.9 | 79.4 | 79.4 | 80.7 |
| Of which: foreign | 7.6 | 9.7 | 8.6 | 10.0 | 9.7 | 10.7 |

Sources: Colombian Bankers' Association and estimates by the authors.

may not require a bailout.[6] Section III presents evidence that sheds light on the probable uses of high spreads in the Colombian case, and will confirm that the above trade-off clearly applies here; while high spreads indicate certain shortcomings of the liberalization policies, they also appear to have facilitated a well-needed capitalization process during the present decade.

## I. Interest Rate Spreads in Colombia, 1974–96

Based on the available balance sheet and profit-loss information, we constructed two separate databases: a quarterly series of the aggregate banking system for the preliberalization 1974–88 period, and a monthly series with individual bank data covering the postliberalization 1991–96 period. The break in the data corresponds to a transition period during which financial intermediaries adapted to a new accounting standard. The intermediation spread ($m$) is defined as the difference between the average rate charged on loans[7] ($i_l$) minus the average rate paid on deposits ($i_d$), and is shown in Figure 1.[8] In the preliberalization period the spread ranged between 16 and 32 percentage points, increasing steadily from 1974 up to its peak level in late 1980 and then falling again gradually until 1988, where it reached just under 19 percentage points. In the postliberalization period, the spread declined steadily from an initial level of about 25 in 1991 to 19 percentage points in 1996.

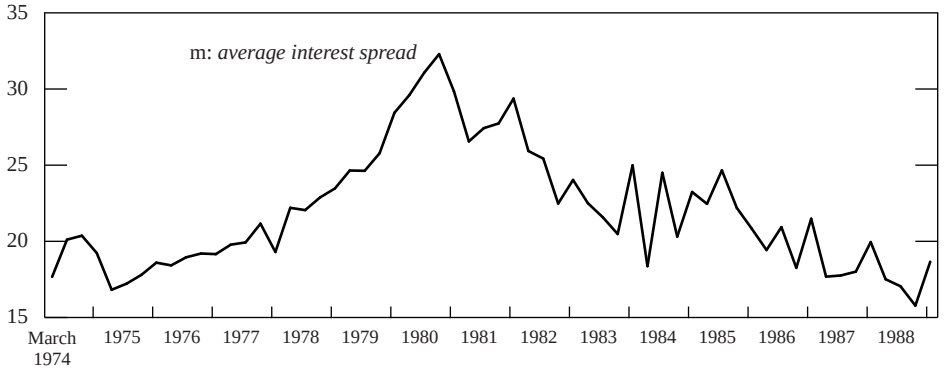
[6]This also can be viewed as an issue of bank franchise value, which has been shown to be a key factor limiting moral hazard and excessive risk taking (Caprio and Summers, 1993; Hellman, Murdock, and Stiglitz, 1998). To the extent that high spreads arising from market power reflect a high franchise value, the likelihood of a bank crisis may be smaller than in the case of a competitive system with lower spreads.

[7]The average lending rate is an "ex post" rate, calculated as interest received/performing loans. To the extent that many nonperforming loans may have been contracted at higher "ex ante" rates, this measure will tend to understate the contracted or ex ante lending rate, and therefore the spread. Also, to the extent that banks have participated in directed credit programs at subsidized interest rates, we adjusted the average lending rate by the share of directed credit in total credit and by its average interest rate, to obtain a "market lending rate." This adjustment was relevant primarily for the preliberalization period, when directed credit represented up to 16 percent of total bank credit and its lending rate was close to zero in real terms.

[8]For the postliberalization period we calculated $m$ using a weighted average of 30 banks comprising virtually the entire banking system. For both periods we annualized the respective monthly or quarterly flows, and took the stocks of loans and deposits at their average monthly or quarterly level.

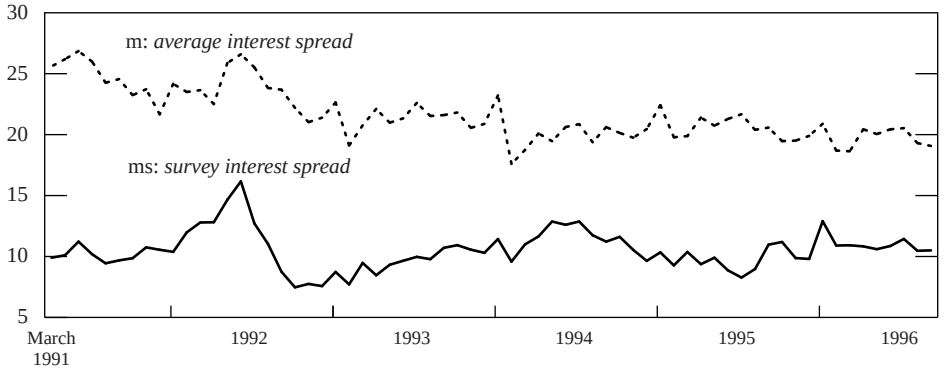
## Figure 1. Intermediation Spreads in Colombia

a. Preliberalization Period 1974–88



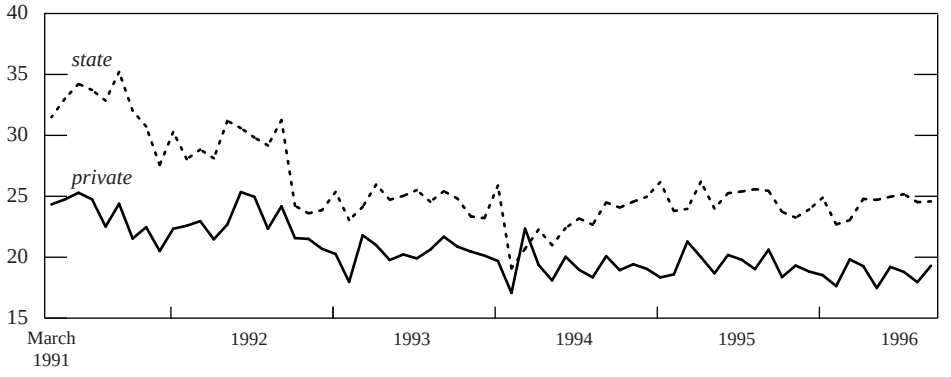

Sources: Banco de la República and estimates by the authors.

b. Postliberalization Period 1991–96




Sources: Colombian Bankers' Association and estimates by the authors.

c. Postliberalization Period: Private and State-Owned Banks




Sources: Colombian Bankers' Association and estimates by the authors.

## A Closer Look at Intermediation Spreads and Related Banking Indicators in 1991–96

The average intermediation spread $m$ may be compared to a spread obtained from survey lending and deposit rates reported weekly by banks to the Colombian Banking Superintendency, a measure we define as $m_s$, equal to the difference between the average rate charged on loans on the last week of each month ($i_{ls}$) and the average rate paid on three-month time deposits during the last week of each month ($i_{ds}$). While the average spread ($m$) fell by about 6 percentage points between 1991 and 1996, with most of the fall occurring before 1994, the survey spread ($m_s$) remained relatively constant at about 10 percentage points throughout the period (Figure 1).

Throughout the period 1991–96 Colombian interest rates were high in real terms and, once observed devaluation is accounted for, high relative to the United States. On average, the deposit rate $i_d$ was 14 percent, the lending rate was about 36 percent, and the rate on three-month time deposits ($i_{ds}$) was 28 percent, compared to an average inflation rate of 23 percent and an average rate of nominal devaluation of 13 percent.

Figure 2 shows several indicators that may be related to interest spreads: the nonperforming loan ratio, the average reserve ratio, the ratio of administrative costs to total assets, and the ratio of demand deposits to total deposits and other liabilities. It should be noted that the average reserve ratio is not strictly a policy variable; since it is an average of different reserve requirements over all types of deposits, it also depends on the composition of the public's demand for different deposits. Hence, the observed decline in the average reserve ratio, from 33 percent in 1992 to less than 20 percent in 1996, was the result of both a reduction in reserve requirements and a shift in deposits away from demand deposits and toward savings and time deposits. The average percentage of nonperforming loans was relatively constant at 5–7 percent, with the exception of a brief upsurge in 1992,[9] and administrative costs did not show a clear upward or downward trend, fluctuating between 4.5 and 6.8 percent of total bank assets.

Figure 2 also sheds some light on the differing behavior between average and survey interest spreads. Although interest rates on time deposits did not increase substantially throughout the period, the share of demand deposits declined from 45 percent to 30 percent, thus increasing the average interest cost of bank deposits. This recomposition in deposits reflects significant changes in the money demand and the possible presence of financial innovations undertaken by the banking system as well as competition from nonbank financial intermediaries.

## Private Versus State-Owned Banks in 1991–96

From Figure 1c, one can see that average spreads exhibit a downward trend for both state and private banks. State banks had a consistently higher spread throughout the

[9]Part of the observed peak in 1992 is due to a statistical quirk: a large state-owned bank with a particularly high nonperforming loan ratio entered the sample in May 1992. Our aggregate regressions therefore are run on the May 1992 to August 1996 sample.

## Figure 2. Total Banking System Indicators

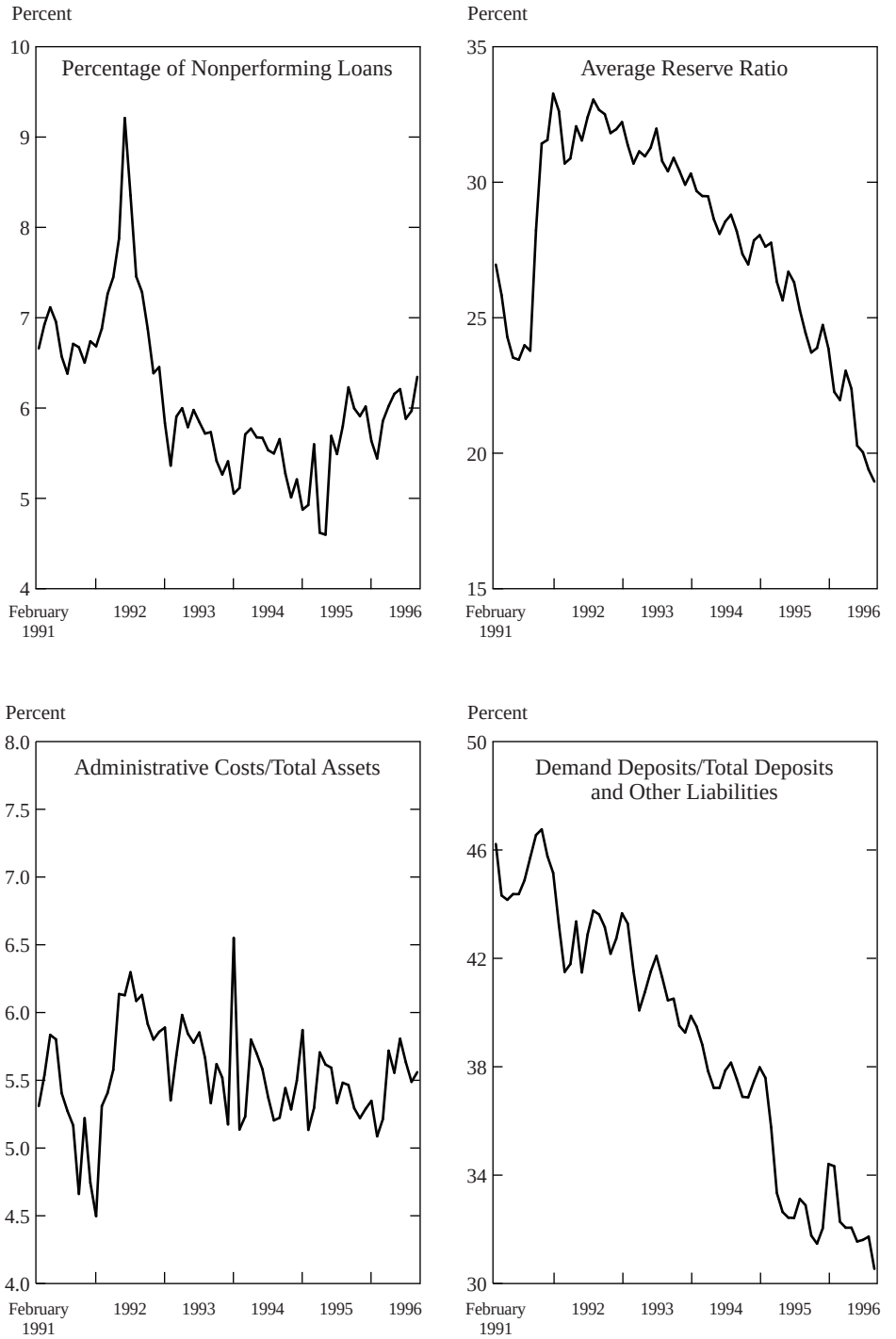


Table 4. Variation Over Time and Across Individual Banks

| | Over Time | Across Banks |
|---|---|---|
| Implicit average deposit rate $i_d$ variation coefficient | 0.17 | 0.30 |
| Implicit lending rate $i_l$ variation coefficient | 0.07 | 0.20 |
| Percentage of nonperforming loans (*NPL*) variation coefficient | 0.16 | 0.57 |
| Administrative costs/total assets variation coefficient | 0.07 | 0.22 |

Source: Estimates by the authors based on Colombian Bankers' Association data.

period, as a result of charging slightly more on loans and paying significantly less on deposits, which in turn may reflect the state banks' relatively higher percentage of nonperforming loans and higher ratio of demand deposits to total deposits (Figure 3). The higher observed percentage of demand deposits for state banks stems from the fact that these banks tend to manage the funds used by the government to carry out spending, and therefore, the recomposition toward interest-bearing deposits has been slower for these institutions. State banks also tended to maintain a greater amount of reserves relative to total deposits, and had higher labor costs in relation to their total assets. Although overall bank productivity increased throughout the 1990s, as measured by the real value of loans per employee or per number of branches, it was consistently lower for state banks.

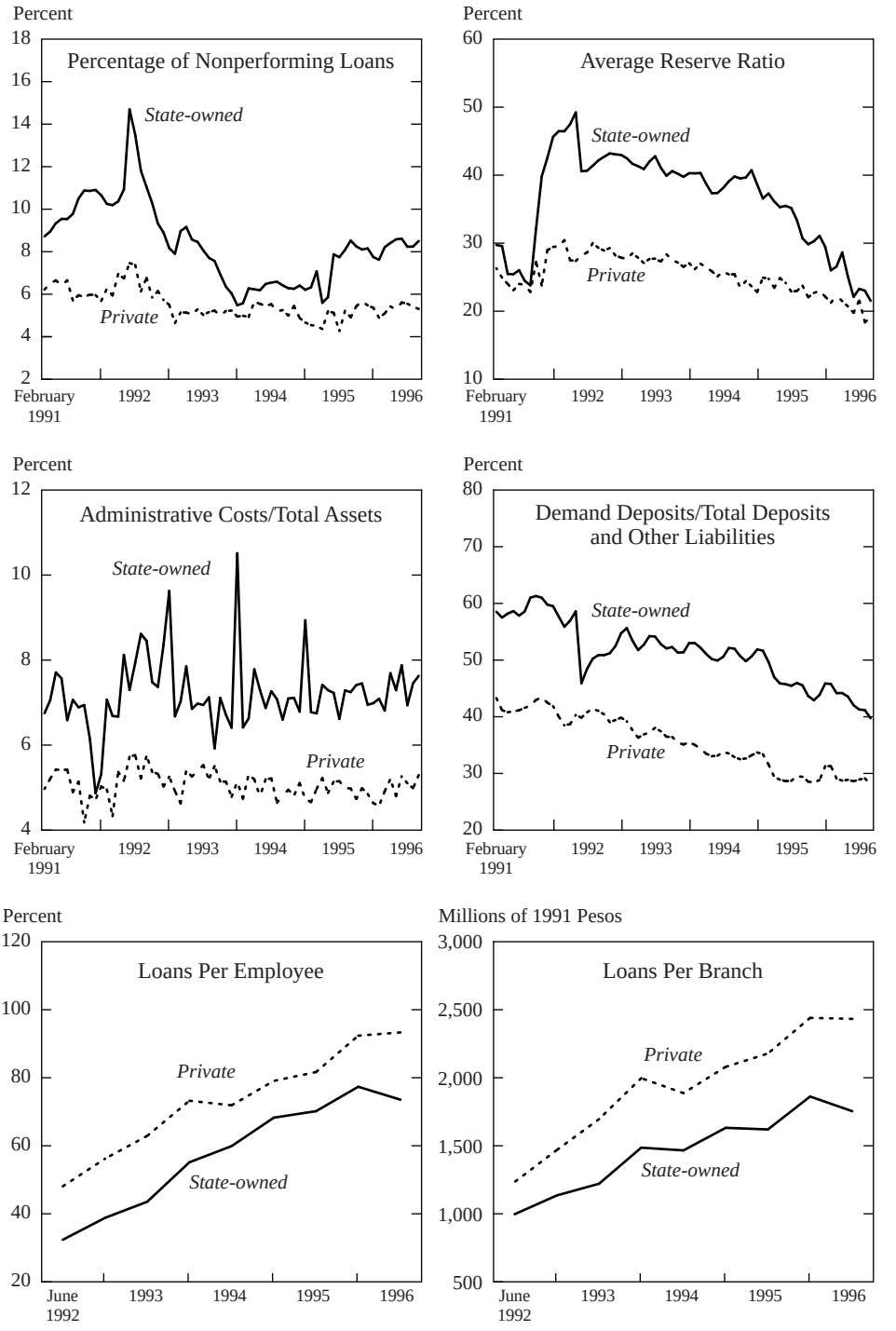
## II. Intermediation Spreads in 1991–96: Some Simple Statistics

In this section we present two simple statistical tests, one showing the degree of cross-sectional versus time variability, and another showing a positive correlation between the percentage of nonperforming loans and the size of the intermediation spread. These, along with the descriptive statistics presented in the previous section, will help motivate the derivation and estimation of a simple model of bank behavior in which the intermediation spread is a function of costs (including financial taxation), credit risk, and, possibly, market power.

### Cross-Sectional Versus Time Variability

Table 4 presents variation coefficients for the implicit lending and deposit interest rates (used to calculate *m*), the percentage of nonperforming loans, and the ratio of administrative costs to total assets. The cross-bank coefficient is obtained by computing a single average observation over time for each bank, and the time variation coefficient is obtained by computing an aggregate banking sector average for each time period. It appears that cross-bank variability is larger than time

## Figure 3. Private and State-Owned Banks: Indicators



variability in general for all four variables shown. Variability in interest rates appears to be relatively small—and greater for deposit rates than for lending rates, reflecting the differences in deposit composition between private and state-owned banks—while loan quality variability is quite large across banks. This result suggests that a panel data approach to the empirical modeling would be useful in capturing this type of cross-sectional variability.

### Correlation Between Loan Quality and the Intermediation Spread

We conducted a simple exercise to examine the possible relation between bank spreads and loan quality. First, we computed the average percentage of nonperforming loans for the banking system and plotted it against the intermediation spread in Figure 4, where there is evidence of a positive correlation between the two. This suggests that banks may be transferring to their customers (either borrowers or depositors) a portion of the additional costs of a deterioration in loan quality.

This result was reinforced by Granger causality tests on these two variables. The upper panel of Table 5 shows that the null hypothesis of a unit root cannot be rejected at a 5 percent level for the percentage of nonperforming loans (*NPL*) and the spread (*m*).[10] Therefore, the Granger causality tests were conducted on the first differences of the variables. The lower panel of Table 5 shows that the null hypothesis of lack of causality going from the percentage of nonperforming loans to the spread was rejected at a 1 percent level. On the other hand, lack of causality in the opposite direction was not rejected, thus suggesting that loan quality is an important determinant of the intermediation spread in Colombia, and since two-way causality was ruled out, loan quality also appears to be exogenous to the spread.[11]

To summarize the results of this section, we found that intermediation spreads in Colombia tended to vary considerably across types of banks, that deteriorations in loan quality were positively correlated with spreads, and that causality appeared to go from loan quality to the spread. These results suggest that spreads in Colombia should be analyzed with a model that incorporates the effect of loan quality, and that panel data techniques would be useful to account for cross-sectional heterogeneity.

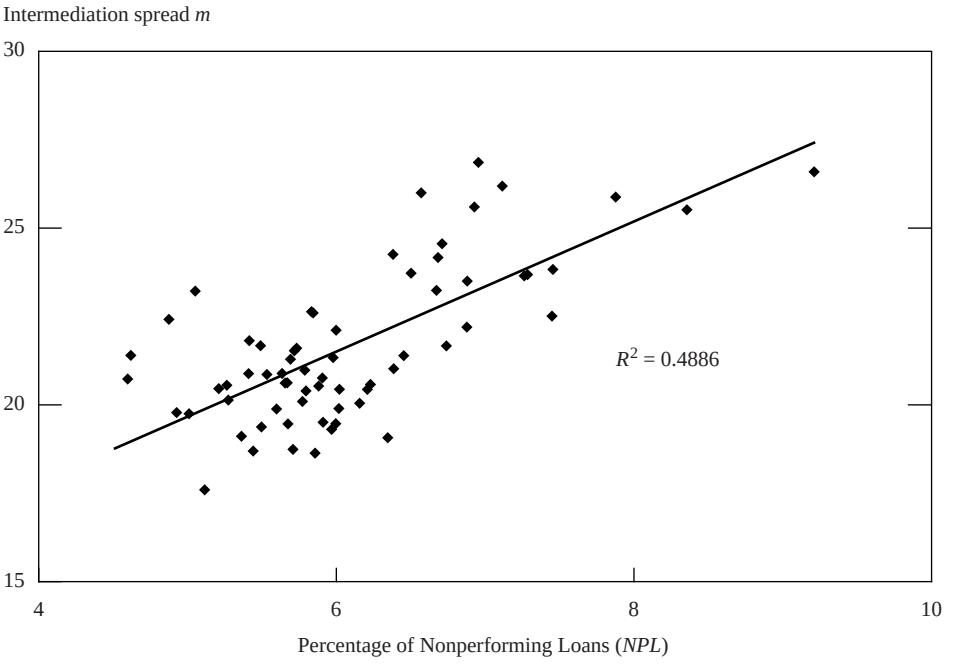
## III. A Simple Bank Intermediation Model

We begin with an intermediation model to represent bank behavior. As in Shaffer (1989 and 1993), the assumption of profit-maximizing behavior leads to a regression equation in which market power may be tested explicitly. However, our framework also incorporates a specific balance sheet relationship between deposits and loans that

[10]Separate analysis not reported here shows that lending and deposit rates both exhibit a unit root and are cointegrated for the banking system as a whole, for state-owned banks, and for private banks. Therefore, bivariate regressions between the two are free of spurious correlation problems arising in non-cointegrated $I(1)$ variables. These results are available from the authors upon request.

[11]Exogeneity of loan quality with respect to the spread was further supported by regression analysis of *NPL*. In equations with *NPL* as the dependent variable and that included as regressors the monthly index of industrial production, a survey index of business climate, and the one-period lagged value of *NPL*, the lending rate was not a significant explanatory variable.

## Figure 4. Loan Quality and the Intermediation Spread




## Table 5. Statistical Tests on Loan Quality and the Intermediation Spread, May 1992–August 1996

Augmented Dickey-Fuller Test

| Variable | Definition | Statistic | Critical Value at 5 Percent Level of Significance | Constant and/or Trend | Number of Lags |
|---|---|---|---|---|---|
| *NPL* | Percentage of nonperforming loans | –2.65 | –2.92 | constant | 1 |
| *dNPL* | | –4.58 | –2.60 | | 3 |
| *m* | Intermediation spread | –2.52 | –3.50 | constant and trend | 2 |
| *dm* | | –4.44 | –1.95 | | 3 |

Granger Causality Test

| Null Hypothesis | Number of Observations | Number of Lags | *F*-statistic | Probability |
|---|---|---|---|---|
| *d*(*m*) does not cause *d*(*NPL*) | 52 | 4 | 0.17 | 0.95 |
| *d*(*NPL*) does not cause *d*(*m*) | 52 | 4 | 4.49 | 0.00 |
| *d*(*m*) does not cause *d*(*NPL*) | 52 | 1 | 2.06 | 0.16 |
| *d*(*NPL*) does not cause *d*(*m*) | 52 | 1 | 14.56 | 0.00 |

allows us to derive a condition for the bank intermediation spread explicitly.[12] We assume that each bank *j* produces an output, namely loans ($L_j$), and uses two inputs, labor and deposits ($D_j$). In addition to loans, on the asset side the bank is also required to hold a certain amount of reserves ($R_j$) with the central bank. Liabilities are made up of deposits plus an exogenous residual, "other net liabilities" ($ONL_j$). Therefore, for a given required reserve ratio ($\varepsilon_j$),[13] the balance sheet condition for each bank is

$$L_j + R_j = D_j + ONL_j \Rightarrow L_j - D_j\left(1-\varepsilon_j\right) - ONL_j = 0. \tag{1}$$

Banks receive revenues from the interest on loans and must pay the interest costs of deposits as well as the real resource costs—mostly wages—of engaging in financial intermediation. They maximize profits ($U_j$), which are defined as the difference between financial revenues and (financial and nonfinancial) costs:

$$U_j = i_l L_j - i_d D_j - C\left(L_j, w, x\right), \tag{2}$$

where $i_l$ and $i_d$ are the lending and deposit interest rates, respectively; *w* is the wage rate; and *x* is a vector of other variables that affect marginal nonfinancial costs. In this simple formulation there is no uncertainty and the banks choose their level of output to maximize profits. The first-order condition for profit maximization is[14]

$$\frac{\partial U_j}{\partial L_j} = i_l + L_j\left(\frac{\partial i_l}{\partial L_j}\right) - i_d\frac{\partial D_j}{\partial L_j} - D_j\frac{\partial i_d}{\partial L_j} - C_l = 0, \tag{3}$$

where $C_l$ is the marginal nonfinancial cost of producing loans.

Two types of relationships in equation (3) are of particular relevance. First is the relationship between changes in deposits and loans, which, according to the balance sheet condition, is determined by the required reserve ratio. That is, credit growth is constrained by the amount of reserves banks must hold: $\partial D_j / \partial L_j = 1/1 - \varepsilon_j$. Second is the relationship between the interest rates and the quantity of output (loans) supplied by the bank ($\partial i_l / \partial L_j$, $\partial i_d / \partial L_j$), which will be

[12]This type of model was used earlier by Barajas (1996) to analyze the aggregate banking system during 1974–88. An individual bank-level framework for Colombia was used by Montes and Carrasquilla (1986) and later updated by Carvajal and Zárate (1996), but was based on accounting identities rather than on a behavioral model.

[13]Two comments must be made here. First, although the required reserve ratio is a policy variable that is imposed equally on all banks, the average reserve ratio, $\varepsilon$, varies from bank to bank since the required reserve ratio varies by type of deposit and each bank has a different composition of deposits. Second, in the preliberalization period, *R* and $\varepsilon$ also contain forced investments that frequently amounted to over 10 percent of bank deposits.

[14]One significant difference between this formulation and that of Shaffer is that the latter includes interest costs within the aggregate cost function *C*, while we include only nonfinancial costs and opt to separate financial costs from the cost function. Since there is no clear consensus on whether financial costs should be included or not (see, for example, Dick, 1996, and Suescún and Misas, 1996), excluding them proved more convenient in order to obtain a clear expression for the interest spread. Furthermore, separating interest costs from the operational cost function could potentially allow one to test whether market power exists on the deposit side as well.

determined by the degree of market power since, in perfect competition, individual bank output will have no effect on prices.

Equation (3) may be transformed easily into a regression equation explaining the spread between lending and deposit interest rates, the precise specifications of which will depend on assumptions regarding the cost function and the markets for deposits and loans. Below we present the two alternative specifications to be estimated in Section I: a single equation specification and one in which the spread equation is estimated jointly with a demand function.

## Single Equation Specification

By rearranging terms and isolating the lending rate on the left-hand side, equation (3) may be rewritten in the following form:

$$i_l = \frac{i_d\left(\frac{\phi_d}{\phi_l}\right)}{1-\varepsilon} + \frac{C_l}{\phi_l}, \tag{4}$$

where $\phi = 1 + ms_j \cdot rs_j/\eta$ is the market power indicator in each of the two markets (for deposits and loans), which depends on the interest elasticity of demand ($\eta$),[15] the market share of bank $j$ in the respective market ($ms_j$), and the response of industry supply to changes in the output of bank $j$ ($rs_j$). (For simplicity, we drop the $j$ subscript in the reserve ratio variable $\varepsilon$, which is appropriate when estimating this equation for the aggregate banking system. On the other hand, panel data estimation will require bank-specific interest rates, cost function variables, and reserve ratios.) It can be shown that if market power exists in either of the two markets, the term $\phi_d/\phi_l$ will be greater than unity. Otherwise, under perfect competition in both markets, this term will be equal to unity.

Equation (4) therefore provides a profit-maximizing relationship between the lending interest rate, the deposit rate (adjusted by the rate of financial taxation), and marginal costs. If we assume marginal costs to be a linear function of the wage rate ($w$), the volume of loans ($L$), and other factors ($x$), equation (4) can be written as a regression equation for the lending rate:

$$\begin{aligned} i_l &= d_0 + d_1 \frac{i_d}{1-\varepsilon} + d_2 L + d_3 w + d_4 x \\ d_0 &= \frac{b_0}{\phi_l},\ d_1 = \frac{\phi_d}{\phi_l},\ d_2 = \frac{b_1}{\phi_l},\ d_3 = \frac{b_2}{\phi_l},\ d_4 = \frac{b_3}{\phi_l}, \end{aligned} \tag{5}$$

where $b_0$, $b_1$, $b_2$, and $b_3$ are parameters of the marginal cost function.

In this specification, $d_1$ summarizes the effect of market power in both markets, and will be equal to unity unless market power exists in at least one of the

[15]More specifically,

$$\eta_l = \frac{\partial L}{\partial i_l}\frac{i_l}{L} < 0,\ \eta_d = \frac{\partial D}{\partial i_d}\frac{i_d}{D} > 0.$$

two markets. If both markets for deposits and loans are perfectly competitive, then the interest rate charged on loans will be equal to the marginal cost of producing loans and deposits, that is, $i_l = C_l + i_d/(1 - \varepsilon)$. If, on the contrary, we assume that one of the markets is perfectly competitive, then the above regression equation will estimate the degree of market power in the remaining market. Hannan and Liang (1993) use a similar approach with respect to U.S. banks. They assume the loan side to be perfectly competitive and therefore set out to estimate market power on the deposit side.

## A Simultaneous Equation Specification

A simultaneous equation approach may also be used, as in the Shaffer (1989 and 1993) studies of market power in U.S. and Canadian banks. The market for bank deposits is assumed to be competitive, and the slope rather than the elasticity of the demand curve for the output market (loans) is assumed to be constant. Joint estimation of the demand curve allows the slope parameters to be estimated and incorporated into the spread equation. The demand for bank loans is specified as a linear function of the lending rate ($i_l$), income ($Y$), and the price of substitutes for bank loans ($z_l$), with certain interaction terms:

$$L = a_0 + a_1 i_1 + a_2 Y + a_3 z_l + a_4 i_1 Y + a_5 i_1 z_l. \tag{6}$$

We then rewrite equation (4) under the assumption of perfect competition in the deposit market ($\phi_d = 1$), and substitute the slope of the demand function ($\partial L/\partial i_l$) from equation (6), thus arriving at a regression equation for the spread:

$$i_l - \frac{i_d}{1-\varepsilon} = -L\lambda\left(\frac{1}{a_1 + a_4 Y + a_5 z_l}\right) + b_0 + b_1 L + b_2 w + b_3 x. \tag{7}$$

Equations (6) and (7) may then be estimated jointly for the aggregate banking system, yielding estimates of all demand and marginal cost parameters, and of average market power in the banking system ($\lambda$). Note that $\lambda$ is equal to the market share times the response indicator ($\lambda = ms_j \cdot rs_j = L_j/L \cdot \partial L/\partial L_j$) and is equal to zero in the case of perfect competition, to the inverse of the number of banks ($1/N$) in the case of a Cournot oligopoly, and to unity in the case of collusion. To identify $\lambda$, either $a_4$ or $a_5$ must be nonzero, and to obtain a downward sloping demand curve for loans, the estimated values of $a_1 + a_4 Y + a_5 z_l$ must be positive.

It can be shown how one can relax the assumption[16] that banks are price takers in the deposit market, thus requiring the estimation of a demand function for deposits.

[16]This assumption was maintained by the Shaffer studies as well as by the analyses of Mexico and Argentina by Gruben and McComb (1996) and Gruben and Koo (1997), respectively. The assumption seemed reasonable in the Colombian case, as banks face natural competition from other financial intermediaries that offer similar types of deposits, but may have a certain amount of market power on the lending side where they do not face as clear a challenge. As Shaffer points out, if the deposit market is not perfectly competitive, then a finding of market power is still valid, but may be misattributed to the loan market.

Suominen (1994)[17] followed this type of approach by modeling a demand function analogous to that of loans, as a function of income, the deposit interest rate ($i_d$), the price of substitutes ($z_d$), and several interaction terms. For simplicity, we will maintain the assumption of a perfectly competitive market for bank deposits.

## IV. Estimation Results

For the econometric analysis, we used banking system data for the 1974–88 (quarterly) and May 1992 to August 1996 (monthly) periods for the aggregate system, and a panel of 22 banks for the March 1991 to August 1996 period.[18] We estimated the single-equation specification described in equation (5) and, in the later period, we estimated the system-equation specification described in equations (6) and (7).[19] The wage variable was constructed as the ratio of total labor costs to employment,[20] the scale variable $L$ was the average monthly stock of loans, and the income variable, $Y$, was the monthly index of industrial production. Wages, loans, and deposits were taken in real terms by deflating the nominal values by the CPI. The price of substitutes of bank output, $z_l$, was the interest rate on 90-day central bank bills.[21]

Finally, to incorporate the possible effects of changes in loan quality, the percentage of nonperforming loans was included in the spread equation, reflecting two possible responses by banks. First, as a shift variable $x$, nonperforming loans would reflect the extent to which bank managers increase operational expenses in response to deteriorations in loan quality.[22] Second, in the spread equation the effect of nonperforming loans may express a risk premium charged by banks in response to the financial costs of forgone interest revenue. Thus, if at least one of these responses is present in the Colombian case, we would expect increases in the percentage of nonperforming loans to widen the interest spread.

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[17]Suominen models the banking firm as a producer of two outputs, deposits and loans, but provides no balance sheet link between the two. Barajas (1996) uses a two-product formulation that incorporates the balance sheet link but does not rely on joint estimation with the demand function(s).

[18]For 21 banks, information was available from March 1991, but for the aggregate system estimations we opted for the shorter time period since the additional bank (for which information was available only from May 1992 onward) was particularly large.

[19]The lack of success in estimating a reliable demand function for loans in the preliberalization period limited our ability to apply the system approach for comparative purposes between the two periods. The difficulties arose in obtaining satisfactory indicators for a price of substitutes of bank loans, which hindered the identification of $\lambda$.

[20]We were only able to construct a wage variable in the postliberalization sample, since no banking sector employment data were available prior to 1990.

[21]Shaffer (1993) used a similar variable for the United States, a 3-month treasury bill, and Gruben and McComb (1996) used a 28-day treasury bill in the case of Mexico. We also ran the regressions using a money market or interbank interest rate as the price of a substitute, but it did not perform as well as the central bank bill rate, possibly as a result of its high volatility.

[22]Berger and De Young (1997) find evidence of a positive relationship between banks' operational costs in the United States and the percentage of nonperforming loans, which appear to reflect two hypotheses: (1) a "bad luck" hypothesis, whereby exogenous increases (decreases) in bad loans lead to increases (decreases) in costs as banks must intensify their monitoring and undertake additional expenses for working out or selling off these loans; and (2) a "bad management" hypothesis, whereby a deterioration in managerial efficiency—shown by an increase in operational costs—causes an increase in bad loans, as the ability to screen loans and manage credit risk also deteriorates.

## Aggregate Estimation

The aggregate single equation results are shown in Table 6. The first column shows the results for the preliberalization period and the remaining columns display the results for the postliberalization period, for the banking system as a whole and for private and state-owned banks separately. The fit of all regressions is relatively close, serial correlation of the error term up to lag 4 is ruled out at the 5 percent level, and all coefficients have the expected sign. Real wages, owing to their relatively high correlation with the scale variable (real loans), appear not to be significant: when the scale variable is excluded, wages become significant.

One salient result is that market power appears to have declined between the two periods. The estimated market power parameter, $d_1$, is 1.29 in the preliberalization sample and is significantly greater than unity with almost complete certainty.[23] In the postliberalization period, on the other hand, the estimated parameter declines to 1.12, and is not significantly different from unity, thus indicating competitive behavior overall.[24] However, when we disaggregate private and state banks, we find that market power is still significant for private banks, who tend to charge a 23 percent markup over marginal financial costs, while state banks behave as price takers in the loan market in the sense that their intermediation spread just covers marginal costs.

The results also show a prevalence of economies of scale in both periods, with the exception of state banks in the postliberalization period. The general result is consistent with the findings of studies adopting a cost function approach to economies of scale and efficiency in the Colombian banking sector (Bernal and Herrera, 1983; Suescún, 1987; Acosta and Villegas, 1989; Ferrufino, 1991; and Suescún and Misas, 1996).

Nonperforming loans are a significant factor contributing to the widening of interest spreads in both periods, indicating that banks have had to commit additional resources to deal with bad loan problems. Furthermore, banks' sensitivity to changes in nonperforming loans appears to have increased considerably from the pre- to the postliberalization period; the estimated coefficient increases from 0.16 to about 1.0.[25] This change could signal a heightened awareness on the part of bank managers regarding credit risk, and/or it could reflect an improved reporting of nonperforming loans. The earlier period included the mid-1980s financial crisis, during which banking behavior most likely contained a significant element of

[23]The probability of the Wald test for perfect competition is equal to zero at four digits. This is also true for a test comparing this parameter to the value estimated in the later subperiod, 1.09.

[24]This result contrasts with one presented in a previous version of this paper (Steiner, Barajas, and Salazar, 1997), where the hypothesis of market power in the 1992–96 period was not rejected for the banking system as a whole. Regressions were run using a linearized version of the spread equation (5), and with a preliminary data set. Once several improvements were made to the data (adjusting for certain excessive volatility in estimates of individual bank interest rates) and regressions were run using the exact functional form of the spread equation, the finding of significant market power remained only for the private banks.

[25]It could be argued that since the lending rate reflects the cost in terms of forgone earnings of nonperforming loans, the effect of loan quality on the spread should tend to increase if the lending rate increases. However, given that the lending rate remained essentially constant on average between the two periods (at 35 percent) the increase in the estimated parameter does not seem to be due to this effect.

## Table 6. Aggregate Estimation of the Spread Equation

*Single Equation Specification:* $i_l = d_0 + d_1(i_d/1-\varepsilon) + d_2L + d_3w + d_4NPL$

| Variable | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Banking System | | | Private | State-Owned |
| | 1974–88[a] | 1992–96 | | 1992–96 | 1992–96 |
| Constant term: $d_0$ | 0.23 | 10.94 | 8.94 | 11.85 | 3.91 |
| | (15.93)** | (7.04)** | (4.36)** | (5.62)** | (1.61) |
| Market power: $d_1$ | 1.29 | 1.12 | 1.09 | 1.23 | 0.86 |
| | (22.51)** | (13.01)** | (12.67)** | (15.63)** | (7.15)** |
| Real loans: $d_2$ | –0.01 | –0.17 | –0.22 | –0.46 | 1.15 |
| | (9.59)** | (2.99)** | (3.37)** | (5.55)** | (2.61)* |
| Real wage rate: $d_3$ | | | 1.14 | 0.58 | 0.53 |
| | | | (1.45) | (0.62) | (1.28) |
| Nonperforming loans: $d_4$ | 0.16 | 1.00 | 0.99 | 0.86 | 1.15 |
| | (3.06)** | (5.48)** | (5.58)** | (3.43)** | (8.49)** |
| Dummy variable for June 1980: $d_5$ | 0.04 | | | | |
| | (6.26)** | | | | |
| $R^2$ | 0.94 | 0.88 | 0.89 | 0.90 | 0.81 |
| Durbin-Watson statistic | 2.10 | 1.96 | 1.82 | 2.15 | 1.54 |
| **Tests** | | | | | |
| *Wald test for market power* | | | | | |
| Null hypothesis: perfect competition, $d_1 = 1$ | | | | | |
| $\chi^2$ statistic | 25.35 | 1.90 | 1.11 | 8.60 | 1.32 |
| Probability | 0.00 | 0.17 | 0.30 | 0.00 | 0.25 |
| *LM test for serial correlation up to lag 4* | | | | | |
| Null hypothesis: white noise error term | | | | | |
| *F*-statistic | 1.84 | 2.48 | 2.51 | 1.32 | 0.21 |
| Probability | 0.17 | 0.058 | 0.055 | 0.86 | 0.93 |
| Number of observations | 60 | 52 | 52 | 52 | 52 |

Notes: All estimations were done using two-stage-least-squares to account for endogeneity of the volume of loans. *t*-statistics are shown in parentheses. One asterisk denotes significance at the 5 percent level; two asterisks denote significance at the 1 percent level.

[a]Contains AR terms to eliminate autocorrelation of order 1, 3, and 4.

moral hazard. Thus, the increase in the significance of nonperforming loans in the second period may also reflect a decline in moral hazard, indicating certain success in how policymakers dealt with the crisis[26] and undertook measures in the early 1990s to tighten prudential regulation and strengthen bank supervision.

The increase in the estimated coefficient on nonperforming loans is especially significant when one considers that the change in the accounting standard led to a step increase in the reported nonperforming loan ratio. Indeed, of the variables analyzed in this study, the one significantly affected by the accounting change was *NPL*, mainly because the definition of nonperforming loans was modified, from over one year past due to over three months past due. Therefore, the transition from between the two periods involved a discrete jump in the measured *NPL* variable.

Finally, interest rate liberalization in the early 1980s appears to have increased intermediation costs. Prior to 1980, all bank deposit interest rates were subject to policy-imposed ceilings, often at very low real levels. Thus, the liberalization of the interest rate on time deposits in the first quarter of 1980 led to a rapid growth in bank deposits (by 32 percent on average up to 1985). While this expansion had a significant narrowing effect on the spread via economies of scale, the (significant) positive coefficient of the dummy variable indicates that the marginal cost curve also shifted outward, a possible indication of nonprice competition as banks were now expanding their branch networks to compete for deposits with other financial intermediaries.

## System and Panel Data Estimation in the Postliberalization Period

The single equation results for the aggregate banking system are confirmed when estimating the spread using a system approach. We estimated the spread equation (7) jointly with a demand function for loans (6), using a Full Information Maximum Likelihood (FIML) procedure, providing initial values from preliminary three-stage least squares estimations. As discussed earlier, market power arises if the $\lambda$ coefficient is significantly greater than zero. As the upper panel of Table 7 shows, competitive behavior again cannot be ruled out for the banking system as a whole. The other coefficient estimates are similar to their single-equation values, although the coefficient on real wages is larger (1.47 versus 1.14) and is now significant at the 1 percent level.

The results of single-equation panel data regressions provided additional insight into the heterogeneity of behavior across banks. When we ran a simple pooled OLS regression that restricted all coefficients to be equal across banks, but which allowed for a change in intercept between private and state banks, the coefficients on total loans, the nonperforming loan ratio, and on the state bank dummy variable were significant and had the expected sign, but the fit of the regression was relatively poor and showed considerable evidence of autocorrelation (see Table 7). Indeed, we used a $\chi^2$ test on the equality of coefficients across banks and

[26]While it is likely that the precrisis years were marked by the perception of an implicit deposit insurance—a situation conducive to moral hazard—the handling of the Colombian crisis has been considered largely successful in providing adequate signals to bank managers. Stockholders of failing institutions were forced to assume significant losses, one bank was closed, and parties responsible for reckless management were prosecuted (Clavijo, 1992; Rojas-Suárez and Weisbrod, 1996).

## Table 7. Postliberalization Period: System and Panel Data Estimation of the Spread Equation

System Estimation (FIML) May 1992–August 1996

$i_l - i_d/(1-\varepsilon) = d_0 - \lambda L(di_l/dL) + d_2L + d_3w + d_4NPL$

| Intercept: $d_0$ | Market Power: $\lambda$ | Real loans: $d_2$ | Real wages: $d_3$ | Nonperforming loans: $d_4$ | $R^2$ | $DW$ |
|---|---|---|---|---|---|---|
| 8.48<br>(3.65)** | 0.00<br>(0.01) | –0.11<br>(4.80)** | 1.47<br>(3.18)** | 1.09<br>(4.61)** | 0.89 | 1.72 |

Panel Data Estimations

$i_l = d_0 + d_1(i_d/1-\varepsilon) + d_2L + d_3w + d_4NPL$

| | $d_0$ | $d_1$ | $d_2$ | $d_3$ | $d_4$ | State bank dummy | $R^2$ | $DW$ |
|---|---|---|---|---|---|---|---|---|
| Pooled OLS, fixed coefficients, with state bank dummy May 1992–August 1996 | 24.87<br>(31.49)** | 0.47<br>(12.13)** | –0.08<br>(4.47)** | –0.23<br>(1.49) | 0.46<br>(9.57)** | 1.27<br>(2.53)* | 0.21 | 0.29 |
| | | | | | | | Tests[a] | |
| Random coefficients | | | | | | | Null hypothesis: | |
| 22 private and state banks | | | | | | | | Constant coefficients |
| | | | | | | | $d_1 = 1$ | across banks |
| March 1991–August 1996 | 18.54 | 0.88 | –1.62 | 0.30 | 0.77 | | 3.94 | 5,497.0 |
| (1,438 observations) | (6.47)** | (14.54)** | (2.35)* | (0.97) | (5.46)** | | 0.05 | 0.00 |
| 19 private banks | 19.38 | 0.94 | –1.88 | 0.32 | 0.70 | | 1.77 | 5,087.1 |
| March 1991–August 1996 | (6.62)** | (20.53)** | (2.45)* | (0.90) | (4.51)** | | 0.18 | 0.00 |
| (1,254 observations) | | | | | | | | |

Notes: One asterisk denotes significance at the 5 percent level; two asterisks represent significance at the 1 percent level.
[a] $\chi^2$ statistic reported above, probability reported below.

overwhelmingly rejected the null hypothesis both for the banking system as a whole and for private banks separately. Therefore, we estimated the spread equation using a Random Coefficients Model (RCM), a GLS method that allows for changes in all coefficients across banks and treats each coefficient as a random drawing from the same probability distribution (see Judge and others, 1985).

The bottom of Table 7 reports the average coefficient values for the RCM on all banks, and for private banks. All coefficients have the expected sign, and again all but the wage rate are significant at least at the 5 percent level. The estimated values of both the intercept and the coefficient of the scale variable (real loans) are considerably larger than in the aggregate case, reflecting the much smaller values for the scale variable at the individual bank level.[27] The estimated effect of nonperforming loans on interest spreads appears to be smaller than in the aggregate case (0.77 versus 0.99), and the results tend to give greater support to the finding of competition; the estimated values of the market power parameter are smaller than in the aggregate estimation, and now competitive behavior cannot be rejected in the case of private banks.[28]

One additional comment must be made regarding the estimated impact of nonperforming loans. As we showed in Section I, a visible spike occurred in 1992 as a result of the entry into the sample of a large bank with a particularly high initial level of nonperforming loans. Since this could suggest that the econometric results might be driven by this bank, we reestimated the banking system and state bank regressions in Tables 6 and 7 excluding this bank. We found the postliberalization model results to hold; in particular, spreads continued to be significantly related to *NPL*, and competitive behavior continued to be exhibited by the aggregate banking system.[29]

To summarize, the aggregate regression results show evidence of two crucial changes in the behavior of interest spreads—and acting in opposite directions—between the pre- and postliberalization periods in Colombia: an increase in competition and a greater responsiveness of spreads to changes in loan quality. The estimates of marginal nonfinancial costs of intermediation exhibit some degree of scale economies in both periods, and the first period shows a significant cost effect brought on by the increased competition for deposits following the liberalization of time deposit rates in early 1980. Finally, panel data analysis in the postliberalization period reveals significant heterogeneity in the spread equation parameters across banks, and tends to give greater support to the hypothesis of competitive behavior and to the relative importance of operational costs versus loan quality.

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[27]In other words, total loans of an individual bank are much smaller than those of the aggregate system. For example, a banking industry coefficient of –0.1 (as in the FIML result) is equivalent—in terms of its effect on the interest spread—to a coefficient of –2.0 for a bank with a 5 percent market share.

[28]Since one essential difference between the aggregate estimation and the panel data regression is that the former procedure implicitly assigns weights to individual banks according to size, the contrasting results on market power indicate that the aggregate results may be driven by several larger private banks that possess market power, while on average most smaller banks behave competitively, consistent with a von Stackelberg type of market structure. Spiller and Favaro (1984) use this type of framework to study the impact of changes in banking regulations in Uruguay in 1977–80.

[29]The main differences that arose in the state bank regressions when we excluded this bank were constant rather than decreasing returns to scale, and the market power test in the panel data estimation providing greater support for competitive behavior as opposed to "supracompetitive" behavior, or pricing below marginal cost. These results are available from the authors upon request.

## Decomposition of the Spread

To measure the main determinants of interest spreads in the two periods, we used the regressions reported in columns (1) and (4) of Table 6 and modified versions of the equations in columns (3) and (5)[30] to break down the estimated interest spreads into their different components: financial taxation (reserve requirements and forced investments), nonfinancial costs, nonperforming loans, and market power. As Table 8 shows, although both periods exhibited similar interest spreads on average—about 21 percentage points—the preliberalization period is characterized by much higher variability. Between 1974 and 1980 the estimated spread nearly doubled (from 17 to 31 percentage points) as a result of increased financial and nonfinancial costs brought on to some degree by the interest rate liberalization of 1980, but primarily by a sharp increase in financial taxation. The spread then declined gradually to 16 percentage points by the end of the period, as marginal costs and financial taxation fell to the levels of the early 1970s. Operating costs made up about 38 percent of the spread in the preliberalization period, financial taxation represented about 22 percent, and market power accounted for 36 percent of the spread. Changes in loan quality had very little effect—they accounted for less than 4 percent of the spread.

Throughout the postliberalization period, the estimated spread was more stable and became more responsive to changes in loan quality. The spread declined by about 6 percentage points during the period, from 26 to 20 points, driven by reductions in financial taxation (1½ points) and marginal operational costs (1½ points), and loan quality (3 points). Marginal costs were larger in this period, and nonperforming loans tended to transmit an additional cost of about 6 percentage points to the spread. This partially offset the effect of greater competition, that is, a reduction in the market power effect from almost 8 percentage points in the preliberalization period to zero in the postliberalization period.

We also observe major differences between the behavior of estimated spreads for private and state banks in the postliberalization period (Table 9). Spreads of state banks were 5 percentage points higher on average, as a result of much higher marginal operating costs—roughly double those of private banks—and a much higher effect of loan quality on the spread. Private banks tended to charge a markup of about 7 percentage points as a result of market power, but had much lower operational costs and significantly better loan quality. Finally, state banks were subject to higher rates of financial taxation, as a result of their greater dependence on demand deposits, for which the required reserve ratio is higher.

This exercise indicates that, despite the financial reforms of the early 1990s, the Colombian banking system continues to exhibit high spreads between lending and deposit rates. Although the banking system is far less repressed than it was in the early 1980s (the absolute effect of financial taxation has been cut by half since 1980) and has recovered notably since the mid-1980s crisis (nonperforming loans have improved from their peak of 27 percent in the mid-1980s to about 6 percent

[30]Given that our results for these two regressions indicated that there was no market power, we re-estimated these equations imposing competitive behavior ($d_1 = 1$).

## Table 8. Decomposition of Estimated Interest Spreads in Colombia

*(Percentages)*

| | | Components of Spreads: Absolute Effects | | | | Components of Spreads: Relative Effects | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Estimated Spread | Financial taxation | Operating costs | Loan quality | Market power | Financial taxation | Operating costs | Loan quality | Market power |
| Preliberalization period: 1974–88 | | | | | | | | | |
| Beginning: March 1974 | 17.34 | 2.32 | 9.61 | 0.29 | 5.12 | 13.36 | 55.43 | 1.68 | 29.53 |
| High point: June 1980 | 30.90 | 9.68 | 10.86 | 0.37 | 9.99 | 31.33 | 35.14 | 1.19 | 32.34 |
| End: December 1988 | 16.03 | 3.32 | 4.82 | 0.69 | 7.20 | 20.73 | 30.08 | 4.29 | 44.90 |
| Period average | 21.86 | 4.90 | 8.33 | 0.80 | 7.83 | 22.42 | 38.09 | 3.68 | 35.81 |
| Postliberalization period: 1992–96 | | | | | | | | | |
| Beginning and high point: May 1992 | 25.57 | 5.66 | 10.42 | 9.50 | 0.00 | 22.13 | 40.73 | 37.14 | 0.00 |
| End: August 1996 | 19.81 | 4.35 | 8.91 | 6.54 | 0.00 | 21.98 | 44.99 | 33.04 | 0.00 |
| Period average | 20.89 | 5.40 | 9.45 | 6.04 | 0.00 | 25.84 | 45.23 | 28.93 | 0.00 |

Source: Calculations based on estimates from Table 6.

## Table 9. Decomposition of Estimated Interest Spreads in Colombia: Postliberalization Period

*(Percentages)*

| | | Components of Spreads: Absolute Effects | | | | Components of Spreads: Relative Effects | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Estimated Spread | Financial taxation | Operating costs | Loan quality | Market power | Financial taxation | Operating costs | Loan quality | Market power |
| State banks | | | | | | | | | |
| Beginning and high point: May 1992 | 30.32 | 7.62 | 6.55 | 16.15 | 0.00 | 25.14 | 21.59 | 53.27 | 0.00 |
| End: August 1996 | 23.68 | 4.26 | 10.07 | 9.34 | 0.00 | 17.99 | 42.54 | 39.47 | 0.00 |
| Period average | 24.60 | 6.90 | 9.02 | 8.67 | 0.00 | 28.07 | 36.69 | 35.24 | 0.00 |
| Private banks | | | | | | | | | |
| Beginning and high point: May 1992 | 24.72 | 4.98 | 7.53 | 5.20 | 7.02 | 20.15 | 30.45 | 21.02 | 28.38 |
| End: August 1996 | 18.40 | 4.40 | 3.36 | 3.69 | 6.95 | 23.91 | 18.27 | 20.08 | 37.74 |
| Period average | 19.96 | 4.92 | 4.80 | 3.71 | 6.53 | 24.63 | 24.03 | 18.60 | 32.75 |

Source: Calculations based on estimates from Table 6.

in recent years[31]), banks appear to be incurring greater costs and/or are imposing a significant risk premium on their customers in order to cover the costs of defaults, even though the actual levels of nonperforming loans have been declining.

To reduce bank spreads further, improvements in several areas will be necessary. First, financial taxation must be reduced; even with the steady decline throughout the 1990s financial taxation in 1996 appeared to be *larger* than at end-1988 and still accounted for about one-fourth of the estimated spread. Second, although liberalization and market-opening policies adopted since 1989 have in fact appeared to generate greater competition among banks, private banks still appear to be setting spreads significantly above marginal cost. Third, operating costs have also been slow to decline even though we found strong evidence of scale economies. As we showed earlier, during the 1990s nonfinancial costs have remained relatively constant at 5 percent of total assets and have accounted for almost half of the intermediation spread for the banking system as a whole.

## Spreads, Profitability, and Capitalization

As we discussed in the introduction, although high intermediation spreads tend to adversely affect the real sector of the economy, they also constitute a key mechanism through which the banking system generates profits and thereby protects itself against credit risk. The *use* of the high spreads thus becomes crucial: whether they are simply covering rampant operative inefficiency (as in the case of some state-owned banks) or generating profits that are then appropriated by the owners, or whether the spreads are generating profits that aid in strengthening and solidifying the banking system.

In the case of Colombia, although a significant portion of the large observed spread (65 percent for state banks; 49 percent for private banks) was used to cover intermediation costs in the 1990s, the remaining portion, which reflected a compensation for nonperforming loans and the prevalence of market power, may have been used in part to capitalize and strengthen the banking system. Throughout the postliberalization period, bank profitability was high (return to equity consistently above 20 percent, compared with 10 percent in industrialized countries) as a result of rapid credit growth with no visible deterioration in loan quality,[32] and high intermediation spreads. There is evidence that these profits were increasingly channeled into the capital base of the banking system, as the capital-asset ratio increased from just under 10 percent during 1974–89[33] to over 14 percent in 1991–96. Table 10 shows the recent capitalization process in greater detail, both in terms of an increase in the overall ratio of equity to risk-weighted assets[34] and of a decline in the number of banks failing to meet the minimum capital ratio.

[31]This reduction is even larger when one accounts for the change in the accounting definition of nonperforming loans.

[32]Loan quality did not even appear to worsen in 1996, when economic growth decelerated from an average of 5.2 percent in 1992–95 to 2.1 percent.

[33]Excluding the crisis years of 1983–85.

[34]For the banking system as a whole, Table 10 shows that the capital-to-asset ratio was 13.7 percent at the end of 1996, while the legal requirement was 9 percent. For three of the largest banks, this ratio was above 15 percent.

Table 10. Performance Indicators for the Colombian Banking System

| Year | Real Growth Rates[a] | | Equity/ Risk-Weighted Assets[b] | Number of Banks Below Minimum Capital Ratio | Return to Equity[b] |
|---|---|---|---|---|---|
| | Assets | Net credit | | | |
| 1992 | 5.98 | 16.25 | 12.30 | 1/25 | 55.25 |
| 1993 | 19.31 | 31.80 | 12.44 | 2/28 | 43.73 |
| 1994 | 8.68 | 14.62 | 14.64 | 0/29 | 37.65 |
| 1995 | 6.36 | 14.51 | 14.00 | 0/31 | 28.80 |
| 1996 | –5.04 | -6.88 | 13.69 | 2/31 | 21.80 |

Sources: Colombian Bankers' Association, Banking Superintendency, Superbancaria, and estimates by the authors.

Note: Figures are obtained from end-of-period stocks.

[a]Does not include Caja Agraria and Caja Social de Ahorros.

[b]Does not include Caja Agraria; total weighted average for the banking system.

Therefore, while high intermediation spreads may certainly signal relative inefficiency and lack of competition in the banking system, they may also indicate that banks are generating the profits needed to protect themselves against increases in credit risk.[35] However, lack of competition allows banks to maintain high spreads that cover their high intermediation costs and credit risk, thus providing little incentive to improve their operative efficiency or the quality of their loan portfolio. In the long run, if banks are to compete internationally, one would expect profits to come increasingly from improvements in both these areas, which would necessarily require a decline in intermediation spreads.

## V. Conclusions

We have provided evidence of the main determinants of intermediation spreads both analytically and empirically with reference to the Colombian banking system from 1974 to 1996. In the introduction we showed how the spread initially increased sharply between 1974 and 1980 then fell gradually in the late 1980s and again throughout the 1990s. A closer look at the selected banking indicators in the 1990s showed how loan quality remained stable and the reserve ratio fell gradually, and how spreads, nonfinancial costs, and nonperforming loans all were consistently higher and average productivity lower for state banks. In Section I we showed how variability in interest rates and other indicators across banks tended to be greater than variability over time, and we found a

[35]Yu (1995) found a similar positive relationship between bank intermediation spreads in Canada and the capital-to-asset ratio. The approach there was different, however, in that the capital ratio was treated as an exogenous and policy-determined variable, and therefore entered the equations as a *determinant* of the spread. In our case, given that observed capital ratios greatly exceeded the legal minimum, it seemed more reasonable to consider this variable as an endogenous decision variable by the banking firm, and to treat it as a *use* of the profits engendered by the banking activity.

positive relationship—possible one-way causality—between loan quality and the spread.

In Section II we developed a simple behavioral model for the banking firm which we then estimated in Section III using aggregate data for both periods and panel data on 22 banks for the postliberalization period. The estimation results indicated that the Colombian banking system on the whole was not competitive throughout the 1970s and 1980s, charging for loans an average markup of 29 percent over marginal costs, but became significantly more competitive during the 1990s, although private banks continued to possess some degree of market power. Furthermore, we showed that the spread was positively related to changes in loan quality, and considerably more so in the postliberalization period, thus contributing to a widening of the spread. While the effects of this variable on the spread were driven to a large degree by the high ratio of nonperforming loans of state banks, the greater responsiveness of private banks could be indicative of an improvement in reporting and/or a more prudent behavior toward risk. This was consistent with the vigorous capitalization process that occurred during the 1990s, far exceeding the legal requirements.

Although reductions in financial taxation/repression have been and will continue to be a key component of any successful liberalization and modernization of Colombia's banking system, further progress needs to be made in increasing efficiency. The measures that have been undertaken so far—the privatizations and the greater opening of the market to both domestic and foreign capital—have not yet been successful on this front, although there was evidence of increased competition. Perhaps major changes in efficiency and nonfinancial costs will only come over time, as foreign participation intensifies[36] and the unrestricted flow of foreign capital is maintained. It is unfortunate that, although direct foreign investment was permitted several years ago, strict penalties on private foreign borrowing were imposed subsequently.[37] This type of measure is not only questionable from a macroeconomic standpoint, but clearly goes against the objective of achieving a more efficient and competitive financial system capable of operating with lower intermediation spreads.

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[36]Claessens, Demirgüç-Kunt, and Huizinga (1998) analyze a sample of 80 countries to show how significant gains in efficiency and in spread reduction are derived from foreign entry into banking. Moreover, the case of Portugal (Honohan, 1999) shows that the benefits of liberalization and opening may require some time to accrue.

[37]It is interesting to note that this measure—an increase in required reserves on private foreign borrowing—was applauded by the bankers themselves, thus suggesting that their effective market power had been enhanced (see *El Espectador*, 1997, p. 6B).

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