

Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence

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Using bank-level data for 80 countries in the years 1988–95, this article shows that differences in interest margins and bank profitability reflect a variety of determinants: bank characteristics, macroeconomic conditions, explicit and implicit bank taxation, deposit insurance regulation, overall financial structure, and underlying legal and institutional indicators. A larger ratio of bank assets to gross domestic product and a lower market concentration ratio lead to lower margins and profits, controlling for differences in bank activity, leverage, and the macroeconomic environment. Foreign banks have higher margins and profits than domestic banks in developing countries, while the opposite holds in industrial countries. Also, there is evidence that the corporate tax burden is fully passed onto bank customers, while higher reserve requirements are not, especially in developing countries.

As financial intermediaries, banks play a crucial role in the operation of most economies. Recent research, as surveyed by Levine (1997), shows that the efficacy of financial intermediation can affect economic growth. Crucially, financial intermediation affects the net return to savings and the gross return to investment. The spread between these two returns mirrors bank interest margins, in addition to transaction costs and taxes borne directly by savers and investors. Thus bank interest spreads could be interpreted as an indicator of the efficiency of the banking system. In this article we investigate how bank interest spreads are affected by taxation, the structure of the financial system, and financial regulations, such as deposit insurance.

A comprehensive review of the determinants of interest spreads is offered by Hanson and Rocha (1986), who summarize the role that implicit and explicit taxes play in raising spreads and discuss some of the determinants of bank costs and profits, such as inflation, scale economies, and market structure. Using aggregate interest data for 29 countries in the years 1975–83, the authors find a positive correlation between interest margins and inflation.

Recently, several studies have examined the impact of international differences in bank regulation using cross-country data. Analyzing interest rates in 13 Organisation for Economic Co-operation and Development (OECD) countries in

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the years 1985–90, Bartholdy, Boyle, and Stover (1997) find that the existence of explicit deposit insurance lowers the deposit interest rate by 25 basis points. Barth, Nolle, and Rice (1997) use 1993 data from 19 industrial countries to further examine the impact of banking powers on bank return on equity, controlling for several bank and market characteristics. They find that variations in banking powers, bank concentration, and the existence of explicit deposit insurance do not significantly affect the return on bank equity.

In this article we extend the existing literature in several ways. First, we use bank-level data for 80 industrial and developing countries in 1988–95 to provide summary statistics on the size and decomposition of bank interest margins and profitability. Second, we use regression analysis to examine the underlying determinants of interest spreads and bank profitability. This empirical work enables us to infer the extent of taxation and regulation on bank customers and on banks themselves.

Apart from covering many banks in many countries, this study is unique in its coverage of the determinants of interest margins and profitability. These determinants include a comprehensive set of bank characteristics (such as size, leverage, type of business, foreign or domestic ownership), macroeconomic indicators, taxation and regulatory variables, financial structure variables, and legal and institutional indexes. Among these, the ownership variable, the tax variables, some of the financial structure variables, and the legal and institutional indicators have not been included in any previous study in this area. To check whether some of these determinants affect banking differently in developing and industrial countries, we interact these variables with the country's gross domestic product (GDP) per capita.

I. BANK INTEREST SPREADS AND PROFITABILITY

We can measure the efficiency of bank intermediation using both *ex ante* and *ex post* spreads. The *ex ante* spread is the difference between the contractual rates charged on loans and rates paid on deposits. The *ex post* spread is the difference between banks' actual interest revenues and their actual interest expenses. The *ex post* spread differs from the *ex ante* spread by the amount of loan defaults. The *ex post* spread is a more useful measure because it controls for the fact that banks with high-yield, risky credits are likely to face more defaults. An additional problem with using the *ex ante* spread is that data are generally available at the aggregate industry level and are put together from a variety of sources. Thus they are not completely consistent. For these reasons we focus on *ex post* interest spreads in this article. There is, however, a problem with *ex post* spreads, in that the interest income and loan loss reserving associated with a particular loan tend to materialize in different time periods.

As a measure of what we call bank "efficiency," we consider the accounting value of a bank's net interest income divided by total assets (*TA*), or the net interest margin (*NIM*). Bank "profitability" is a bank's before-tax profits (*BTP*) divided by total assets. Profitability could also be measured by the return on

equity as opposed to the return on assets. It is well known that, *ceteris paribus*, a bank with a higher equity ratio will have a higher return on assets and a lower return on equity than a bank with a lower equity ratio. The problem in some developing countries is that banks operate with extremely low equity capital, often supported by implicit state guarantees, which inflates their return on equity. Using unadjusted returns on equity may then be more distortionary than using returns on assets. Ideally, we should use risk-adjusted returns on equity, but since these are not available, we analyze returns on assets after controlling for the banks' equity ratio. We do this by entering the equity ratio as an independent variable in the profit regression. Thus, by straightforward accounting,

$$(1) \quad \frac{BTA}{TA} \equiv \frac{ATP}{TA} + \frac{TX}{TA}$$

where *ATP* is after-tax profits. From the bank's income statement, before-tax profits divided by total assets further satisfies the following accounting identity:

$$(2) \quad \frac{BTA}{TA} \equiv NIM + \frac{NII}{TA} - \frac{OV}{TA} - \frac{LLP}{TA}$$

where *NII* is noninterest income, *OV* is overhead, and *LLP* is loan loss provisioning. *NII/TA* reflects the fact that many banks also engage in nonlending activities, such as investment banking and brokerage services, *OV/TA* accounts for the bank's entire overhead associated with all of its activities, and *LLP/TA* measures actual provisioning for bad debts.

Although the net interest margin can be interpreted as a rough index of bank efficiency, this does not mean that its reduction always signals improved efficiency. A reduction in the net interest margin can, for example, reflect a reduction in bank taxation or, alternatively, a higher loan default rate. In the first instance the reduction in the net interest margin may reflect the improved functioning of the banking system, while in the second case the opposite may be true. Also, variation in an accounting ratio, such as the net interest margin, may reflect differences in net interest income (the numerator) or differences in, say, nonlending assets (a component of the denominator).

In the data set the accounting data are organized so as to be comparable internationally. However, differences in accounting conventions regarding the valuation of assets, loan loss provisioning, hidden reserves, and so on may remain. Vittas (1991) reviews the pitfalls in interpreting bank operating ratios. Accounting data also tend to reflect economic realities with a long lag so that they are not able to flag pending banking crises, such as those that have recently occurred in Southeast Asia.

This article focuses on accounting measures of income and profitability as investors equalize (risk-adjusted) financial returns on bank stocks in the absence of prohibitive barriers. Gorton and Rosen (1995) and Schranz (1993) also focus

on accounting measures of profitability when examining managerial entrenchment and bank takeovers.

The above accounting identity (equation 2) suggests a useful decomposition of the realized interest spread—the net interest margin—into its constituent parts: noninterest income, overhead, taxes, loan loss provisions, and after-tax bank profits. Hanson and Rocha (1986) take this approach, with some modifications. As a first step to analyzing the data, in section III we provide an accounting breakdown of the net interest margin for individual countries and for selected aggregates. Although it may be misleading to compare accounting ratios without controlling for differences in the macroeconomic environment in which banks operate and the differences in their business, product mix, and leverage, these breakdowns are still a useful initial indicator of differences across countries.

Next, controlling for bank characteristics and the macroeconomic environment, we provide an economic analysis of the determinants of the interest and profitability variables—the net interest margin and before-tax profits divided by total assets. This empirical work offers insights into how bank customers and banks themselves are affected by these variables. The net interest margin regressions tell us how the spread determinants affect the combined welfare of depositors and lenders. The relationship between the interest spread and a bank's corporate taxes, for instance, reveals the extent to which a bank is able to shift its tax bill forward to its depositors and lenders.

Generally, taxes and other variables can affect interest rates as well as the volume of loans and deposits. In the short term the major effects may come through pricing changes, in which case the net interest margin and before-tax profits as a share of total assets immediately reveal easily interpreted welfare consequences for banks and their customers. With market imperfections in the form of credit rationing or imperfect competition in credit markets, changes in quantities generally have first-order welfare implications independent of changes in prices. We do not, however, evaluate changes in quantities in this article. Lastly, the before-tax profit regressions show how spread determinants affect bank shareholders.

The regression analysis starts from the following equation:

$$(3) \quad I_{ijt} = \alpha_0 + \alpha_i B_{ijt} + \beta_j X_{jt} + \gamma_t T_t + \delta_j C_j + \varepsilon_{ijt}$$

where I_{ijt} is the dependent variable (either the *NIM* or *BTP/TA*) for bank i in country j at time t , B_{ijt} are characteristics of bank i in country j at time t , X_{jt} are characteristics of country j at time t , T_t and C_j are time and country dummy variables, and ε_{ijt} is a white-noise error term. We estimate several specifications of equation 2 including different bank and country variables.

II. DATA

In this study we use income statement and balance sheet data of commercial banks from the BankScope database provided by IBCA. IBCA's coverage is compre-

hensive in most countries, accounting for 90 percent of all bank assets. We begin with all commercial banks worldwide, with the exception of France, Germany, and the United States, for which we include only several hundred commercial banks listed as “large.” To ensure reasonable coverage for individual countries, we include only countries with at least three banks for a given year. We end up with a data set that includes 80 countries during the years 1988–95, with about 7,900 individual commercial bank observations. This data set includes all OECD countries, as well as many developing countries and transition economies (table 1).

Several countries, such as Luxembourg, the Netherlands, and Egypt, have a net interest margin close to 1 percent (column 2 of table 1). This is the low end of the distribution. Egypt’s low net interest margin can be explained by a predominance of low-interest directed credits by the large state banking sector. Generally, developing countries, and especially Latin American countries, such as Argentina, Brazil, Costa Rica, Ecuador, and Jamaica, have relatively large spreads. This is also true for certain Eastern European countries, such as Lithuania and Romania.

Columns 3–6 in table 1 break down the net interest income into its four components: overhead minus noninterest income, taxes, loan loss provisioning, and net profits. Taxes as a share of net interest income (column 4) reflect the explicit taxes that banks pay (mostly corporate income taxes). Banks also face implicit taxation because of reserve and liquidity requirements and other restrictions on lending that come through directed or subsidized credit policies. These indirect forms of taxation directly lower the net interest income rather than the tax variable. Nonetheless, the tax variable indicates that there is considerable international variation in the explicit taxation of commercial banks. Several countries in Eastern Europe impose high explicit taxes on banking. (For example, taxes as a percentage of net interest income are only 17.5 in Lithuania and 13.7 in Hungary compared with 26.2 in Romania, 83.3 in Russia, and 23.2 in the Czech Republic.) The lowest share of taxes in net interest income is 0 for Qatar, where there is no significant taxation of banking. For some countries, such as Norway, Sweden, and Costa Rica, low tax shares reflect the tax deductibility of bad debts, which are plentiful.

Loan loss provisioning as a share of net interest income is a direct measure of differences in credit quality across countries (column 5). It also reflects differences in provisioning regulations. This variable is high for some Eastern European countries. It is also high for some industrial countries, such as France and the Nordic countries. The fourth component of net interest income is net profits (column 6). As a residual, net profits as a share of net interest income reflect the extent to which the net interest margin translates into net-of-tax profitability.

The remaining columns in table 1 tabulate the various accounting ratios (relative to total assets) in the accounting identity (equation 2). Noninterest income as a share of total assets reveals the importance of fee-based services for banks in different countries (column 7). Banks in Eastern Europe—for example, those in Estonia, Hungary, and Russia—seem to rely heavily on fee-based operations.

Table 1. *Bank Interest Spreads and Profitability: Economy Averages, 1988-95*
(percent)

Economy	Net interest income ^b										
	Net interest margin ^a	Overhead minus noninterest income				Net profits	Noninterest income	Loan loss provisions			Net profits
		Taxes	Loan loss provisions	Overhead	Taxes			Loan loss provisions	Overhead	Taxes	
	(as a percentage of net interest income)	(as a percentage of total assets)									
Argentina	7.3	35.6	5.5	28.5	30.3	6.3	9.4	0.4	1.8	2.0	
Australia	3.0	32.8	8.5	28.1	33.2	1.3	2.8	0.3	0.7	0.6	
Austria	1.7	54.9	6.8	25.7	24.8	0.5	1.5	0.1	0.5	0.3	
Bahrain	2.2	30.8	2.7	32.9	43.3	0.8	1.4	0.0	0.6	1.1	
Belgium	2.0	48.7	10.2	20.4	24.0	0.9	2.1	0.2	0.4	0.4	
Bolivia	3.1	73.7	1.9	12.6	12.6	2.0	5.2	0.6	0.6	-1.1	
Botswana	6.0	43.7	11.8	12.9	31.5	2.8	5.4	0.7	0.7	1.9	
Brazil	8.9	60.5	11.6	13.8	17.5	4.5	10.2	1.1	1.3	1.4	
Canada	2.9	47.3	12.7	21.5	19.0	1.2	2.5	0.4	0.6	0.6	
Chile	4.3	71.7	2.4	13.8	14.2	-0.1	3.0	0.1	0.6	0.5	
China	2.1	30.0	15.9	—	54.2	1.0	1.6	0.3	—	1.2	
Colombia	6.0	53.8	10.3	12.9	27.7	5.8	8.3	0.7	0.9	2.2	
Costa Rica	13.6	40.7	4.7	57.6	9.9	3.5	8.1	0.8	5.7	3.5	
Cyprus	1.0	59.1	11.1	15.8	22.0	3.1	3.2	0.3	0.3	0.5	
Czech Rep.	3.3	13.5	23.2	53.4	13.6	1.5	2.1	0.6	2.0	0.3	
Denmark	4.8	52.9	5.4	33.3	8.6	1.0	3.7	0.3	1.6	0.3	
Dominican Rep.	6.6	52.8	8.6	9.1	30.9	3.1	6.3	0.6	0.5	2.3	
Ecuador	7.7	52.8	4.7	12.8	34.9	3.8	8.1	0.4	1.0	2.5	
Egypt	1.4	-32.7	11.2	62.6	63.5	2.1	1.4	0.3	0.7	1.2	
El Salvador	3.2	34.3	1.9	14.0	49.8	1.6	2.9	0.1	0.4	1.5	
Estonia	4.7	-35.9	24.1	—	111.7	8.7	7.0	1.1	—	5.3	
Finland	1.8	50.1	9.4	55.6	-10.7	1.2	2.1	0.2	0.8	-0.1	
France	2.4	48.3	7.0	50.8	-1.7	1.4	2.6	0.2	1.0	0.1	
Germany	2.0	51.6	12.3	29.5	12.6	1.1	2.1	0.3	0.6	0.3	
Greece	3.0	33.8	12.7	25.7	29.7	2.2	3.4	0.4	0.6	1.0	
Guatemala	5.6	80.5	3.6	—	16.0	1.4	5.7	0.2	—	1.1	
Haiti	2.8	53.8	7.3	12.4	26.5	2.8	4.2	0.2	0.4	0.8	
Honduras	4.3	72.3	9.8	—	17.9	0.9	4.0	0.4	—	0.8	
Hong Kong, China	2.5	17.1	10.2	6.0	67.8	1.3	1.4	0.3	0.2	2.0	

Hungary	4.7	17.5	13.7	68.8	29.9	5.8	7.0	0.6	2.7	1.4
India	4.0	18.2	12.4	19.3	50.2	1.6	2.0	0.6	0.7	2.3
Indonesia	3.6	47.5	10.9	17.8	26.2	1.2	2.9	0.4	0.7	0.9
Israel	2.8	41.9	17.1	23.6	17.3	1.8	3.2	0.4	0.7	0.4
Italy	3.4	56.5	14.3	17.4	11.9	1.4	3.3	0.5	0.5	0.4
Jamaica	10.5	33.9	21.2	2.2	43.1	2.8	6.3	2.2	0.3	4.5
Japan	1.6	61.9	16.2	10.0	12.1	0.2	1.3	0.2	0.1	0.2
Jordan	2.1	48.0	10.4	24.1	24.5	1.4	2.4	0.2	0.5	0.5
Korea, Rep. of	1.8	36.4	12.5	34.0	29.9	1.5	2.2	0.2	0.5	0.5
Lebanon	2.7	45.6	9.2	13.7	35.3	0.9	2.1	0.3	0.5	0.9
Lithuania	10.6	29.8	17.5	81.7	-22.2	5.0	—	—	—	—
Luxembourg	0.8	-11.5	28.2	52.7	46.0	0.9	1.0	0.2	0.3	0.3
Malaysia	2.7	40.0	15.9	17.3	29.2	0.8	1.9	0.4	0.4	0.8
Malta	2.4	37.6	18.0	6.2	39.1	1.1	2.0	0.4	0.1	0.9
Mexico	4.6	40.8	6.1	42.2	15.4	2.1	4.5	0.3	1.1	0.9
Morocco	3.4	66.8	13.6	0.1	21.9	1.3	3.5	0.5	0.0	0.8
Nepal	3.6	10.5	25.3	16.1	48.1	2.1	2.4	1.0	0.5	1.8
Netherlands	1.4	43.1	9.7	21.4	26.1	1.0	1.7	0.1	0.3	0.4
Nicaragua	4.4	85.2	8.0	18.5	-10.4	3.3	6.3	0.3	0.9	0.2
Nigeria	5.3	-29.3	13.1	88.3	27.8	5.8	7.0	0.7	1.6	1.8
Norway	3.2	51.6	4.6	44.3	3.2	1.2	2.8	0.1	1.4	0.2
Oman	4.1	43.1	5.5	15.2	36.2	1.4	3.3	0.2	0.6	1.4
Pakistan	2.8	38.8	28.6	—	32.6	1.8	2.9	0.9	—	0.8
Panama	2.1	29.9	4.3	20.3	46.4	1.4	2.0	0.1	0.4	1.0
Papua New Guinea	3.2	-2.6	20.2	40.8	45.8	4.2	5.0	0.4	0.9	1.1
Paraguay	5.9	63.5	5.5	11.4	23.3	2.5	6.2	0.4	0.7	1.5
Peru	6.5	43.8	14.3	47.0	12.1	5.7	9.6	0.7	1.7	0.8
Philippines	4.1	29.8	6.6	10.3	55.0	3.0	4.3	0.3	0.4	2.2
Poland	6.1	16.8	27.9	23.3	34.9	2.4	3.6	1.6	1.3	2.1
Portugal	3.3	45.9	8.0	25.5	23.7	1.0	2.5	0.3	0.9	0.7

(continued on following page.)

Table 1. (continued)
(percent)

Economy	Net interest margin ^a	Net interest income ^b				Noninterest income	Net interest income ^b			Net profits
		Overhead minus noninterest income (as a percentage of net interest income)	Taxes	Loan loss provisions	Net profits		Overhead	Taxes	Loan loss provisions	
Qatar	1.9	6.6	0.0	15.0	85.2	1.1	1.3	0.0	0.2	1.6
Romania	9.7	1.9	26.2	36.8	44.3	2.4	2.8	2.3	3.7	4.3
Russia	4.7	-5.0	33.3	47.2	37.1	10.9	7.0	1.9	2.6	4.7
Singapore	2.2	20.7	21.6	8.7	56.4	1.0	1.4	0.5	0.1	1.3
South Africa	3.9	45.1	11.8	16.1	29.0	1.9	3.6	0.5	0.7	1.1
Spain	3.6	60.3	10.2	17.7	12.7	1.2	3.2	0.4	0.6	0.7
Sri Lanka	3.7	31.8	11.1	9.7	52.5	2.0	3.0	0.5	0.4	2.1
Swaziland	5.4	52.1	16.3	2.8	30.9	2.7	5.5	0.9	0.2	1.7
Sweden	3.1	26.3	1.9	64.6	11.2	1.5	2.5	0.1	1.9	0.3
Taiwan (China)	2.0	34.6	10.1	10.8	45.5	1.0	1.6	0.2	0.2	1.0
Tunisia	2.3	31.4	9.9	56.1	48.0	2.2	3.1	0.2	1.1	0.8
Turkey	6.3	11.7	10.0	32.9	47.2	4.0	5.4	0.8	0.8	3.3
United Kingdom	2.3	18.4	20.6	29.8	40.9	2.3	3.0	0.4	0.7	0.8
United States	3.9	47.6	12.5	15.2	25.8	1.8	3.6	0.5	0.7	1.0
Venezuela	7.2	49.9	2.7	16.7	30.6	2.8	6.4	0.2	1.0	2.5
Yemen	4.0	48.8	14.1	2.6	34.6	-0.5	1.4	0.6	0.1	1.4
Zambia	-4.7	186.1	-6.6	-49.1	-30.4	9.5	0.4	0.3	2.4	1.7

— Not available.

Note: Ratios are calculated for each bank in each country and then averaged over the country's sample period.

a. The net interest margin is defined as net interest income divided by total assets.

b. Columns 3 through 6 show the shares of the four components of net interest income. These shares add to 100 percent except for cases where information on loan loss provisioning is missing.

Source: Authors' calculations based on data from the BankScope database of the IBCA.

This is also the case in some Latin American countries, such as Argentina, Brazil, Colombia, and Peru, and in a few African countries, such as Nigeria and Zambia.

Overhead as a share of total assets reveals variations in operating costs across banking systems (column 8). This variable reflects variations in employment and in wage levels. Despite high wages, overhead as a share of total assets appears to be lowest at around 1 percent for high-income countries, such as Japan and Luxembourg. It is notably high at 3.6 percent for the United States, perhaps reflecting the proliferation of banks and bank branches because of banking restrictions.

Jamaica, Lithuania, and Romania stand out with high tax-to-asset ratios of around 2 percent (column 9). Loan loss provisioning, proxied by loan loss provisioning as a share of total assets, is equally high in Eastern Europe and in some developing countries (column 10). Finally, net profits divided by total assets also tend to be relatively high in developing countries (column 11).

Table 2 presents statistics on interest spreads and profitability for selected aggregates. The first breakdown is by ownership; a bank is said to be foreign-owned if 50 percent or more of its shares are owned by foreign residents. There is only a small difference in the net interest margin for domestic banks (3.7 percent) and foreign banks (2.9 percent). This small difference, however, masks the fact that foreign banks tend to achieve higher interest margins in developing countries and lower interest margins in industrial countries.¹ This may reflect the fact that foreign banks are less subject to credit allocation rules and have technical advantages (in developing countries), but also have distinct informational disadvantages relative to domestic banks (everywhere).

Foreign banks pay somewhat lower taxes than domestic banks (column 4). This gap may reflect differences in the tax rules governing domestic and foreign banks, as well as the ability of foreign banks to shift profits internationally to minimize their global tax bill. Foreign banks also have relatively low provisioning, as indicated by loan loss provisioning as a share of total assets, which is consistent with the view that foreign banks generally do not engage in retail banking operations.

The next breakdown is by bank size. For countries with at least 20 banks, large banks are defined as the 10 largest banks according to the value of their assets. Large banks tend to have lower margins and profits and smaller overheads. They also pay relatively low direct taxes and have lower loan loss provisioning.

Table 2 also considers bank groupings by national income levels and location.² Breaking down the data into four income levels, we see that the net interest margin is highest for countries in the middle-income groups. Banks operating in middle-income countries also have the highest values for overhead, taxes, and loan loss provisioning as shares of total assets. Net profits as a share of total

1. See Claessens, Demirgüç-Kunt, and Huizinga (1997) for more detailed information on the average spreads of domestic and foreign banks for different groupings of countries by income. That article also considers how entry by foreign banks affects the interest spreads and operating costs of domestic banks.

2. For country groupings by income, see World Bank (1996).

Table 2. *Bank Interest Spreads and Profitability, Selected Aggregates, 1988–95*
(percent)

<i>Bank groupings</i>	<i>Net interest margin^a</i>	<i>Net interest income^b</i>				<i>Noninterest income</i>	<i>Overhead Taxes Loan loss Net profits</i>			
		<i>Overhead minus noninterest income</i>	<i>Taxes</i>	<i>Loan loss provisions</i>	<i>Net profits</i>		<i>(as a percentage of total assets)</i>			
		<i>(as a percentage of net interest income)</i>								
All banks	3.5	43.1	11.5	24.8	20.6	1.6	3.2	0.3	0.8	0.8
<i>Bank ownership</i>										
Domestic	3.7	46.2	11.1	22.8	19.9	1.6	3.3	0.4	0.8	0.8
Foreign ^c	2.9	29.0	13.1	33.5	24.4	1.6	2.8	0.3	0.7	0.8
<i>Bank size^d</i>										
Large	2.6	35.5	13.1	27.5	23.9	1.2	2.5	0.3	0.6	0.5
Small	3.4	48.0	11.9	22.0	18.2	1.5	3.1	0.4	0.7	0.7
<i>Country income</i>										
Low	2.8	37.9	11.3	20.0	30.8	3.2	3.1	0.5	0.8	1.5
Lower-middle	5.7	36.8	11.0	24.9	27.2	3.2	5.1	0.7	1.3	1.8
Upper-middle	4.1	32.7	11.2	27.3	28.8	2.1	3.8	0.4	1.0	0.9
High	2.6	30.0	10.3	31.8	27.9	1.2	2.3	0.2	0.7	0.5
<i>Region</i>										
Africa	3.3	59.2	9.6	14.2	16.9	4.5	4.4	0.6	1.1	1.6
Asia	3.0	20.1	14.7	17.3	47.9	1.8	2.4	0.4	0.5	1.5
Latin America	6.2	48.7	6.8	21.1	23.4	3.1	6.2	0.5	1.1	1.5
Middle East and North Africa	2.9	26.1	8.5	23.4	41.9	1.6	2.6	0.3	0.5	1.1
Transition economies ^e	6.4	13.2	21.8	51.9	13.1	4.4	4.5	1.4	3.0	1.9
Industrial economies	2.7	32.9	10.4	34.7	21.9	1.2	2.5	0.3	0.8	0.4

Note: The data by income group and by region are means of country averages. Income and region classifications follow World Bank definitions as published in World Bank (1996).

a. The net interest margin is defined as net interest income divide by total assets.

b. Columns 3 through 6 show the shares of the four components of net interest income. These shares add to 100 percent.

c. A foreign bank is defined as having at least 50 percent foreign ownership.

d. Large includes the largest 10 banks; the remaining banks are classified as small. The large versus small distinction is made only if there are more than 20 banks in a given year.

e. The transition economies are China, Czech Republic, Estonia, Hungary, Lithuania, Poland, Romania, Russia, and Slovenia.

Source: Authors' calculations based on data from the BankScope database of the IBCA.

assets tends to be highest for banks operating in lower-income countries. Banks operating in higher-income countries, instead, achieve the lowest net interest margins, and they face the lowest values of overhead, taxes, loan loss provisioning, and net profits as shares of total assets.

The breakdown by region reveals that the net interest margin is highest for banks operating in the transition economies at 6.4 percent and is also high in Latin America at 6.2 percent. It is lowest for banks operating in industrial countries at 2.7 percent. The transition economies further stand out with high values of overhead, taxes, loan loss provisioning, and net profits as shares of total assets. Banks operating in industrial countries have the lowest ratio of net profits to total assets at 0.4 percent, probably because of the high level of competition in banking services.

Table 3 provides information on some of the macroeconomic and institutional variables used in the regression analysis. The data are for 1995 or the most recent year available. The tax rate is computed on a bank-by-bank basis as taxes paid divided by before-tax profits. The figure reported in the table is the average for all banks in the country in 1995. Reserves divided by deposits are the banking system's aggregate central bank reserves divided by aggregate banking system deposits. Actual reserve holdings reflect required and excess reserves. Reserves are generally remunerated at less-than-market rates, and therefore actual reserves may be a reasonable proxy for required reserves, as averaged over the different deposit categories. For several developing countries—Botswana, Costa Rica, Greece, and Jordan—the reserve ratio is above 40 percent, indicating substantial financial repression. In contrast, this ratio is low in Belgium, France, and Luxembourg at 0.01.

The deposit insurance variable is a dummy variable that takes on a value of 1 if there is an explicit deposit insurance scheme (with defined insurance premia and insurance coverage) and a value of 0 otherwise. Even if there is an explicit deposit insurance scheme, however, the ex post insurance coverage may prove to be higher than the de jure coverage, if the deposit insurance agency chooses to guarantee all depositors. With a value of 0 there is no explicit deposit insurance, even if the authorities offer some type of implicit insurance.

Next, table 3 presents some indicators of the structure of financial markets. The concentration variable is defined as the ratio of the assets of the three largest banks to the assets of the total banking sector. As is well known, the concentration of the U.S. banking market is low, at 16 percent, compared with values of about 50 percent for France and Germany. Note, however, that the U.S. figure may understate the concentration ratio in individual banking markets, which are protected from outside competition by interstate banking and branching restrictions. The number of banks in the table reflects the number of banks in the data set with complete information. The ratio of bank assets to GDP is defined as the total assets of the deposit-money banks divided by GDP. This ratio reflects the banking sector's overall level of development. The ratio of stock market capitalization to GDP measures the extent of stock market development. Developing coun-

Table 3. *Economic and Institutional Indicators*

<i>Economy</i>	<i>GDP per capita (U.S. dollars)</i>	<i>Inflation^a (percent)</i>	<i>Tax rate^b (percent)</i>	<i>Reserves/ deposits</i>	<i>Deposit insurance^c</i>	<i>Market concentration^d</i>	<i>Number of banks^e</i>	<i>Bank assets/ GDP^f</i>	<i>Stock market capital/GDP</i>	<i>Law and order^g</i>
Argentina	3,825	0.02	0.15	0.06	1	0.48	11	0.23	0.13	5
Australia	14,542	0.03	0.47	0.02	0	0.45	44	0.77	0.70	6
Austria	16,947	0.02	0.23	0.04	1	0.75	12	1.27	0.14	6
Bahrain	7,902	0.02	0.01	0.10	—	0.94	7	0.49	—	5
Belgium	16,197	0.03	0.27	0.01	1	0.46	49	1.53	0.39	6
Bolivia	665	0.11	0.10	—	0	0.57	11	0.43	0.01	3
Botswana	1,844	0.18	0.32	0.41	—	0.94	5	0.14	0.09	—
Brazil	2,113	22.95	0.38	0.13	0	0.43	56	0.32	0.21	3
Canada	16,091	0.02	0.35	0.01	1	0.56	72	0.72	0.65	6
Chile	2,481	0.12	0.07	0.08	1	0.40	23	0.45	1.10	5
China	468	0.12	0.21	—	0	0.99	5	0.80	0.06	—
Colombia	1,445	0.23	0.18	0.23	1	0.35	28	0.20	0.22	2
Costa Rica	1,936	0.23	0.09	0.59	0	0.76	22	0.15	0.07	—
Cyprus	7,500	0.03	0.34	0.16	—	0.75	9	0.91	0.30	5
Czech Rep.	3,165	0.15	2.01	0.18	1	0.76	15	0.87	0.33	—
Denmark	22,386	0.02	0.16	0.07	1	0.77	56	0.55	0.33	6
Dominican Rep.	829	0.13	0.19	0.25	1	0.62	13	0.17	—	4
Ecuador	1,243	0.23	0.12	0.10	0	0.89	6	0.24	0.15	4
Egypt	709	0.12	0.25	0.20	0	0.89	9	0.65	0.13	4
El Salvador	994	0.12	0.04	0.32	1	0.86	4	0.28	0.67	3
Estonia	2,820	0.29	0.20	—	0	—	7	—	—	—
Finland	18,275	0.03	0.48	0.15	1	0.70	12	0.70	0.35	6
France	18,128	0.01	0.26	0.01	1	0.48	98	0.99	0.34	6
Germany	16,572	0.02	0.56	0.04	1	0.50	82	1.19	0.24	6
Greece	5,140	0.10	0.21	0.46	1	0.70	16	0.40	0.15	6
Guatemala	898	0.10	0.10	0.32	0	0.29	24	0.16	—	3
Haiti	230	0.72	0.25	0.35	—	1.00	3	0.10	—	3
Honduras	900	0.25	0.33	0.14	0	1.00	3	0.22	0.09	3
Hong Kong, China	11,911	0.02	0.13	—	0	0.44	35	—	2.17	6
Hungary	2,330	0.20	0.13	—	1	0.40	22	0.40	0.04	—

India	423	0.06	0.04	0.16	1	0.90	5	0.35	0.38	4
Indonesia	718	0.13	0.30	—	0	0.38	21	0.41	0.33	5
Ireland	13,653	0.01	0.26	0.05	1	0.75	12	0.46	0.42	6
Israel	10,515	0.10	0.53	0.07	0	0.48	26	0.91	0.42	5
Italy	15,491	0.05	0.48	—	1	0.27	66	0.62	0.11	6
Jamaica	1,573	0.33	0.24	0.33	0	0.52	10	0.30	0.41	3
Japan	23,960	0.02	0.57	0.01	1	0.21	81	1.32	0.72	6
Jordan	1,263	0.02	0.31	0.49	0	0.93	7	0.70	0.70	5
Korea, Rep. of	5,663	0.06	0.26	0.10	0	0.17	43	0.55	0.40	5
Lebanon	1,800	—	0.24	0.16	1	0.61	6	0.79	—	—
Lithuania	1,233	0.36	0.37	0.14	0	0.76	8	0.17	0.03	—
Luxembourg	21,433	0.07	0.45	—	1	0.30	108	0.41	0.14	6
Malaysia	3,108	0.06	0.32	0.12	0	0.31	49	0.84	2.82	5
Malta	6,102	0.04	0.29	0.08	—	0.69	7	0.75	—	—
Mexico	1,749	0.45	0.20	0.23	1	0.59	20	0.35	0.32	3
Morocco	853	0.07	0.34	0.07	—	0.63	8	0.46	0.18	6
Nepal	203	0.07	0.35	—	—	1.00	3	0.22	0.06	—
Netherlands	17,187	0.02	0.21	0.01	1	0.84	25	1.14	0.90	6
New Zealand	12,008	0.08	0.28	0.03	0	0.52	8	0.87	0.53	6
Nicaragua	786	0.09	0.22	0.27	—	0.63	13	0.32	—	—
Nigeria	339	0.65	0.06	0.14	1	0.87	9	0.13	0.03	3
Norway	23,083	0.03	0.16	0.01	1	0.52	27	0.68	0.31	6
Oman	5,696	0.04	0.12	0.05	0	0.69	6	0.29	0.15	5
Pakistan	377	0.14	0.53	0.19	0	0.73	15	0.37	0.16	2
Panama	2,435	0.05	0.08	—	—	0.54	9	0.69	0.10	3
Papua New Guinea	1,104	0.03	0.23	0.03	—	0.78	5	0.31	—	3
Paraguay	1,049	0.13	0.17	0.33	0	0.35	23	0.20	—	4
Peru	1,046	0.13	0.43	0.32	1	0.65	22	0.13	0.20	3
Philippines	615	0.07	0.12	0.12	1	0.44	21	0.43	0.79	4
Poland	1,903	4.65	0.40	0.10	1	0.45	32	0.29	0.04	—
Portugal	5,199	0.11	0.14	0.03	1	0.32	38	0.88	0.19	6
Qatar	12,820	—	0.01	0.04	—	1.00	2	0.71	—	—
Romania	1,341	2.16	0.30	0.33	0	0.70	7	0.15	—	—
Russia	1,989	1.90	0.46	0.19	0	0.44	18	0.12	0.05	—

(Table continued on following page.)

Table 3. (continued)

Economy	GDP per capita (U.S. dollars)	Inflation ^a (percent)	Tax rate ^b (percent)	Reserves/ deposits	Deposit insurance ^c	Market concentration ^d	Number of banks ^e	Bank assets/ GDP ^f	Stock market capital/GDP	Law and order ^g
South Africa	2,176	0.09	0.23	0.04	0	0.71	15	0.67	2.09	4
Saudi Arabia	5,316	0.04	0.00	—	0	0.96	4	0.41	0.33	5
Singapore	13,436	0.04	0.29	0.08	0	0.48	19	0.96	1.74	6
Spain	9,137	0.05	0.26	0.08	1	0.50	49	1.01	0.35	4
Sri Lanka	640	0.11	0.23	—	0	0.63	7	—	—	—
Swaziland	787	0.47	0.16	0.21	—	—	4	0.23	0.30	—
Sweden	19,387	0.04	-4.91	—	0	0.41	18	0.62	0.78	6
Taiwan (China)	7,268	0.02	0.18	—	1	0.40	25	—	—	5
Thailand	1,807	0.04	0.31	0.04	0	0.49	14	0.98	0.86	5
Tunisia	1,464	0.05	0.20	0.04	—	0.55	8	0.55	0.22	—
Turkey	1,848	1.06	0.14	0.27	1	0.43	29	0.17	0.17	5
United Kingdom	13,478	0.02	0.36	—	1	0.39	71	1.12	1.27	6
United States	20,931	0.01	0.27	0.03	1	0.16	372	0.48	0.95	6
Venezuela	2,651	0.51	0.06	0.25	1	0.46	17	0.13	0.05	4
Yemen	280	—	0.51	—	—	1.00	3	—	—	—
Zambia	247	0.55	0.34	0.08	0	1.00	3	0.10	—	4

— Not available.

Note: For all variables 1995 figures were reported, if available. Otherwise figures are for the most recent year available.

a. Inflation is the annual inflation of the GDP deflator.

b. The tax rate is defined as total taxes paid by banks divided by before-tax profits.

c. Deposit insurance is a dummy variable that takes the value 1 if there is an explicit deposit insurance scheme and 0 otherwise.

d. Market concentration is defined as the ratio of the assets of the largest three banks to total banking assets.

e. This value is the number of banks in the data set with complete information.

f. Bank assets include the total assets of the deposit money banks.

g. The law and order indicator reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes. It is scored 0–6 with higher scores indicating sound political institutions and a strong court system. Lower scores indicate a tradition of depending on physical force or illegal means to settle claims.

Source: GDP per capita and inflation are from World Bank National Accounts. The tax rate, market concentration, and number of banks are from IBCA's BankScope database. Reserves/deposits and bank assets/GDP are from the International Monetary Fund, *International Financial Statistics*. Deposit insurance is compiled from Kyei (1995) and Talley and Mas (1990). Stock market data are from International Finance Corporation's emerging market database. The law and order indicator is produced by the International Country Risk Rating Agency.

tries tend to have lower bank-to-GDP and capitalization-to-GDP ratios, with some notable exceptions. Malaysia, South Africa, and Thailand, for instance, have relatively high ratios for both variables.

The final column in the table provides an index of law and order, which is one of the institutional variables used in the regression analysis. This variable is scaled from 0 to 6, with higher scores indicating sound political institutions and a strong court system. Lower scores reflect a tradition in which physical force or illegal means are used to settle claims. The table shows considerable variation among countries in the sample.

III. EMPIRICAL RESULTS

Tables 4 and 5 report the results of regressions of the net interest margin and before-tax profits as a share of total assets, respectively. Measuring profitability using the return on equity (as opposed to using the return on assets and controlling for equity ratios as we do here) does not lead to significantly different results and thus is not reported. All regressions include country and year fixed effects. The tables report several specifications, the basic one including a set of bank and macroeconomic indicators as regressors. These are important control variables to which we subsequently add the taxation variables, the deposit insurance index, the financial structure variables, and the legal and institutional indicators. We drop some variables from these two regressions because we want to ensure that banks from a reasonable number of countries are included. The estimation technique is weighted least squares, with the weight being the inverse of the number of banks for the country in a given year. This weighting corrects for the fact that the number of banks varies considerably across countries.

Bank Characteristics and Macroeconomic Indicators

The first bank characteristic is the book value of equity divided by total assets lagged one period (E/TA_{t-1}). We lag total assets by one period to correct for the fact that profits, if not paid out in dividends, have a contemporaneous impact on bank equity. Buser, Chen, and Kane (1981) examine the theoretical relationship between bank profitability and bank capitalization. They find that banks generally have an interior optimal capitalization ratio in the presence of deposit insurance. Banks with a high franchise value, reflecting costly bank entry, have incentives to remain well-capitalized and to engage in prudent lending behavior (see Caprio and Summers 1993 and Stiglitz and Uy 1996). Berger (1995b) provides empirical evidence that U.S. banks show a positive relationship between bank profitability and capitalization, although the evidence is not conclusive. The author notes that well-capitalized firms face lower expected bankruptcy costs for themselves and their customers, thereby reducing their cost of funding.

The basic specification (column 1 in tables 4 and 5) confirms that there is a positive relationship between E/TA_{t-1} and net interest income and bank profitability. In the regressions this variable is also interacted with GDP per capita (measured

Table 4. *Determinants of Net Interest Margins*

<i>Independent variable</i>	<i>Regression results</i>				
	(1)	(2)	(3)	(4)	(5)
<i>Bank characteristics</i>					
Equity/lagged total assets (E/TA_{t-1})	0.046*** (0.007)	0.047*** (0.007)	0.044*** (0.007)	0.064*** (0.007)	0.063*** (0.006)
Equity/lagged total assets interacted with GDP per capita	-0.001 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.002** (0.001)	-0.002*** (0.001)
Loans/total assets	0.017*** (0.004)	0.008** (0.004)	0.012*** (0.004)	0.022*** (0.004)	0.019*** (0.004)
Loans/total assets interacted with GDP per capita	-0.000 (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)
Non-interest earning assets/total assets	-0.016** (0.007)	-0.020*** (0.007)	-0.021*** (0.008)	-0.011 (0.007)	-0.020*** (0.007)
Non-interest earning assets/ total assets interacted with GDP per capita	-0.001* (0.001)	-0.001 (0.001)	0.000 (0.001)	-0.002** (0.001)	-0.001 (0.001)
Customer and short-term funding/total assets	-0.007 (0.005)	0.003 (0.005)	0.004 (0.006)	-0.000 (0.005)	-0.004 (0.005)
Customer and short-term funding/total assets interacted with GDP per capita	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.001)
Overhead/total assets	0.173*** (0.022)	0.025*** (0.019)	0.213*** (0.019)	0.141*** (0.018)	0.310*** (0.019)
Overhead/total assets interacted with GDP per capita	0.002*** (0.002)	0.004* (0.002)	0.004* (0.002)	0.009*** (0.002)	0.005*** (0.002)
Foreign ownership dummy	0.004*** (0.001)	0.003** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.003*** (0.001)
Foreign ownership dummy interacted with GDP per capita	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
<i>Macroeconomic indicators</i>					
GDP per capita	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.011*** (0.002)
Growth rate	0.004 (0.008)	0.005 (0.008)	0.006 (0.008)	-0.011 (0.008)	-0.020)** (0.007)
Inflation rate	0.021*** (0.006)	0.026*** (0.006)	0.025*** (0.006)	0.020*** (0.006)	0.003 (0.005)
Real interest rate	0.044*** (0.007)	0.060*** (0.007)	0.058*** (0.007)	0.051*** (0.007)	0.025*** (0.006)
Real interest rate interacted with GDP per capita	0.001 (0.002)	-0.004 (0.002)**	-0.003* (0.002)	-0.005*** (0.002)	-0.000 (0.002)

Table 4. (continued)

<i>Independent variable</i>	<i>Regression results</i>				
	(1)	(2)	(3)	(4)	(5)
<i>Taxation</i>					
Reserves		-0.076*** (0.015)	-0.076*** (0.015)	-0.024* (0.016)	-0.104*** (0.016)
Reserves interacted with GDP per capita		0.011*** (0.003)	0.011*** (0.003)	0.009*** (0.003)	0.004 (0.004)
Tax rate		0.016*** (0.002)	0.015*** (0.002)	0.017*** (0.002)	0.017*** (0.002)
Tax rate interacted with GDP per capita		-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
<i>Deposit insurance</i>					
Deposit insurance dummy			-0.009*** (0.003)		
<i>Financial structure</i>					
Bank assets/GDP				-0.024** (0.010)	
Bank assets/GDP interacted with GDP per capita				0.001* (0.001)	
Stock market capitalization/GDP				0.016*** (0.005)	
Stock market capitalization/GDP interacted with GDP per capita				-0.002*** (0.001)	
Stock market capitalization/bank assets				-0.013*** (0.003)	
Stock market capitalization/bank assets interacted with GDP per capita				0.001** (0.001)	
Number of banks				-0.001 (0.015)	
Market concentration				0.004 (0.005)	
Total assets (U.S. dollars)				0.003*** (0.000)	
<i>Legal and institutional indicators</i>					
Contract enforcement dummy					-0.042*** (0.007)
Contract enforcement dummy interacted with GDP per capita					0.003*** (0.001)
Law and order index					-0.003*** (0.001)
Law and order index interacted with GDP per capita					-0.000*** (0.000)
Corruption					-0.009*** (0.001)

(Table continued on following page.)

Table 4. (continued)

Independent variable	Regression results				
	(1)	(2)	(3)	(4)	(5)
Corruption interacted with GDP per capita					0.001*** (0.000)
Adjusted R ²	0.50	0.51	0.50	0.58	0.63
Number of observations	5,841	5,276	5,212	5,054	4,497

* Significant at the 10 percent level.

** Significant at the 5 percent level.

*** Significant at the 1 percent level.

Note: The regressions are estimated using weighted least squares pooling bank-level data across 80 countries for the 1988–95 time period. The number of banks in each period is used to weight the observations. The regressions also include country and time dummy variables that are not reported. The dependent variable is the net interest margin defined as net interest income divided by total assets. Standard errors are given in parentheses.

Source: Authors' calculations.

Table 5. Determinants of Bank Profitability

Independent variable	Regression results				
	(1)	(2)	(3)	(4)	(5)
<i>Bank characteristics</i>					
Equity/lagged total assets (ETA _{t-1})	0.047*** (0.009)	0.051*** (0.009)	0.055*** (0.009)	0.058** (0.010)	0.015*** (0.006)
Equity/lagged total assets interacted with GDP per capita	0.002 (0.001)	0.002*** (0.001)	0.003*** (0.001)	0.002*** (0.001)	0.003*** (0.001)
Loans/total assets	-0.013*** (0.005)	-0.024*** (0.005)	-0.023** (0.005)	-0.015*** (0.005)	-0.018*** (0.004)
Loans/total assets interacted with GDP per capita	0.001*** (0.000)	0.003*** (0.000)	0.003*** (0.000)	0.003*** (0.000)	0.001*** (0.000)
Non-interest earning assets/ total assets	-0.005 (0.010)	-0.010 (0.010)	-0.011 (0.010)	-0.014 (0.010)	-0.033*** (0.007)
Non-interest earning assets/ total assets interacted with GDP per capita	-0.007*** (0.001)	-0.007*** (0.001)	-0.007*** (0.001)	-0.008*** (0.001)	0.002** (0.001)
Customer and short-term funding/total assets	-0.029*** (0.006)	-0.017** (0.007)	-0.014*** (0.008)	-0.031*** (0.001)	-0.051*** (0.005)
Customer and short-term funding/total assets interacted with GDP per capita	0.002*** (0.000)	-0.000 (0.001)	-0.000 (0.001)	0.001 (0.001)	0.002*** (0.000)
Overhead/total assets	-0.023 (0.025)	-0.006 (0.026)	-0.004 (0.026)	-0.024 (0.026)	-0.114*** (0.019)
Overhead/total assets interacted with GDP per capita	-0.030*** (0.003)	-0.049*** (0.003)	-0.049*** (0.003)	-0.048*** (0.003)	0.007*** (0.002)

Table 5. (continued)

Independent variable	Regression results				
	(1)	(2)	(3)	(4)	(5)
Foreign ownership dummy	0.005*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	0.006*** (0.001)
Foreign ownership dummy interacted with GDP per capita	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	0.000*** (0.000)
<i>Macroeconomic indicators</i>					
GDP per capita	0.008*** (0.001)	0.008*** (0.001)	0.008*** (0.001)	0.007*** (0.002)	0.000 (0.002)
Growth rate	0.002 (0.010)	-0.006 (0.011)	-0.007 (0.011)	-0.019 (0.011)	0.004 (0.007)
Inflation rate	0.011 (0.008)	0.015* (0.008)	0.014* (0.008)	0.009 (0.008)	0.011* (0.005)
Real interest rate	0.023*** (0.009)	0.029*** (0.010)	0.029*** (0.010)	0.023*** (0.009)	0.026*** (0.006)
Real interest rate interacted with GDP per capita	-0.000 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.000 (0.002)	-0.003** (0.002)
<i>Taxation</i>					
Reserves		-0.126*** (0.021)	-0.129*** (0.021)	-0.106*** (0.023)	-0.091*** (0.016)
Reserves interacted with GDP per capita		0.029*** (0.004)	0.031*** (0.004)	0.032*** (0.004)	0.005*** (0.004)
Tax rate		0.022*** (0.003)	0.022*** (0.003)	0.021*** (0.003)	0.017*** (0.002)
Tax rate interacted with GDP per capita		-0.000 (0.000)	-0.000** (0.000)	-0.003** (0.000)	0.000*** (0.000)
<i>Deposit insurance</i>					
Deposit insurance dummy			-0.005 (0.004)		
<i>Financial structure</i>					
Bank assets/GDP				-0.028* (0.014)	
Bank assets/GDP interacted with GDP per capita				0.002* (0.001)	
Stock market capitalization/GDP				0.010 (0.007)	
Stock market capitalization/ GDP interacted with GDP per capita				0.000 (0.001)	
Stock market capitalization/bank assets				-0.001 (0.001)	

(Table continued on following page.)

Table 5. (continued)

Indicator	Regression results				
	(1)	(2)	(3)	(4)	(5)
Stock market capitalization/bank assets interacted with GDP per capita				-0.001 (0.001)	
Number of banks				0.000 (0.000)	
Market concentration				0.010* (0.007)	
Total assets (U.S. dollars)				0.000 (0.000)	
<i>Legal and institutional indicators</i>					
Contract enforcement dummy					-0.022*** (0.007)
Contract enforcement dummy interacted with GDP per capita					0.001*** (0.001)
Law and order index					-0.000 (0.001)
Law and order index interacted with GDP per capita					-0.000* (0.000)
Corruption					-0.002* (0.001)
Corruption interacted with GDP per capita					-0.000 (0.000)
Adjusted R ²	0.21	0.27	0.27	0.31	0.35
Number of observations	5,841	5,276	5,212	5,054	4,497

* Significant at the 10 percent level.

** Significant at the 5 percent level.

*** Significant at the 1 percent level.

Note: The regression is estimated using weighted least squares pooling bank-level data across 80 countries for the 1988–95 time period. The number of banks in each period is used to weight the observations. The regressions also include country and time dummy variables that are not reported. The dependent variable is before-tax profits divided by total assets. Standard errors are given in parentheses.

Source: Authors' calculations.

in constant thousands dollars for the year 1987). The positive coefficient on the interaction variables in the before-tax profits regression may reflect a higher bank franchise value in wealthier countries. The coefficients on E/TA_{t-1} and the interaction variable together indicate how the ratio of equity to assets affects bank variables in countries with different income levels. For a country with a per capita GDP of \$10,000, for instance, the point estimate of the effect of E/TA_{t-1} on before-tax profits divided by total assets is 0.067 (or $0.047 + 10 \times 0.002$).

There is a negative and significant coefficient on non-interest-earning assets as a share of total assets in the net interest margin equation, but there is no significant relationship for the before-tax profits equation. Note that the sign on this variable interacted with per capita GDP is negative in both the net interest margin

and the before-tax profits specifications. Apparently, the presence of non-interest earning assets depresses net interest income and profitability more in wealthier countries than in poorer countries. By contrast, the sign on loans divided by total assets is positive in the net interest margin equation and negative in the before-tax profits equation. However, the coefficient of this variable interacted with GDP in the profits equation is positive, indicating that at higher income levels bank lending activities tend to be more profitable.

On the liability side, customer and short-term funding consists of demand deposits, savings deposits, and time deposits. On average, this type of customer funding may carry a low interest cost, but it is costly in terms of the required branching network. This liability category does not significantly affect the net interest variable, although there is evidence that it lowers bank profitability.

Differences in overhead may also capture differences in bank business and product mix, as well as variation in the range and quality of services. The ratio of overhead to total assets has an estimated coefficient of 0.173 in the net interest margin regression, which suggests that about a sixth of a bank's overhead cost is passed on to its depositors and lenders. The interaction of overhead with per capita GDP also enters with a positive coefficient, indicating that a larger share of overhead is passed onto financial customers in wealthier countries. This may reflect more competitive conditions in banking markets in industrial than in developing countries. In the before-tax profits regression the interaction of overhead with per capita GDP enters negatively, indicating that higher overheads eat into bank profits.

The foreign ownership variable equals 1 if at least 50 percent of the bank's stock is in foreign hands and equals 0 otherwise. In both tables 4 and 5 this variable has a positive coefficient, while its interaction with per capita GDP has a negative coefficient. These results suggest that foreign banks realize relatively high net interest margins and profitability in relatively poor countries. It may be that foreign banks are frequently exempt from unfavorable domestic banking regulations and apply superior banking techniques. Note, however, that the point estimate of the effect of foreign ownership for a wealthy country with a per capita GDP of \$20,000 is negative in the net interest margin equation at -0.016 (that is, $0.004 - 20 \times 0.001$) and in the profitability equation at -0.015 (that is, $0.005 - 20 \times 0.001$). Foreign banks' technological and efficiency advantages in countries may be insignificant because, while there, they face informational disadvantages. This could explain why foreign banks in industrial countries are relatively unprofitable on average.

Turning to the macroeconomic indicators, we see, first, that per capita GDP has no significant impact on the realized net interest margin, although it enters the profitability equation with a positive coefficient. Per capita GDP is a general index of economic development, and it thus reflects differences in banking technology, the mix of banking opportunities, and any aspects of banking regulations omitted from the regression. Growth, defined as the growth rate of real per capita GDP, is insignificant in both regressions. The percentage change in the GDP defla-

tor, or inflation, is estimated to increase the net interest margin and bank profitability. However, the significance of the coefficients in the profitability regressions is low, possibly because banks obtain higher earnings from float or because there are delays in crediting customer accounts in an inflationary environment. With inflation, bank costs also tend to rise. A larger number of transactions may lead to higher labor costs and, as shown by Hanson and Rocha (1986: 40), result in a higher ratio of bank branches per capita. On net, however, the regression results suggest that the impact of inflation on profitability, although not very significant, is positive throughout.

We constructed the real interest rate using the short-term government debt yield and, if that measure was not available, other short-term market rates. The real interest rate enters the net interest margin and before-tax profits regressions positively, although this variable interacted with per capita GDP has a significantly negative coefficient in the net interest margin equation. Thus there is some evidence that increases in the real interest rate do not raise spreads as much in industrial countries, perhaps because their deposit rates are not tied down by deposit rate ceilings.

Taxation Variables

Banks are subject to direct taxation through the corporate income tax and other taxes, and they are subject to indirect taxation through reserve requirements. Reserve requirements are an implicit tax on banks if, as is usual, official reserves are remunerated at less-than-market rates. The corporate income tax and the reserve tax differ in important respects. First, the corporate income tax, in principle at least, can be targeted at pure profit. To the extent that it is a profit tax, the corporate income tax is relatively nondistorting. In practice, however, it may not be a pure profit tax if complete expensing of costs is not allowed.

The reserve tax, by its very nature, is proportional to the volume of deposit taking and is therefore a distorting tax. From a welfare perspective the corporate income tax thus appears to be superior to the reserve tax. A second important difference is that the severity of the reserve tax depends on the opportunity cost of holding reserves. This may depend on financial market conditions as much as on any tax code. Related to this second condition, reserve requirements are also an instrument of monetary policy.

As far as we know, there has been no other empirical research on the effect of the corporate income tax on the banking sector. Several studies have considered the impact of reserve requirements on bank profitability. Some, in particular, have examined how Federal Reserve membership affected the profitability of U.S. commercial banks in the 1970s (see Rose and Rose 1979 and Gilbert and Rasche 1980). Federal Reserve membership subjected banks to generally higher reserve requirements. Most of the studies in this area support the notion that nonmember banks were more profitable than member banks (with similar characteristics) because nonmember banks held relatively little cash. Competition among member and nonmember banks in the same market appears to have pre-

vented member banks from passing their higher reserve costs onto their customers. In related work Kolari, Mahajan, and Saunders (1988) study the impact of announced changes in reserve requirements on bank stock prices using an event study methodology. Huizinga (1996) and Eijffinger, Huizinga, and Lemmen (1998) examine how nonresident withholding taxes affect interest rates, while Fabozzi and Thurston (1986) examine how differences in reserve requirements are priced into money-market instruments.

Because detailed information on the reserve regulation of all countries in our sample is not available, we use a proxy to capture bank reserves. We construct this variable in the regressions as the product of the banking system's ratio of aggregate reserves to deposits (as in table 3) and the individual bank's ratio of short-term funding to total assets. Customer and short-term funding, consisting of demand deposits, savings deposits, and time deposits, here proxy for reservable deposits. The reserves variable is thus an approximation of actual bank reserves that reflects differences in systemwide reserve requirement rules.

In tables 4 and 5 the reserves variable enters the regressions negatively. The coefficients in the net interest margin equations show two effects: less-than-market remuneration and the impact on banks' lending and deposit rates. The first effect is expected to be negative because underremunerated reserves lower a bank's net interest income and profitability. The second effect could be either zero, in which case the bank bears the full cost of higher reserves, or positive, in which case the cost of reserves is passed onto bank customers in the form of higher interest margins. In table 5 we see that the reserves variable negatively affects bank profitability. This suggests that the second, or pass-through, effect is either nonexistent or too small to offset the first, or direct, effect. Abstracting from any pass-through, the coefficient on the reserves variable in either regression can also be interpreted as a bank's opportunity cost of holding reserves. The reserves variable interacted with per capita GDP enters both regressions positively, which may reflect the fact that the opportunity cost of holding reserves is higher in wealthier countries.

We capture the explicit taxes that banks pay with the variable tax rate, which is measured by a bank's tax bill divided by its pretax profits. This variable has a significantly positive impact on interest margins and profitability. The tax rate interacted with per capita GDP is negative and significant in both regressions. These results suggest that both the net interest margin and profitability increase with tax rates, but less so in richer countries. Thus the corporate income tax is passed through to bank customers to some degree.

To calculate the extent of this pass-through, we use the estimated coefficients on the tax rate variable and its interaction with per capita GDP. Let the pass-through be defined as the increase in before-tax profits following a one-unit increase in the corporate tax bill, or $\partial BTP/\partial TX$. Next, note that $(\partial BTP/\partial \tau)/TA = \beta$, where τ is the tax rate, TA is total assets, and β is estimated at $0.022 - (0.0004) \times (\text{per capita GDP})$. Further, $\partial TX/\partial \tau = (\partial BTP/\partial \tau) + BTP$, as $TX = \tau \times BTP$. It now follows that $\partial BTP/\partial TX = \beta/[\beta\tau + (BTP/TA)]$. We can evaluate this expression using mean val-

ues of τ , BTP/TA , and per capita GDP separately for countries in four different income groups (low, lower-middle, upper-middle, and high), where per capita GDP is the international average for 1995. The calculations suggest that the pass-through coefficient, $\partial BTP/\partial TX$, equals 1.01, 0.72, 1.00, and 1.21 for countries in the four income groups, respectively. For low-income countries in 1995 BTP/TA and τ have mean values of 0.016 and 0.225 for all banks, while the average GDP per capita is \$426. The calculations reflect the fact that in high-income countries the mean value of BTP/TA is lower, while the value of τ changes little.

Essentially, these results suggest that the corporate income tax completely passes through to bank customers. Thus there is no support for the notion that the corporate income tax is a nondistorting tax on bank profits. Generally, it is a source-based tax on domestically employed capital resources. A complete pass-through of this tax is consistent with the assumption that international investors demand a net-of-tax return on capital invested in a particular country independent of the country's source-based taxes.

Deposit Insurance

Several studies have examined the impact of deposit insurance using international data. Demirgüç-Kunt and Detragiache (1997) find that the existence of explicit deposit insurance is positively associated with the probability of banking crises. Barth, Nolle, and Rice (1997), however, find that deposit insurance has no significant impact on banks' return on equity for a sample of 142 banks in 1993. Bartholdy, Boyle, and Stover (1997) estimate that deposit insurance lowers the deposit rate by 25 basis points, using aggregate deposit interest rate data for 13 OECD countries during 1985-90. These authors discuss why deposit insurance has a theoretically ambiguous effect on interest margins. On the one hand, the deposit rate for insured deposits should decrease given the insurance protection. On the other hand, mispriced deposit insurance provides banks with an incentive to engage in more risky lending strategies to increase the contingent pay-out from the deposit insurance agency.

Brewer and Mondschean (1994) offer empirical support for the notion that deposit insurance creates incentives for banks to acquire risky assets by examining the junk bond holdings of U.S. banks, while Demirgüç-Kunt and Huizinga (1993) argue that deposit insurance was an important determinant of bank stock prices during the international debt crisis of the 1980s. This moral hazard problem and the associated risks can lead bank creditors to demand a higher interest rate. Also, for a given level of risk, deposit insurance may lead banks to lend money more cheaply than they otherwise would, depressing net interest margins and profitability. Even banks that do not engage in risky lending strategies themselves may experience a downward effect on interest margins because of bank competition.

The deposit insurance variable equals 1 if the country has an explicit deposit insurance regime. For some countries this variable changes with time, reflecting changes in the regime during the sample period. The results suggest that deposit

insurance lowers net interest margins. Deposit insurance may also influence margins and profits through its effect on financial structure—it encourages new entry and enables small banks to operate. However, when we include financial structure variables in the regression, the results do not change. The impact on bank profits is negative, but it is not significant, possibly because of the offsetting impact of mispriced subsidies in actual deposit insurance schemes. These results suggest that explicit deposit insurance regimes do not produce higher bank profitability and margins, perhaps because of design and implementation problems.

Financial Structure Variables

In the regressions reported in column 4 of tables 4 and 5 we include two sets of financial structure variables. The first set comprises the market concentration ratio, the number of banks, and total bank assets as indicators of market structure and scale effects. Various authors, such as Gilbert (1984), Berger (1995a), and Goldberg and Rai (1996), have pointed out that such variables may proxy for market power as well as for differences in bank efficiency. We do not attempt here to distinguish between the corresponding market power and efficient structure hypotheses.

The second set consists of financial structure variables that measure the importance of bank and stock market finance relative to GDP and to each other. Reasons why these variables matter may also hinge on market power arguments. A high ratio of bank credit to GDP, for instance, may reflect a high demand for banking services fueling competition among banks. Or these variables may reflect the complementarity of or substitutability between bank and stock market finance. The Miller-Modigliani theorem states that debt and equity finance are purely substitutes in the absence of taxes and bankruptcy costs. In practice, however, debt and equity finance may also be complementary, as modeled in Boyd and Smith (1996). Demirgüç-Kunt and Maksimovic (1996) provide empirical evidence that an ability to attract equity capital may also enhance firms' borrowing capacity, especially in developing countries' financial markets. In this setting easier equity finance may increase rather than decrease the demand for debt finance, reflecting that these sources of finance are complements.

Turning to the first set of market concentration and scale variables, we see that the bank concentration ratio has a significant and positive impact on bank profitability, while bank size, as proxied by total assets, has a significant and positive impact on interest margins. The number of banks has no significant impact on either interest margins or profits.

The second set of financial structure variables affects bank margins more significantly than bank profits. This may indicate that these variables have a greater impact on banks' loan and deposit customers than on other clients. The ratio of bank assets to GDP has a significantly negative impact on margins and profits, perhaps reflecting more intense interbank competition in well-developed financial systems. This effect is smaller in richer countries that already have relatively developed banking sectors. The ratio of stock market capitalization to GDP enters

the net interest margin equation positively, which suggests that a larger stock market per se enables banks to obtain higher interest margins, supporting the complementarity hypothesis between debt and equity financing discussed above. As stock markets develop, better availability of information increases the potential pool of borrowers, making it easier for banks to identify and monitor them. This raises the volume of business for banks, making higher margins possible. In the regression the ratio of stock market capitalization to banking assets enters the interest margin equation negatively. Thus it may be that a larger stock market relative to the banking sector lowers bank margins, reflecting substitution possibilities between debt and equity. For both stock market development indicators the interaction with per capita GDP enters the interest margin equation with the opposite sign, suggesting that the impact of any stock market development on interest margins is muted in wealthier countries.

Legal and Institutional Indicators

The final regressions reported in tables 4 and 5 include a variety of legal and institutional variables (column 5). The contract enforcement dummy, ranging from 1 to 4, measures the degree to which contractual agreements are honored and not subject to language and mentality differences. A higher value means greater contract enforcement. In both the net interest margin and before-tax profits regressions, the contract enforcement variable has a negative and significant sign. Poor contract enforcement may prompt banks to require higher interest margins and investors to require higher profitability to compensate for the additional risk. In both regressions the contract enforcement variable interacted with per capita GDP enters positively, suggesting a muted effect of this variable in wealthier countries.

The law and order index, ranging from 0 to 6, captures how well the legal system works in adjudicating disputes. From table 4 we see that a higher value of this index is significantly associated with lower interest margins. The reason may again be that an effective legal system reduces the required risk premia on bank lending. The interaction between the law and order index and per capita GDP enters the equation negatively, however.

Finally, the corruption index, ranging from 0 to 6, measures the degree of government corruption. A higher score indicates that government officials are less likely to take bribes. Table 4 indicates that a cleaner government is associated with lower realized interest spreads, and this relationship is weaker in wealthier countries. Again, banks may require a lower risk premium on their investments in countries that are relatively free of corruption. Overall, the regressions indicate that the underlying legal and institutional variables are important in explaining cross-country variation in interest spreads and bank profitability. For two of the three variables the interaction with per capita GDP has a coefficient with the opposite sign, suggesting that the effects of institutional differences are muted in wealthier countries.

IV. CONCLUSIONS

Banking systems around the world differ widely in their size and operation. Across countries commercial banks have to deal with different macroeconomic environments, explicit and implicit tax policies, deposit insurance regimes, financial market conditions, and legal and institutional realities. Using a comprehensive cross-country data set with bank-level data, this article analyzed how bank characteristics and the overall banking environment affect how banks function as reflected in interest margins and bank profitability.

We can confirm some findings of earlier research: for instance, a positive relationship between capitalization and profitability and a negative relationship between reserves and profitability. But other important determinants of bank margins and profitability, such as ownership, corporate taxation, financial structure, and the legal and institutional setting, have not been treated extensively in the literature.

Differences in the mix of bank activity also have an impact on spreads and profitability. Our results show that banks with relatively high non-interest earning assets are less profitable. Banks that rely largely on deposits for their funding are also less profitable, because deposits apparently entail high branching and other expenses. Similarly, variation in overhead and other operating costs is reflected in variation in bank interest margins, because banks pass on their operating costs to their depositors and lenders.

The international ownership of banks also has a significant impact on bank spreads and profitability. Foreign banks, specifically, realize higher interest margins and higher profitability than domestic banks in developing countries. This finding may reflect the fact that in developing countries a foreign bank's technological edge is relatively strong, apparently strong enough to overcome any informational disadvantage in lending or raising funds locally. Foreign banks, however, are shown to be less profitable in industrial countries, where they may not have a technological edge.

Macroeconomic factors also explain variation in interest margins. We found that inflation is associated with higher realized interest margins and higher profitability. Inflation entails higher costs—more transactions and generally more extensive branch networks—and also higher income from bank float. The positive relationship between inflation and bank profitability implies that bank income increases more with inflation than do bank costs. Further, high real interest rates are associated with higher interest margins and profitability, especially in developing countries. This may reflect the fact that in developing countries demand deposits frequently pay zero or below-market interest rates.

Regarding financial structure, banks in countries with more competitive banking sectors—where banking assets constitute a larger portion of GDP—have smaller margins and are less profitable. The bank concentration ratio positively affects bank profitability, and larger banks tend to have higher margins. A larger ratio of stock market capitalization to GDP increases bank margins, suggesting possible

complementarity between debt and equity financing. A larger ratio, however, is negatively related to margins, suggesting that relatively well-developed stock markets can substitute for bank finance.

Similarly, several institutional factors, such as indexes of credit rights, law and order, and corruption, and differences in financial structure, have more pronounced effects on interest margins and bank profitability in developing than in industrial countries. These results may reflect the relatively closed nature of banking markets in developing countries. Coupled with earlier empirical evidence that a weak institutional environment makes banking crises more likely (Demirgüç-Kunt and Detragiache 1997), these results suggest that returns to improving underlying institutions are indeed high. Reserves also have a more pronounced impact on margins and profitability in developing than in industrial countries. This result may simply reflect the relatively high opportunity cost of holding reserves in poorer and more inflationary countries.

The corporate income tax appears to be passed on fully to bank customers in both developing and industrial countries. This finding is consistent with the notion that bank stock investors require net-of-company-tax returns independent of the level of company taxation. It also implies that the corporate income tax on banks is likely to distort the underlying saving and investment decisions, with possibly negative implications for economic growth. These considerations must weigh heavily in considering the merits of the corporate income tax on banks as part of the overall tax system.

However, we also found that official reserves depress bank profits. *Prima facie*, this suggests that reserve requirements are a better instrument with which to tax bank profits than the corporate income tax. Note, however, that the implicit reserve tax in many countries is much more variable than the corporate income tax. The level of banking investment and activity is therefore unlikely to be adjusted to each change in the implicit reserve tax. Variability in the reserve tax can thus go a long way toward explaining the responsiveness of bank profits to this tax. These issues are pursued further in Demirgüç-Kunt and Huizinga (1997).

Policymakers have an interest in promoting banking sectors that are both stable and efficient. Stability clearly requires sufficient banking profitability, while economic efficiency requires banking spreads that are not too large. A prerequisite to formulating effective banking policies is thus to understand the determinants of bank profitability and interest margins.

Several other topics remain for further study. Countries worldwide differ considerably in the extent of foreign ownership of their banking systems. An interesting issue is how entry by foreign banks affects the operation of domestic banking firms. In principle, foreign entry can affect pricing by domestic firms and force them to reduce their operating costs and to remain competitive. Both of these effects determine whether the entry of foreign firms is welfare-improving overall. We address the impact of foreign entry in Claessens, Demirgüç-Kunt, and Huizinga (1997).

As a related issue, it would be interesting to consider what determines foreign bank entry. Foreign bank entry, and foreign direct investment generally, may be driven by the different (worldwide) taxation of domestic and foreign firms rather than simply by countries' comparative advantage in providing financial services.

We have found some evidence that government regulations, such as the design of deposit insurance schemes, have an impact on bank margins. It would be interesting to analyze this issue further by taking into account differences in design features. We intend to return to these issues in future work.

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