How bank capital buffers vary across countries. The influence of cost of deposits, market power and bank regulation

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Abstract

This paper analyzes the bank and country determinants of capital buffers using a panel data of 1,337 banks in 70 countries between 1992 and 2002. After controlling for adjustment costs and the endogeneity of explanatory variables, the results show that capital buffers are positively related to the cost of deposits and bank market power, although the relations vary across countries depending on regulation, supervision, and institutions. Their impact is the result of two generally opposing effects: restrictions on bank activities and official supervision reduce the incentives to hold capital buffers by weakening market discipline, but at the same time they promote higher capital buffers by increasing market power. Institutional quality has the two opposite effects. Better accounting disclosure and less generous deposit insurance, however, have a clear positive effect on capital buffers by both strengthening market discipline and making charter value better able to reduce risk-taking incentives.

JEL classification: G21; G28; M41.

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1. Introduction

Bank capital has been a particular target of regulation in most countries. It is also one of the first facets of banking to be the focus of international coordination.[1] Analysis of how well regulatory capital requirements work requires knowing whether the requirements are binding and, if so, whether the degree to which they are binding varies across countries. This paper aims to shed light on both these issues by analyzing the determinants of bank capital buffers in 70 countries and the effects of bank regulation, bank supervision, and a country's institutions.

Capital requirements aim to counteract banks' risk-shifting incentives exacerbated by the provision of a government safety net. In theory, capital requirements have stabilizing effects, according to the option-pricing model (Furlong and Keeley, 1989; Episcopos, 2008). Yet others challenge the idea that capital requirements can strengthen the stability of the banking system, using models based on the mean-variance framework. Koehn and Santomero (1980) and Kim and Santomero (1988) find that a forced reduction in leverage reduces a bank's expected returns and may lead bank owners to undertake investments with higher return and higher risk. In some cases, increased bank risk offsets the increase in capital, leading to a greater default probability. The introduction of risk-based capital standards is an attempt to eliminate this potentially perverse effect of capital requirements. Basel II is one of the latest examples of the constant endeavor to better match capital requirements to real bank risk.

A common feature of banking models is that banks will not have capital ratios above the minimum required if federal insurance guaranties bank liabilities (Merton, 1977). The banking literature, however, offers three reasons why banks may hold capital beyond the minimum legally required levels. The first is market discipline. When bank liabilities are not totally insured, and depositors demand higher returns to compensate for higher bank risk, bank shareholders may have incentives to add to bank capital to reduce bank risk and therefore the cost of deposits. Second is the expectation of earning economic quasi-rents if banks have market power. Bank shareholders may find it optimal to contribute capital rather

[1] Over 100 countries implemented the 1987 Basel I Accord, which regulates bank capital (Barth *et al.*, 2004). The new Basel II Accord continues to consider bank capital regulation as one of its three pillars (Pillar 1),

than fund the bank with cheaper deposits, as long as capital provides a buffer that reduces the likelihood of failure and guards against destroying a high charter value created by monopoly power. Finally, there are costs to adjusting regulatory capital that impede complete adjustment to a bank's target capital at any particular time.

There are few empirical studies on the determinants of capital buffers. Researches have traditionally focused on analyzing the cyclical behavior of capital buffers.[2] Flannery and Rangan (2008) analyze the influence of market discipline on capital buffers using data from the 100 largest US banking firms over a long enough period (1986-2000) to see variations in market discipline. They observe that these large bank holding companies raised their capital ratios after 1994, and that none of them have been constrained by *de jure* regulatory capital standards since 1995. They attribute capital increases in the latter half of the 1990s to enhanced market incentives to monitor and price large banks' default risks. Nier and Baumann (2006) provide evidence that market discipline has a positive influence on capital buffers in a sample of banks in 32 different countries. They find that government safety nets result in lower capital ratios, while stronger market discipline resulting from uninsured liabilities and disclosure results in higher capital ratios.

Our paper complements this literature by analyzing a sample of banks in 70 countries. We make four main contributions. First, we analyze the influence of market discipline by directly considering the link between the cost of deposits and bank capital buffers. This is the most straightforward way to measure market discipline, where investors in bank liabilities punish banks for greater risk-taking by demanding higher yields on these liabilities.

Second, we explicitly analyze the influence of bank market power on capital buffers, as banking literature has clearly established that bank risk-taking incentives depend critically on market power and charter value. This variable has not been included so far in any research on the determinants of bank capital buffers.

Third, we include country variables beyond those considered in Nier and Baumann (2006) to analyze the influence of official supervisory power and legal restrictions on bank

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alongside official supervision (Pillar 2) and market discipline (Pillar 3). VanHoose (2007) reviews literature on bank capital regulation to evaluate the intellectual foundation for Basel I and Basel II.

[2] Ayuso *et al.* (2004) examine Spanish banks, Lindquist (2004) Norwegian banks, and Stolz and Wedow (2005) German banks, finding evidence of a negative relation between the cycle and the buffer. Using an international bank database, Jokipii and Milne (2008) find a similar negative relation for the 15 countries of the European

activities, along with disclosure, generosity of deposit insurance, and quality of institutions. We consider not only how country variables affect levels of capital buffers but also the mechanism driving this effect, as we focus on how regulation, supervision, and institutions modify the influence of the cost of deposits and market power on capital buffers.

Finally, unlike Nier and Baumann (2006), we account for the possibility that banks may face adjustment costs in moving toward their optimal capital ratios by using the generalized method of moments (GMM) estimator developed by Arellano and Bond (1991) for dynamic panel data. GMM models also control for the presence of unobserved bank-specific effects and the endogeneity of the explanatory variables.

Our results suggest that, on average, bank capital buffers are positively related to the cost of deposits and bank market power, although the influence of cost of deposits and market power varies across countries depending on the regulatory, supervisory, and institutional environment. The influence of restrictions on bank activities and official supervision is the net result of two opposing effects on market discipline and market power. That is, restrictions on bank activities and official supervision reduce the incentives to hold capital buffers by weakening market discipline, but at the same time they promote higher capital buffers by increasing market power. The net effect on capital buffers is positive for both variables. A better-quality institutional environment increases the incentives to hold capital buffers by strengthening market discipline, but also promotes smaller capital buffers by reducing market power. The net effect on capital buffers is negative in our sample. We find that only stringent accounting disclosure requirements and less generous deposit insurance have a clear positive effect on capital buffers.

The rest of the paper is organized as follows. Section 2 describes the theoretical background and discusses the hypotheses. Section 3 describes the characteristics of the dataset and the empirical methodology, while Section 4 shows the results of the bank and country determinants of capital buffers. Finally, Section 6 presents our conclusions.

2. Determinants of bank capital buffers and hypotheses

We consider both bank variables and country variables as determinants of capital buffers.

Union in 2004, but an opposite relation for the 10 countries that joined the European Union in 2004. Heid (2007)

2.1. Bank determinants

Following Ayuso *et al.* (2004), Elizalde and Repullo (2004), and Lindquist (2004), we consider three different types of bank capital-related costs to model capital buffers: cost of funding, cost of financial distress, and adjustment costs.

2.1.1. Cost of funding

Bank shareholders' incentives to hold capital buffers depend on the cost of capital compared to the cost of deposits. It is well known that shareholders require higher returns than depositors to account for their higher risk. It is similarly common knowledge that the returns that shareholders demand are positively related to the risk of their claims. How sensitive the cost of deposits is to bank risk, however, depends on market discipline. If deposits are completely insured, depositors have no incentive to monitor bank shareholders and they demand a risk-free flat rate, regardless of the risk of deposits. In this case, bank shareholders have no incentives to hold capital beyond what is required by law, as there is no benefit in terms of reduction of cost of deposits. Nor is there any relation between cost of deposits and bank capital ratio, because the optimum choice is for bank shareholders to hold the maximum amount of debt, in which case bank capital varies only in response to changes in risk-weighted assets.

If deposits are not completely insured, however, depositors may demand higher returns for higher risk. In this case, higher bank leverage increases bank risk and the return required by depositors, leading bank shareholders to adhere to a higher capital ratio in order to reduce the cost of funding. Thus, if depositors impose discipline on bank shareholders, we predict the cost of deposits will have a positive influence on capital ratios. Moreover, as the marginal cost of deposits per unit of risk increases with market discipline, the optimum capital ratio will also increase with market discipline. For this reason, we predict that the positive relation between the cost of deposits and capital buffers will strengthen with market discipline.[3]

2.1.2. Cost of financial distress

finds that Basel II increases cyclicality in a sample of banks operating operating in OECD countries.

[3] Authors have traditionally considered two types of causality. Those explaining capital buffers consider it as the endogenous variable, while those analyzing market discipline usually consider the cost of deposits as the endogenous variable and test whether capital buffers reduce that cost (Demirgüc-Kunt and Huizinga, 2004). We are also interested in explaining the determinants of capital buffers, but we control for the endogeneity of the cost of deposits to consider both types of causality using the GMM estimator.

Capital reduces the likelihood of bankruptcy and financial distress costs, including both the legal costs of the bankruptcy process and the loss of charter value (Keeley, 1990). The banking literature indicates that higher market power that increases charter value reduces bank risk-taking incentives, because a bank with a high charter value has an incentive to avoid high-risk choices that may trigger a drop in its charter value.

Consistent with this argument, empirical studies show an inverse relation between charter value and bank risk-taking in US banks (Keeley, 1990; Galloway *et al*., 1997); in Japanese banks (Konishi and Yasuda, 2004); and in a sample of banks in 36 countries (González, 2005). Therefore, if banks with higher market power and high charter value have low risk-taking incentives, we would expect higher capital buffers in these banks, as they are of greater benefit in terms of avoiding the loss of charter value.

2.1.3. Adjustment costs

Banks may maintain a cushion of capital simply because it is costly to fall below the regulatory standards. Bank capital ratios may be shocked by earnings surprises and by unexpected opportunities to invest in positive net present value projects. Offsetting these shocks via changes to equity capital may have a negative impact on banks' common stock values. Equity issues may, in the case of information asymmetries, convey negative information to the market on the bank's economic value (Myers and Majluf, 1984). Moreover, increasing capital ratios via reductions in assets may require a bank to forgo positive net present value projects or sell assets at prices below their value. Banks may thus prefer to hold a "buffer" of excess capital to make it less likely they will fall below the legal capital requirements. Adjustment costs imply that a bank's capital ratio at any particular time may differ from its target ratio, because banks may only partially adjust toward their target in any given period. This reason would be enough to encourage banks to establish capital buffers even if depositors were totally insured (no market discipline) and there were no cost of financial distress associated with the loss of charter value.

On the basis of the above three capital buffer-linked costs, our first hypothesis is:

H.1. Bank capital buffers are positively related to deposits cost, bank market power, and adjustment costs.

2.2. Country determinants

We posit that the expected positive influence of market discipline and market power on capital buffers varies across countries, depending on bank regulation, bank supervision, and a country's institutions. We analyze the influence of the quality of accounting systems, the generosity of deposit insurance, restrictions on bank activities, official supervisory power, and the quality of a country's legal system and institutions.

2.2.1. Quality of accounting information

Pillar 3 of the Basel II Accord encourages greater bank disclosure to strengthen market discipline. Empirical evidence is consistent with this view, showing that investor monitoring of banks requires the development of accounting systems and information disclosure mechanisms to provide information on the value of banks' claims (Nier and Baumann, 2006). Therefore, if the quality of accounting information favors greater market discipline, we expect the cost of deposits to have a greater positive influence on bank capital buffers. We therefore expect to see higher capital buffers in countries with stricter accounting standards.

Accounting disclosure requirements may also have an effect on bank charter values. Yu (2005) reports that the quality of firms' information disclosure is negatively related to credit spreads. Reductions in spreads may increase bank valuations and thus mitigate bank risk-taking incentives, thereby encouraging larger capital buffers.

According to these arguments, the second hypothesis is:

H.2. Stricter accounting standards encourage larger capital buffers to reduce both the cost of deposits and the cost of financial distress associated with the loss of charter value.

2.2.2. Generosity of deposit insurance

It has long been suggested that more generous deposit insurance weakens the market discipline enforced by depositors and encourages banks to take greater risks (Merton, 1977). Some empirical evidence confirms this effect, showing that deposit insurance increases the likelihood of banking crises (Demirgüc-Kunt and Detragiache, 2002) and that risk-shifting incentives are positively related to the generosity of deposit insurance (Hovakimian *et al.* 2003). According to this evidence, if more generous deposit insurance reduces market discipline, it will also make the cost of deposits less sensitive to bank risk and reduce the optimum capital ratio for banks. For this reason, we forecast that the positive relation between

the cost of deposits and the capital ratio will be weaker depending on the generosity of the deposit insurance.

There is little research on the influence of the generosity of deposit insurance on bank charter values. To our knowledge, only González (2005) offers evidence on this issue, finding a positive relation between the presence of explicit deposit insurance and the charter values of banks in 32 countries. A positive relation would provide banks that have explicit deposit insurance with incentives to hold capital buffers to preserve their higher charter value.

If deposit insurance diminishes market discipline but increases bank charter value, its predominant effect on capital buffers becomes an empirical question. The third hypothesis is:

H.3. More generous deposit insurance makes capital buffers less important in reducing the cost of deposits but more important in reducing the cost of financial distress.

2.2.3. Restrictions on bank activities

One further regulatory variable is whether banks are allowed to undertake activities that generate non-interest income (e.g., securities, insurance, real estate, and bank ownership of non-financial firms). Tighter restrictions on bank activities may reduce depositors' incentives to monitor banks, as constraints on a bank's range of activities limit the opportunities for bank managers to undertake risky investments. Relaxation of market discipline will make it less beneficial for a bank to hold capital buffers. Flannery and Rangan (2008) show that when long-standing restrictions on permissible bank activities were removed in the US in the 1990s, banks raised their capital ratios as a consequence of enhanced market discipline. We thus expect tighter restrictions on bank activities to make the cost of deposits less sensitive to bank risk.

Claessens and Laeven (2004) conclude that restrictions on bank activities have a negative influence on market competition and increase bank market power. We would accordingly expect that the stricter the restrictions on bank activities, the greater the positive influence of market power on capital buffers.

The theoretical offsetting effects that restrictions on bank activities may have on capital buffers are considered in our fourth hypothesis, making their analysis an empirical question.

H.4. Tighter restrictions on bank activities make capital buffers less important in reducing the cost of deposits but more important in reducing the cost of financial distress.

2.2.4. Official supervision

Official supervisory power may affect capital buffers in a number of ways. First, greater official supervision, such as in early closure of failing banks or early substitution of bank managers in difficulty, may become a way to reduce the risk undertaken by banks and will have a direct positive link on capital buffers. Aggarwal and Jacques (2001) document that the prompt corrective action provision of the Federal Deposit Insurance Corporation Improvement Act (FDICIA) passed by the US Congress in 1991 was effective in raising capital ratios and reducing credit risk.

Second, if official bank supervision is a stand-in for private supervision, it may have a negative effect on capital buffers by reducing market discipline. Any official control that curbs investor incentives to monitor would make the cost of funding less sensitive to bank risk. We accordingly expect banks in countries with more official supervisory power to have a less positive relation between capital ratio and the cost of deposits.

Third, official oversight may affect bank charter values and therefore incentives to hold capital buffers in two different ways. On the one hand, effective supervision may enhance investor confidence regarding expropriation and boost charter values. Official supervision may also constrain some bank decisions and limit bank market competition, which would also encourage higher charter value. On the other hand, as bank supervision aims to protect depositors and to reduce excessive risk-taking by owners, it might actually reduce bank charter values by forcing bank risk below what equityholders would choose in the presence of government insurance. Empirical evidence provided by Caprio *et al*. (2007) for a sample of publicly traded banks in 44 countries does not show that official supervisory power has a significant influence on bank valuations.

The multiple and mixed effects of official supervisory power lead us to make no explicit hypothesis on its effect on capital buffers.

2.2.5. Institutions

A growing number of recent papers highlights that well-functioning markets and financial development rely on contracts and their legal enforceability (La Porta *et al.*, 1998). As the enforceability of contracts is the prime reason investors have incentives to monitor and the reason markets develop and progress, market discipline by depositors will be strengthened with the quality of the legal and institutional environment. We thus expect higher market discipline in good-quality contracting environments to make capital buffers more sensitive to the cost of deposits.

Yet greater competition promoted by better institutions may have a negative impact on capital buffers by reducing bank market power. As Keeley (1990) and Galloway *et al.* (1997), among others, have demonstrated for US banks, reduction in market power and bank franchise value lessens banks' incentives to hold capital buffers. For this reason, we expect better institutions to reduce the ability of market power to provide incentives to hold capital buffers.

Our fifth hypothesis captures the offsetting effects of a better-quality institutional environment on capital buffers:

H.5. Better institutions make capital buffers more important in reducing the cost of deposits but less important in reducing the cost of financial distress.

3. Database and econometric model

3.1. Database

We obtain consolidated bank balance-sheet and income-statement data (in US dollars and in real prices) from the Fitch-IBCA Ltd. BankScope Database for 1995-2002. Our starting point is the 118 countries included in the World Bank's Bank Regulation and Supervision database, for which information about bank capital requirements is available. We add seven other countries (Colombia, Ecuador, Hong Kong, Malaysia, Norway, Tunisia, and Ukraine) after examining the web pages of their central banks. We eliminate 26 countries because of the lack of data in Bankscope to calculate market power (9 countries) and other bank explanatory variables (17 countries). The final sample covers 70 countries.

3.2. Econometric model

We apply the generalized method of moments (GMM) estimator developed for dynamic models of panel data by Arellano and Bond (1991). This methodology is specifically designed to address three relevant econometric issues: (1) the presence of unobserved bank-specific effects, which we eliminate by taking first-differences of all variables; (2) the autoregressive process in the data regarding the behavior of capital buffers (i.e., the need to use a lagged dependent variables model to capture the dynamic nature of the capital buffer); and (3) the likely endogeneity of the explanatory variables. The panel estimator controls for this potential endogeneity by using instruments based on lagged values of the explanatory variables.[4]

The model is:

$$RBUF_{i,t} = \beta_0 + \beta_1 \, RBUF_{i,t-1} + \beta_2 \, COSTDEP_{i,t} + \beta_3 \, LERNER_{i,t} + \beta_4 \, LERNERSQ_{i,t} + \beta_5 \, BANK_{i,t} + \\ + \beta_6 \, REGINST_{i,t} + \beta_7 \, GDPGR_{jt} + \beta_8 \sum_{j=1}^{70} Country_j + \beta_9 \sum_{t=1995}^{2002} T_t + \nu_i + \varepsilon_{it} \qquad [1]$$

where $RBUF_{i,t}$ is the capital buffer of bank i in year t. We measure capital buffers in relative terms, i.e., the difference between capital and the requirement divided by the requirement. Results do not change when the measure is in absolute terms. All the countries included in the study implemented the Basel I guidelines, and differences in requirements basically lie in the percentage of minimum capital required over risk-weighted assets. Table 1 reports requirements and capital buffers by country.

We define bank explanatory variables to capture the three types of capital buffer-related costs. We capture the importance of adjustment costs by using a partial adjustment model that includes the first lag of the dependent variable ($RBUF_{i,\,t-1}$). A positive and significant coefficient for this variable would indicate that adjustment costs are relevant.

We include the cost of deposits (COSTDEP) to incorporate the cost of funds and to evaluate the influence of market discipline. A positive coefficient for this variable would be consistent with the effect of market discipline. We follow Demirgüc-Kunt and Huizinga (2004) to measure the cost of deposits, defined as the ratio of interest expense to interest-

[4] Ayuso *et al.* (2004), Stoltz and Wedow (2005), and Jokipii and Milne (2008) also use this estimator to analyze the cyclical behavior of capital buffers.

bearing debt of the bank minus the government interest rate. The government rate is the Treasury bill rate where available; otherwise, it is the discount rate.[5]

We use the Lerner index (LERNER) to capture the expected financial distress costs associated with the loss of bank charter value. The Lerner index defines the difference between price (interest rate) and marginal cost expressed as a percentage of price, taking into account that the divergence between product price and marginal cost of production is the essence of monopoly power. We estimate a single indicator of the Lerner index using the same procedure as Maudós and Fernández de Guevara (2004). The Lerner index has been widely used in the banking sector as an indicator of the degree of market power.[6]

As higher market power reduces banks' incentives to increase risk to preserve their higher charter value, we expect a positive coefficient for LERNER. We include the square of the Lerner index (LERNERSQ) to capture possible non-linear relations. Elizalde and Repullo (2004) note that a higher franchise value provides a source of income in each period, which may reduce the need to hold capital as a buffer against losses. According to their model, the expected positive relation between charter value and capital buffers may become negative for high levels of charter value.

BANK includes a set of bank-specific characteristics: return on equity, size, loans, non-performing loans, and allowance for loan loss. Alfon *et al*. (2004) and Ayuso *et al*. (2004) use return on equity (ROE) as a proxy for the opportunity cost of capital, finding a negative relation between ROE and capital. However, ROE is valid as such a proxy only in perfectly competitive bank markets, however. Otherwise it is not a good proxy for cost of equity because it mirrors not only the return required by shareholders but also the positive effect of bank market power on profitability. Moreover, when there are information asymmetries, a significant proportion of fluctuations in bank earnings is kept as retained earnings, and increases in earnings will spark increases in capital ratio, so we can expect a positive relation between ROE and capital. Consistent with this argument, Berger (1995), Nier and Baumann (2006), and Flannery and Rangan (2008) find a positive relation between ROE and cost of

[5] We also control for the possibility that market discipline is substituted by some kind of bank market power in the deposit market dividing this absolute margin by the ratio of interest expense to interest-bearing debt of the bank. Basic results do not change when we use the relative margin.
[6] See Prescott and McCall (1975) for US banks, Shaffer (1993) for Canadian banks, and Maudós and Fernández de Guevara (2004) for banks in five European countries.

capital. The opposing arguments and mixed empirical evidence lead us to include ROE as a control variable and not make a clear forecast for the sign of its coefficient.

We control for the influence of bank size (SIZE) for several reasons. Big banks might have smaller buffers if, as the "too-big-to-fail" hypothesis suggests, they believe they will receive support from the regulator in the event of difficulties or if they have lower risk as a consequence of the enhanced diversification of their asset portfolio. These arguments predict a negative coefficient for SIZE. We use the natural logarithm of total bank assets as a measure of bank size.

As the Lerner index does not control for the risk of the bank asset portfolio (if risk is high, the Lerner index would be high, regardless of market power), we include bank loans (LOANS), non-performing loans (NPL), and allowance for loan loss (LLA) as measures of bank risk. These three variables are normalized by total bank assets.

Panel A of Table 1 reports median values of the bank variables by country. Correlations in Panel B show that capital buffers in relative and absolute terms are highly correlated (correlation of 0.992) and that, on average, capital buffers correlate positively with the cost of deposits and bank market power. Bank size and the ratios of loans and non-performing loans, however, correlate negatively with bank capital buffers.

INSERT TABLE 1 ABOUT HERE

REGINST is a set of proxy variables for regulation, supervision, and institutions in the country. These variables include: accounting and information disclosure requirements, the generosity of deposit insurance, restrictions on bank activities, official supervisory power, and the quality of a country's legal system and institutions. The proxies for the regulatory and supervisory variables come from the World Bank's Bank Regulation and Supervision Database and are defined following Barth *et al.* (2004).

We measure accounting and information disclosure requirements (ACCOUNT) by adding a value of one for an affirmative response to six questions related to the obligation to produce consolidated accounts, disclosure of off-balance sheet items and risk management procedures, or the requirement of credit ratings for commercial banks. Measures range from 0 to 6, and higher values indicate higher information disclosure requirements.

We follow Demirgüc-Kunt and Detragiache (2002) to measure the generosity of deposit insurance (HAZARD) and define this variable as the sum of eight dummy variables that are positively related to the moral hazard of deposit insurance. Measures range from 0 to 8, and higher values indicate more generous deposit insurance.

The measure of restrictions on bank activities (RESTRICT) indicates whether bank activities in the securities, insurance, and real estate markets and bank ownership and control of non-financial firms are: (1) unrestricted, (2) permitted, (3) restricted, or (4) prohibited. The aggregate indicator varies from 4 to 16, and higher numbers indicate more restrictions on bank activities and non-financial ownership and control.

We measure a country's official supervisory power (OFFICIAL) by adding a value of one for each affirmative answer to 14 questions intended to gauge the power of supervisors to undertake prompt corrective action, to restructure and reorganize troubled banks, and to declare a deeply troubled bank insolvent. This variable may range from 0 to 14, and higher values indicate more official supervisory power.

We report results measuring the quality of a country's legal environment by the KKZ index (KKZ) calculated by Kaufman *et al*. (2001) as the average of six indicators: voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption.[7]

We include the annual growth of real per capita gross domestic product (GDPGR) to control for the potential cyclical behavior of capital requirements under Basel I. A negative relation between capital buffers and the cyclical position offers support for the view that during upswings institutions tend to underestimate actual risks because they fail to properly characterize the cyclical nature of output. A positive relation between capital buffers and GDPGR indicates that banks would use capital buffers to offset the negative effects of pro-cyclical requirements. Data on GDP growth come from the International Financial Statistics of the IMF.

[7] We also check the robustness of results by including alternative measures of the quality of the legal and institutional environment: 1) the Economic Freedom Index (FREEDOM) of the Heritage Foundation, which measures which individuals and firms feel free to conduct their business; 2) the property rights (RIGHTS) index from the Economic Freedom Index used initially by La Porta *et al*. (1998), and 3) the law and order index (LAW) of the International Country Risk Guide. Results are not significantly different from those reported using the KKZ index.

We include a set of country dummy variables ($\sum_{j=1}^{70} Country_j$) to control for other country characteristics beyond those included in REGINST, and a set of dummy time variables ($\sum_{t=1995}^{2002} T_t$) to capture any unobserved bank-invariant time effects not included in the regression. Finally, u_i is an unobservable bank-specific effect, which is assumed to be constant over time; and ε_{it} is the white noise error term.

We control for the potential endogeneity of COSTDEP, LERNER, LERNERSQ, ROE, SIZE, LOANS, NPL, and LLA in the GMM estimations using two-to-four period lags of the same variables as instruments. We also identify the exogenous component of each country variable (REGINST) using the instruments defined by Barth *et al*. (2004). These are four binary variables indicating an English, German, French or Scandinavian legal origin following the classification of La Porta *et al*. (1998), a country's latitudinal distance from the equator, and three religious composition dummy variables. We measure religious composition as the percentage of population in each country that is Roman Catholic, Protestant, Muslim or other. The only variables considered exogenous are the country and the time dummy variables.

4. Empirical results

4.1. Bank determinants of capital buffers

Table 2 reports the results for bank determinants of capital buffers. We apply Sargan's statistic of over-identifying restrictions to confirm the absence of correlation between the instruments and the error term. The non-significance of the m_2 statistic indicates no second-order serial correlation in the first-difference residuals. These are the conditions required for consistency of the GMM estimates.[8]

INSERT TABLE 2 ABOUT HERE

[8] The absence of first-order serial correlation in the first-difference residuals indicated by the non-significant values of m_1 in some estimation suggests that errors in levels follow a random walk. This fact does not affect the consistency of the GMM estimates in the first-difference model (Arellano and Bond, 1991).

Results are consistent with our hypothesis H.1. The lagged dependent variable exhibits positive coefficients, confirming that adjustment costs impede a complete adjustment to the target capital buffer in each period. The cost of deposits (COSTDEP) has the positive coefficients that we predict when depositors impose discipline on bank shareholders.

The coefficients of LERNER are positive and of LERNERSQ negative. This result indicates that the once positive influence of market power turns negative at high levels of market power. This change is consistent with a conclusion that capital buffers are less useful as potential loss absorbers when considerable market power enables banks to offset losses with resources generated in a single period. The turning point is a value of 10.55 for LERNER according to the specification in column 3. Only one bank in our sample is above the LERNER value at the turning point, indicating that the primary effect of market power is to increase banks' capital buffer. The positive influence of market power on capital buffers in our international sample of banks confirms considerable evidence in US studies that shows higher market power dampens bank risk-taking incentives.

Economically, the cost of deposits and market power have a considerable impact on bank capital buffers. In regression (1), for instance, a one-standard deviation increase in cost of deposits (0.969) would cause an increase in the capital buffer (RBUF) of 0.870 times its standard deviation. In the case of market power, a one-standard deviation increase in the Lerner index (0.389) would cause an increase in the capital buffer of 0.03 times its standard deviation.

In columns (4) to (6) we interact COSTDEP and LERNER to see if they are substitutes. If a bank has market power, basically in the deposit market, it might not need to increase capital to reduce the cost of deposits when its risk profile increases. In this case, the positive relation between capital buffer and the cost of deposits is reduced. The negative coefficients of COSTDEPxLERNER in all the specifications confirm that market discipline and market power are substitutes in favoring higher capital buffers.

Coefficients of return on equity are not statistically significant and the results do not vary whether we include ROE in the regressions or not. As forecast, the coefficients for bank size (SIZE) are negative. The smaller capital buffers of large banks are consistent with a "too-big-to-fail" policy in that regulators provide support to large banks in case of financial distress, obviating to some extent the need for capital buffers.

The negative coefficients of LOANS, NPL, and LLA suggest that banks that opt to take greater risks with their assets also opt to hold smaller capital buffers. Data on NPL and LLA are less available, and we could obtain estimates for only 66 countries. The results for NPL and LLA should be treated with caution, however, because the Sargan test rejects the null hypothesis of the absence of correlation between the instruments and the error term.

GDPGR has negative statistically significant coefficients only in columns (2) and (5), when we include NPL and LLA as explanatory variables. The absence of significant coefficients in the other estimations is not consistent with the procyclical effect of capital requirements reported by Alfon *et al.* (2004) in the UK, Ayuso *et al.* (2004) in Spain, Lindquist (2004) in Norway, and Stolz and Wedow (2005) in Germany. In Section 4.3, we analyze whether this non-significant relation between capital buffers and the economic cycle in the overall sample reflects offsetting patterns across countries.

4.2. Country determinants of capital buffers

To analyze how the influence of market discipline and market power varies across countries, we add to model [1] two interaction terms for each country variable: one interaction term with the cost of deposits, and another with the Lerner index. A positive coefficient on the first interaction term would indicate that the positive relation between the cost of deposits and capital buffers increases with the country variable, consistent with greater market discipline. A negative coefficient would indicate that the country variable mitigates the positive relation.

A positive coefficient on the second interaction term would point to an enhanced capacity of market power to prevent bank risk from increasing with the country variable, fostering larger capital buffers. A negative coefficient implies decreased capacity of market power to prevent bank risk.

The paucity of instruments, the extensive number of country variables, and the need to use interaction terms indicate that it is best to incorporate each of the coefficients separately rather than incorporating the interaction terms of all country variables at once.[9]

[9] Barth *et al*. (2004) use a similar sequential procedure to analyze the influence of regulatory and supervisory practices on bank development.

Table 3 reports the results.[10] As in Table 2, the net effect of COSTDEP and LENER on capital buffers is positive in all the estimations. Using the average of the marginal effects in Table 3, a one-standard deviation increase in COSTDEP and LERNER would cause an increase in the capital buffer, respectively, of 0.450 and 0.072 times its standard deviation.

The results in column (1) are consistent with an expectation that the quality of accounting information has the positive effect on capital buffers forecasted in H.2. The positive coefficient of COSTDEPxACCOUNT confirms that better accounting disclosure increases capital buffers by strengthening market discipline. Moreover, the positive coefficient of LERNERxACCOUNT indicates that improved accounting transparency makes charter value better able to reduce bank risk-taking incentives and also increases bank incentives to hold larger capital buffers. In fact, the negative coefficient of LERNER indicates that market power would have a negative effect on capital buffers in countries with the poorest accounting standards. These results confirm the effectiveness of recent initiatives to improve the quality of bank disclosure to make banks more stable. They are also consistent with the results of Nier and Baumann (2006).

(INSERT TABLE 3 ABOUT HERE)

The results in column (2) of Table 3 indicate that more generous deposit insurance tends to reduce bank capital buffers. The negative coefficient of COSTDEPxHAZARD is consistent with reduced market discipline in countries with more generous deposit insurance and therefore with the diminished benefits of capital buffers in reducing banks' funding cost in these countries. That LERNERxHAZARD also has a negative coefficient suggests that more generous deposit insurance dampens the ability of market power to counteract bank risk-taking incentives, and leads banks to hold smaller capital buffers.

The results in column (3) indicate that restrictions on bank activities have the two opposite effects on capital buffers that we forecast in H.4. The negative coefficient of COSTDEPxRESTRICT on the one hand supports reduced market discipline in countries with tighter restrictions on bank activities. The positive coefficient of LERNERxRESTRICT on the

[10] We do not include NPL and LLA as control variables to maximize the number of countries and to avoid the problems of correlation between the instruments and the error term revealed in Table 2 when we include the two explanatory variables.

other hand supports the hypothesis that greater restrictions on bank activities add to the ability of market power to counteract bank risk-taking incentives. The negative coefficient of LERNER in this estimation indicates that market power might even have a negative effect on capital buffers in countries with the least stringent restrictions. The net effect on capital buffers of the two offsetting effects is positive. The marginal effect in Table 3 indicates that, using the mean values of COSTDEP and LERNER, a one-standard deviation increase in restrictions on bank activities (2.151) would cause an increase in the capital buffer of 0.071 times its standard deviation.

The results in column (4) confirm the offsetting effects of official supervision on bank capital buffers. The negative coefficient of COSTDEPxOFFICIAL is consistent with the diminished ability of bank capital to reduce the cost of deposits when more stringent official supervision lessens market discipline. The positive coefficient of LERNERxOFFICIAL, however, suggests that official supervisory power makes market power better able to reduce bank risk.

The net effect on capital buffers of the two opposite effects is positive for most banks in our sample. Using the mean values of COSTDEP and LERNER, a one-standard deviation increase in official supervision (8.579) would cause an increase in the capital buffer of 0.095 times its standard deviation.

Although the effect of country variables differs in the sign, there are no clear differences in their economic significance. The net effect of one-standard deviation of the country variable on the buffer ranges from 0.062 for the KKZ index to 0.118 for the generosity of deposit insurance.

The negative LERNERxKKZ coefficient in column (5) confirms that the enhanced quality of the institutional environment has a negative effect on capital buffers in that market power is less able to provide incentives for banks to behave prudently. The positive coefficient of COSTDEPxKKZ, although not statistically significant, is consistent with strengthened market discipline and with greater benefits of holding capital buffers to reduce the cost of funding in high-quality legal systems. The negative influence on the ability of bank charter value to counteract bank risk-taking incentives and the non-influence on market discipline point to a negative relation between the quality of the institutional environment and capital buffers.

Consistent with research that finds a negative relation between bank competition and financial stability, our results suggest that changes in restrictions on bank activities and official supervision have offsetting effects on market discipline and market power. Our results also indicate, however, that greater bank disclosure or less generous deposit insurance may be the way to make greater banking competition compatible with better financial stability by promoting both stronger market discipline and an improved ability of charter value to counteract bank risk-taking. This latter result is consistent with results finding a positive relation between competition and financial stability.[11]

4.3. Capital buffers and economic cycle

Most of the previous literature on capital buffers has focused on their relation to the economic cycle. We analyze instead whether the non-significant coefficients of GDP growth in Tables 2 and 3 stem from compensation of opposing effects across countries, estimating model [1] separately for each country. To save space, Table 4 provides the GDPGR variable coefficients only for countries with statistically significant coefficients.

Our results confirm different patterns across countries. We find a negative relation between economic cycle and capital buffers in seven countries, Chile, Denmark, France, Indonesia, the Philippines, the UK, and the US. In 5 countries there is a positive relation, Brazil, Hong Kong, India, Italy, and Romania. There is no statistically significant RBUF-GDPGR relation in the remaining 59 countries. The existence of opposite relations across countries between economic cycle and capital buffers is not captured in the other tables when we combine banks of different countries in a single sample.

INSERT TABLE 4 ABOUT HERE

5. Conclusions

This paper analyzes the determinants of bank capital buffers using a panel data of 1,337 banks in 70 countries between 1995 and 2002. We apply the GMM difference estimator to control for adjustment costs, unobservable heterogeneity and potential endogeneity of the

[11] The traditional negative relation between competition and financial stability initially reported by Keeley (1990) is at variance with a growing body of empirical evidence suggesting that increased competition is

explanatory variables. The results suggest that banks hold more capital, the higher the cost of deposits and the greater their market power. The positive influence of the cost of deposits mirrors the operation of market discipline in the countries in our sample. The positive influence of market power is consistent with evidence showing that banks with higher charter value have fewer risk-taking incentives and need less supervision and control.

Moreover, our results highlight that bank regulation, supervision, and institutions alter the influence of the cost of deposits and market power on capital buffers across countries. Restrictions on bank activities and official supervision reduce the incentives to hold capital buffers by weakening market discipline, but at the same time promote higher capital buffers by increasing market power. The net effect is positive for both country variables. Institutional quality has two opposite effects to restrictions on bank activities and official supervision. The net influence on capital buffers is negative.

Stringent accounting disclosure requirements and less generous deposit insurance, however, have a clear positive effect on capital buffers by both strengthening market discipline and making charter value better able to reduce risk-taking incentives. These results relate to the literature that finds a positive relation between competition and financial stability because they suggest that better bank disclosure or less generous deposit insurance may be ways to make greater banking competition compatible with greater financial stability.

Our analysis has three basic implications for regulatory policy. First, one should not always assume that supervisory capital standards inevitably constrain a bank. Market discipline and/or market power by themselves may induce banks to hold capital above the minimum stipulated, thereby reducing the power of capital requirements as instruments of financial stability. Second, bank regulators and supervisors should recognize that the effectiveness of regulatory capital requirements varies across countries, depending on current bank regulation (e.g., restrictions on bank activities, generosity of deposit insurance), official supervision, and the quality of accounting information and institutions. The third implication relates to the second and affects the implementation of the Basel II Accord. Given that official supervision (Pillar 2) and market discipline (Pillar 3) affect the effectiveness of regulatory capital requirements (Pillar 1), defining the optimum mix for each pillar is far more important in optimizing Basel II than developing each pillar separately, whatever its maximum potential.

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positively associated with banking stability (Barth *et al*., 2004; Schaeck and Cihák, 2007).

6. References

Aggarwal, R., Jacques, K.T., 2001. The impact of FDICIA and prompt corrective action on bank capital and risk: Estimates using a simultaneous equations model. Journal of Banking and Finance 25, 1139-1160.

Arellano, M., Bond, S., 1991. Some test of specification for panel data: Monte Carlo evidence and application to employment equations. Review of Economic Studies 58, 227-297.

Ayuso, J., Pérez, D., Saurina, J., 2004. Are capital buffers pro-cyclical? Evidence from Spanish panel data. Journal of Financial Intermediation 13, 249-264.

Barth, J.R., Caprio, G., Levine, R., 2004. Bank regulation and supervision: What works best? Journal of Financial Intermediation 13, 205-248.

Berger, A.N., 1995. The relationship between capital and earnings in banking. Journal of Money, Credit, and Banking 27, 432-456.

Caprio, G., Laeven, L., Levine R., 2007. Governance and bank valuation. Journal of Financial Intermediation 16, 584-617.

Claessens, S., Laeven, L., 2004. What drives bank competition? Some international evidence. Journal of Money, Credit, and Banking 36, 585-592.

Demirgüc-Kunt, A., Detragiache, E., 2002. Does deposit insurance increase banking system stability? An empirical investigation. Journal of Monetary Economics 49, 1373-1406.

Demirgüc-Kunt, A., Huizinga, H., 2004. Market discipline and deposit insurance. Journal of Monetary Economics 51, 375-399.

Elizalde, A., Repullo, R., 2004. Economic and regulatory capital. What is the difference? CEPR Discussion Papers.

Episcopos, A., 2008. Bank capital regulation in a barrier option framework. Journal of Banking an Finance 321, 466-500.

Flannery, M. J., Rangan, K. P., 2008. What caused the bank capital build-up of the 1990s? Review of Finance 12 (2), 391-429

Furlong, F.T., Keeley, M.C., 1989. Capital regulation and bank risk taking: A note. Journal of Banking and Finance 13, 883-891.

Galloway, T.M., Lee, W.B., Roden, D.M., 1997. Banks'changing incentives and opportunities for risk-taking. Journal of Banking and Finance 21, 509-527.

González, F., 2005. Bank regulation and risk-taking incentives: An international comparison of bank risk. Journal of Banking and Finance 29, 1153-1184.

Heid, F., 2007. The cyclical effects of the Basel II capital requirements. Journal of Banking and Finance 31, 3885-3900.

Hovakimian, A., Kane, E.J., Laeven, L., 2003. How country and safety-net characteristics affect bank risk-shifting. Journal of Financial Services Research 23, 177-204.

Jokipii, T., Milne, A. 2008. The cyclical behaviour of European bank capital buffers. Journal of Banking and Finance 32, 1440-1451..

Kaufman, D., Kraay, A., Zoido-Lobaton, P., 2001. Governance matters II: Update indicators for 2000/01. World Bank.

Keeley, M.C., 1990. Deposit insurance, risk, and market power in banking. American Economic Review 5, 1183-1200.

Kim, D., Santomero, A.M., 1988. Risk in banking and capital regulation. Journal of Finance 43, 1219-1233.

Koehn, M., Santomero, A.M., 1980. Regulation of bank capital and portfolio risk. Journal of Finance 35, 1235-1244.

Konishi, M., Yasuda, Y., 2004. Factors affecting bank risk-taking: Evidence from Japan. Journal of Banking and Finance 28, 215-234.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 1998. Law and Finance. Journal of Political Economy 106, 1113-1155.

Lindquist, K.G., 2004. Banks buffer capital: How important is risk? Journal of International Money and Finance 23, 493-513.

Maudós, J., Fernández de Guevara, J., 2004. Factors explaining the interest margin in the banking sectors of the European Union. Journal of Banking and Finance 28, 2259-2281.

Merton, R.C., 1977. An analytic derivation of the cost of deposit insurance and loan guarantees. Journal of Banking and Finance 1, 3-11.

Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187-221.

Nier, E., Baumann, U., 2006. Market discipline, disclosure and moral hazard in banking. Journal of Financial Intermediation 15, 332-361.

Prescott, H., MCall, A., 1975. Market power and structure and commercial bank installment lending. Journal of Money, Credit, and Banking 7, 449-467.

Schaeck, K., Cihák, M., 2007. Banking competition and capital ratios. IMF Working Paper, WP/07/216.

Shaffer, S., 1993. Patterns of competition in banking. Journal of Economics and Business 56, 287-313.

Stolz, S., Wedow, M., 2005. Banks' regulatory capital buffer and the business cycle: Evidence for German saving and cooperative banks. Discussion Paper Series 2: Banking and Financial Studies, 07/2005.

VanHoose, D., 2007. Theories of bank behavior under capital regulation. Journal of Banking and Finance 31, 3680-3697.

Yu, F., 2005. Accounting transparency and the term structure of credit spreads. Journal of Financial Economics 75, 53-84.

Table 1

Summary statistics by country

Median values by country. Capital requirement shows the percentage of minimum capital required over risk-weighted assets defined following Basel I. RBUF is the capital buffer in relative terms (the difference between capital and the requirement divided by the requirement), BUF is the capital buffer in absolute terms, COSTDEP is the cost of deposits, LERNER is the Lerner index, ROE is the return on equity, SIZE is the logarithm for total bank assets, LOANS is the ratio of total loans to total bank assets, NPL is the ratio of non-performing loans to total bank assets, and LLA is the ratio of the total allowance for loan loss to total bank assets. ***, **, and * represent significance at the 1%, 5% and 10% levels, respectively.

Panel A: Descriptive statistics (Median values)

Country	Capital Requirement	RBUF	BUF	COSTDEP	LERNER	ROE	SIZE	LOANS	NPL	LLA	# observations	# banks
Argentina	11.5	0.331	3.810	0.045	0.032	0.158	15.060	0.567	0.056	0.035	14	2
Australia	8	0.387	3.100	0.044	0.285	0.189	16.053	0.785	0.007	0.008	113	16
Austria	8	0.341	2.730	0.036	0.237	0.115	13.259	0.529	0.036	0.033	46	10
Bahrain	12	0.730	8.765	0.048	0.248	0.117	14.663	0.525	0.049	0.053	36	6
Bangladesh	8	0.524	4.195	0.057	0.267	0.464	12.129	0.582	0	0.023	26	5
Brazil	11	0.568	6.250	0.138	0.096	0.175	13.894	0.354	0.065	0.049	288	56
Colombia	9	0.269	2.425	0.127	0.026	0.098	13.770	0.599	0.050	0.025	54	4
Croatia	10	0.660	6.600	0.040	0.147	0.058	13.816	0.477	0.117	0.138	32	5
Cyprus	8	0.460	3.680	0.052	0.365	0.167	15.440	0.589	0.071	0.041	20	4
Czech Republic	8	0.951	7.610	0.054	0.221	0.103	13.676	0.375	0.098	0.093	57	10
Chile	8	0.525	4.200	0.057	0.088	0.139	14.513	0.623	0.015	0.022	76	15
Denmark	8	0.703	5.625	0.028	0.270	0.139	12.676	0.594	0.011	0.051	396	53
Ecuador	9	0.556	5.000	0.060	0.425	0.093	13.480	0.544	0.107	0.114	19	5
El Salvador	11	0.305	2.438	0.068	0.124	0.177	14.238	0.613	0.031	0.031	25	3
Estonia	10	0.401	4.010	0.032	0.394	0.165	12.659	0.518	0.057	0.022	34	5
Finland	8	0.420	3.360	0.034	0.046	0.120	16.364	0.512	0.010	0	46	8
France	8	0.430	3.440	0.046	0.026	0.119	14.509	0.469	0.069	0.046	401	64
Germany	8	0.262	2.100	0.039	0.141	0.128	17.041	0.545	0.032	0.028	101	16
Greece	8	0.524	4.190	0.059	0.176	0.297	16.679	0.387	0	0.033	31	3
Hong Komg	12.5	0.712	8.895	0.052	0.197	0.124	14.986	0.541	0.030	0.021	234	32
Hungary	8	0.647	5.175	0.064	0.066	0.197	14.620	0.524	0.029	0.018	34	5
Iceland	8	0.289	2.310	0.053	0.274	0.140	14.257	0.731	0.038	0.025	29	3
India	8	0.407	3.260	0.070	0.114	0.204	14.236	0.428	0.069	0.051	378	57
Indonesia	8	0.769	6.150	0.101	0.334	0.155	12.519	0.592	0.095	0.033	217	38
Ireland	8	0.387	3.100	0.042	0.548	0.220	16.894	0.605	0.019	0.017	30	4
Israel	9	0.126	1.135	0.049	0.086	0.103	14.965	0.710	0.073	0.025	84	14
Italy	8	0.512	4.095	0.032	0.051	0.118	14.295	0.536	0.063	0.029	520	95
Jamaica	10	1.657	16.570	0.062	0.135	0.419	14.466	0.289	0.067	0.038	7	1
Japan	8	0.237	1.895	0.016	-1.092	0.028	18.784	0.690	0.056	0.025	36	5
Jordan	12	0.186	2.240	0.049	0.168	0.156	13.925	0.399	0.138	0.076	23	4
Kazakhstan	12	1.937	23.250	0.048	0.261	0.204	11.127	0.543	0.035	0.050	26	2
Kenya	7.5	1.833	13.750	0.075	0.177	0.249	10.881	0.601	0.213	0.095	23	5
Korea	8	0.344	2.755	0.062	0.041	0.038	17.557	0.554	0.116	0.031	60	10
Kuwait	12	0.758	9.100	0.052	0.370	0.135	15.316	0.407	0.133	0.132	26	4
Lithuania	10	0.649	6.490	0.041	-0.021	0.081	11.871	0.477	0.097	0.057	44	8
Luxembourg	8	0.532	4.255	0.058	0.120	0.234	15.650	0.166	0	0.031	120	19
Malawi	8	1.750	14.000	0.116	0.377	0.723	11.692	0.307	0.112	0.053	14	2
Malaysia	8	0.665	5.320	0.040	0.261	0.148	14.465	0.638	0.060	0.040	161	27
Malta	8	1.136	9.090	0.041	0.238	0.187	13.088	0.390	0.052	0.030	36	5
Mauritius	10	0.824	8.240	0.072	0.329	0.180	13.042	0.609	0.151	0.042	18	4
Mexico	8	0.579	4.630	0.189	1.356	0.076	16.087	0.680	0.074	0.066	31	7
Moldova	12	2.750	33.000	0.074	0.423	0.189	9.932	0.519	0.131	0.084	10	2
Namibia	8	0.862	6.900	0.088	-0.355	0.414	12.629	0.733	0.075	0.036	20	3
Netherlands	8	0.825	6.600	0.048	0.014	0.106	14.790	0.535	0.020	0.017	135	20
Nigeria	8	0.660	5.280	0.043	0.214	0.301	13.347	0.255	0.318	0.211	16	3
Norway	8	0.370	2.960	0.052	-0.017	0.140	14.538	0.840	0.027	0.019	74	10
Oman	12	0.365	4.375	0.046	0.303	0.152	13.475	0.736	0.079	0.041	42	7
Peru	9	0.157	1.430	0.067	-0.021	0.031	14.355	0.579	0.105	0.095	13	2
Philippines	10	0.623	6.230	0.055	0.064	0.046	13.790	0.642	0.136	0.056	62	11
Poland	8	0.701	5.605	0.084	0.780	0.184	13.792	0.479	0.120	0.051	106	17
Portugal	8	0.487	3.900	0.047	-0.101	0.117	15.780	0.442	0.032	0.023	77	13
Romania	8	2.661	21.290	0.159	0.251	0.174	12.232	0.346	0.041	0.056	62	11
Russian	12	1.129	13.550	0.063	0.332	0.184	11.987	0.426	0.007	0.082	99	15
Saudi Arabia	8	1.067	8.540	0.036	0.152	0.171	15.739	0.404	0.058	0.045	27	4
Singapore	12	0.733	8.800	0.033	0.288	0.105	17.022	0.601	0.106	0.050	32	6
Slovakia	8	0.562	4.495	0.075	0.277	0.109	13.127	0.363	0.052	0.067	30	6
Slovenia	8	0.737	5.900	0.052	0.189	0.165	13.525	0.523	0.081	0.061	62	10
South Africa	8	0.400	3.200	0.104	0.762	0.190	14.095	0.777	0.044	0.024	53	10
Spain	8	0.351	2.810	0.038	0.066	0.157	15.950	0.513	0.019	0.022	115	20

Sri Lanka	8	0.656	5.250	0.073	0.396	0.080	11.349	0.593	0.150	0.021	25	5
Sweden	8	0.584	4.670	0.047	0.358	0.165	16.165	0.624	0.022	0.107	53	8
Switzerland	8	0.745	5.960	0.032	0.280	0.135	15.291	0.394	0.053	0.052	63	10
Thailand	8	0.438	3.720	0.033	-0.485	-0.171	15.919	0.716	0.236	0.076	39	9
Trinidad and Tobago	8	0.527	4.220	0.065	0.295	0.411	13.709	0.638	0.024	0.006	7	1
Tunisia	8	0.246	1.970	0.029	0.250	0.163	13.820	0.707	0.133	0.099	20	4
Turkey	8	0.592	4.740	0.146	0.095	0.317	14.474	0.401	0.039	0.030	29	4
Ukraine	8	2.750	22.000	0.085	0.133	0.116	11.089	0.493	0.080	0.117	32	2
U K	8	0.975	7.900	0.050	0.142	0.147	15.073	0.479	0.028	0.021	194	28
US	8	0.537	4.300	0.034	0.227	0.210	14.683	0.635	0.005	0.015	2922	408
Venezuela	10	0.979	9.790	0.070	0.133	0.187	11.982	0.437	0.052	0.066	145	26
Median		0.562	4.700	0.041	0.189	0.166	14.420	0.566	0.008	0.022		
Mean		1.103	9.452	0.058	0.171	0.101	14.416	0.539	0.026	0.051		
Standard Dev.		2.768	24.454	0.185	0.389	3.840	2.047	0.201	0.059	0.307		

Panel B: Correlations

Variables	RBUF	BUF	COSTDEP	LERNER	ROE	SIZE	LOANS	NPL	LLA
RBUF	1								
BUF	0.992***	1							
COSTDEP	0.107***	0.109***	1						
LERNER	0.069***	0.073***	-0.002	1					
ROE	0.008	0.008	-0.002	0.047***	1				
SIZE	-0.256***	-0.273***	-0.071***	-0.024**	0.002	1			
LOANS	-0.285***	-0.293***	-0.067***	0.046***	-0.008	0.107***	1		
NPL	-0.090***	-0.070***	0.203***	-0.289***	-0.068***	-0.126***	0.003	1	
LLA	0.018	0.022	0.046***	-0.114***	-0.011	-0.062***	-0.120***	0.178***	1

Table 2
Bank determinants of capital buffers

We estimate regressions using the Arellano and Bond (1991) GMM difference estimator for panel data with lagged dependent variables. The dependent variable is the capital buffer in relative terms (RBUF). As explanatory variables we include one lag of the dependent variable ($RBUF_{t-1}$), the cost of deposits (COSTDEP), the Lerner index (LERNER) as a measure of the bank's market power, the square of the Lerner index (LERNERSQ), the return on equity (ROE), the natural logarithm of bank assets (SIZE), the ratio of loans to total bank assets (LOANS), the ratio of non-performing loans to total bank assets (NPL), the ratio of the total allowance for loan loss to total bank assets (LLA), and the GDP growth in the country (GDPGR). We estimate regressions for 1995-2002. Year and country dummy variables are included for all the estimations but are not reported. T-statistics are in parentheses. ***, **, and * represent significance at the 1%, 5% and 10% levels, respectively.

	Predicted sign	Panel A. Dependent variable RBUF					
		(1)	(2)	(3)	(4)	(5)	(6)
$RBUF_{t-1}$	+	0.339***	0.258***	0.327***	0.336***	0.253***	0.327***
		(61.33)	(46.73)	(70.17)	(76.66)	(53.72)	(99.95)
COSTDEP	+	2.473***	3.113***	2.708***	2.773***	3.544***	2.858***
		(15.85)	(16.31)	(21.70)	(23.27)	(25.82)	(29.98)
LERNER	+	0.202***	0.756***	0.633***	0.190***	0.889***	0.563***
		(2.63)	(10.25)	(8.40)	(3.58)	(15.08)	(9.91)
ROE	-/+	-0.032	0.008	-0.034	0.003	0.006	-0.029
		(-0.91)	(0.67)	(-1.04)	(0.13)	(0.65)	(-1.20)
SIZE	-	-0.404***	0.522***	-0.365***	-0.272***	0.581***	-0.293***
		(-9.19)	(10.82)	(-8.72)	(-9.72)	(14.50)	(-10.13)
LOANS		-0.514*	-1.132***	-0.010	-0.472**	-1.216***	0.176
		(-1.78)	(-9.15)	(-0.04)	(-2.11)	(-11.35)	(0.98)
NPL			-0.424**			-0.137	
			(-2.28)			(-1.37)	
LLA			-0.060***			-0.059***	
			(-17.16)			(-17.64)	
LERNERSQ	-			-0.030***			-0.023***
				(-4.22)			(-4.05)
COSTEDxLERNER					-1.630***	-3.212***	-0.920***
					(-5.85)	(-7.64)	(-3.79)
GDPGR	-	-0.00003	-0.0096***	-0.0000	-0.00002	-0.009***	-0.0000
		(-0.57)	(-19.60)	(0.02)	(-0.47)	(-23.50)	(0.09)
Year dummies		Yes	Yes	Yes	Yes	Yes	Yes
Country dummies		Yes	Yes	Yes	Yes	Yes	Yes
m_1		-1.62*	-0.46	-1.65*	-1.55	-0.30	-1.62*
m_2		1.03	-0.49	1.04	1.01	-0.52	1.03
Sargan Test		152.54	261.58**	188.25	206.85	288.01**	238.32
# observations		5202	3577	5202	5202	3577	5202
# banks		1337	978	1337	1337	978	1337
# countries		70	66	70	70	66	70

Table 3. Political economy variables and capital buffers

We estimate regressions using the Arellano and Bond (1991) GMM difference estimator for panel data with lagged dependent variables. The dependent variable is the capital buffer in relative terms (RBUF). As explanatory variables we include one lag of the dependent variable ($RBUF_{t-1}$), the cost of deposits (COSTDEP), the Lerner index (LERNER) as a measure of the bank´s market power, the square of the Lerner index (LERNERSQ), the return on equity (ROE), the natural logarithm of bank assets (SIZE), the ratio of loans to total bank assets (LOANS), and the GDP growth in the country (GDPGR). ACCOUNT is the index of information disclosure requirements. HAZARD is the index of moral hazard associated with the generosity of deposit insurance. RESTRICT is the measure of regulatory restrictions on bank activities. OFFICIAL measures the power of official bank supervision. KKZ is the indicator of institutional quality in the country. We estimate regressions for 1995-2002. Year and country dummy variables are included for all the estimations but are not reported. T-statistics are in parentheses. ***, **, and * represent significance at the 1%, 5% and 10% levels, respectively.

	Predicted sign	(1)	(2)	(3)	(4)	(5)
RBUFt-1	+	0.325***	0.326***	0.326***	0.333***	0.325***
		(70.42)	(65.61)	(68.36)	(69.92)	(63.27)
COSTDEP	+	-23.565***	4.577***	5.333***	3.966***	0.777***
		(-4.07)	(5.08)	(2.81)	(5.76)	(3.31)
LERNER	+	-7.054***	5.714***	-3.975***	-0.828**	1.239***
		(-5.29)	(16.31)	(-8.01)	(-2.38)	(16.12)
LERNERSQ	-	-0.040***	-0.007	-0.067***	-0.029***	0.083***
		(-6.91)	(-1.19)	(-6.94)	(-6.25)	(10.46)
ROE		-0.019	0.014	0.019	0.001	0.050
		(-0.55)	(0.46)	(0.53)	(0.02)	(1.43)
SIZE	-	-0.296***	-0.370***	-0.321***	-0.267***	-0.381***
		(-6.32)	(-9.97)	(-6.32)	(-4.98)	(-14.83)
LOANS		-0.018	0.136	-0.164	-0.078	-0.193
		(-0.07)	(0.65)	(-0.71)	(-0.36)	(-0.89)
GDPGR	-	-0.003	-0.003	-0.003	-0.004	0.000
		(-0.66)	(-0.71)	(-0.72)	(-0.79)	(0.17)
ACCOUNT		-0.163*				
		(-1.91)				
COSTDEPxACCOUNT	+	5.978***				
		(4.22)				
LERNERxACCOUNT	+	1.858**				
		(5.60)				
HAZARD			-0.012			
			(-0.24)			
COSTDEPxHAZARD	-		-0.605***			
			(-4.07)			
LERNERxHAZARD	+		-1.082***			
			(-15.91)			
RESTRICT				0.032**		
				(2.43)		
COSTDEPxRESTRICT	-			-0.418***		
				(-2.34)		
LERNERxRESTRICT	+			0.486***		
				(8.28)		
OFFICIAL	+				0.021**	
					(2.08)	
COSTDEPxOFFICIAL	-				-0.226**	
					(-4.45)	
LERNERxOFFICIAL	-/+				0.134***	
					(3.93)	
KKZ						0.016**
						(2.20)
COSTDEPxKKZ	+					0.014
						(0.58)
LERNERxKKZ	-					-0.317***
						(-18.10)
Year dummies		Yes	Yes	Yes	Yes	Yes
Country dummies		Yes	Yes	Yes	Yes	Yes
Marginal effects:						
COSTED		0.582	0.450	0.455	0.464	0.301
LERNER		0.047	0.042	0.115	0.105	0.052
The country variable		0.106	-0.118	0.071	0.095	-0.062
m_1		-1.35	-1.37	-1.37	-1.38	-1.39
m_2		0.94	0.94	0.95	0.95	0.94
Sargan Test		202.92	187.87	209.70	196.60	210.14
# observations		5202	5202	5202	5202	5202
# banks		1337	1337	1337	1337	1337
# countries		70	70	70	70	70

Table 4
Capital buffers and economic cycle

These results are for countries with statistically significant coefficients. The coefficient of GDP growth across countries shown in column 1 is obtained using the Arellano and Bond (1991) GMM difference estimator for panel data with lagged dependent variables. In each country regression, the dependent variable is the capital buffer in relative terms (RBUF). As explanatory variables we include one lag of the dependent variable ($RBUF_{t-1}$), the cost of deposits (COSTDEP), the Lerner index (LERNER) as a measure of the bank's market power, the square of the Lerner index (LERNERSQ), the return on equity (ROE), the natural logarithm of bank assets (SIZE), the ratio of loans to total bank assets (LOANS), and the GDP growth in the country (GDPGR). We estimate regressions for each country for 1995-2002. Year dummy variables are included in all estimations. T-statistics are in parentheses. ***, **, and * represent significance at 1%, 5%, and 10% level, respectively.

	GDP Growth	m_2	Sargan test	# banks
	(1)	(2)	(3)	(4)
Brazil	0.202*** (6.27)	1.02	40.78	56
Chile	-0.199** (-2.27)	0.56	3.07	15
Denmark	-0.012*** (-2.86)	0.59	36.41	53
France	-0.248*** (-4.75)	1.01	55.70	64
Hong Kong	0.038*** (12.16)	0.94	18.43	32
India	0.001*** (12.11)	1.24	42.86	57
Indonesia	-0.006* (-1.68)	-1.61	22.83	38
Italy	0.449*** (39.15)	0.78	72.08	95
Philippines	-0.178*** (-2.99)	-0.63	3.19	11
Romania	0.387** (2.38)	-1.36	0.00	11
UK	-0.336*** (-4.67)	1.16	16.97	28
US	-0.003*** (-6.32)	-0.13	235.11**	408