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Published in:
Journal of Financial Intermediation

DOI:
10.1016/j.jfi.2014.11.005

Publication date:
2015

Document Version
Peer reviewed version

Bank capital management: International evidence[1]

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November 2014

Abstract

We examine the dynamic behavior of bank capital using a global sample of 64 countries during the 1994–2010 period. Banks achieve deleveraging primarily through equity growth (rather than asset liquidation). In contrast, they achieve leveraging through reduced earnings retention and substantial asset expansion. The speed of capital structure adjustment is heterogeneous across countries. Banks make faster capital structure adjustments in countries with more stringent capital requirements, better supervisory monitoring, more developed capital markets, and high inflation. In times of crises, banks adjust their capital structure significantly more quickly.

JEL classification: G20, G21, G28, G32

Keywords: Bank, Capital, Regulation, International, Speed of adjustment, Basel III

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[1] The authors thank Charles Calomiris (the editor), Elena Carletti, Hans Degryse, Cem Demiroglu, Bob DeYoung, Mark Flannery, Reint Gropp, Zhiguo He, Harry Huizinga, Anjan Thakor, Josef Zechner, an anonymous referee and seminar participants of the Belgian Financial Research forum, Glasgow Business School, the Dutch Central Bank (DNB), Tilburg University, the Bocconi - CAREFIN conference on The Effect of Tighter Regulatory Requirements on Bank Profitability and Risk-Taking Incentives, and the FINEST workshop on Competing for Survival in the Banking Industry at the Rome III University for interesting discussions and helpful comments. The authors gratefully acknowledge the financial support of the Center for Applied Research in Finance (CAREFIN) of Bocconi University.

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Abstract

We examine the dynamic behavior of bank capital using a global sample of 64 countries during the 1994–2010 period. Banks achieve deleveraging primarily through equity growth (rather than asset liquidation). In contrast, they achieve leveraging through reduced earnings retention and substantial asset expansion. The speed of capital structure adjustment is heterogeneous across countries. Banks make faster capital structure adjustments in countries with more stringent capital requirements, better supervisory monitoring, more developed capital markets, and high inflation. In times of crises, banks adjust their capital structure significantly more quickly.

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1. Introduction

Theoretical research on bank capital has primarily focused on the existence and determinants of optimal bank capital ratios (see, e.g., Orgler and Taggart (1983); Myers and Rajan (1998); Diamond and Rajan (2000); Allen, Carletti, and Marquez (2011)). An increasing body of empirical research provides support for the existence of an optimal capital structure (e.g., Marcus (1983), Flannery and Rangan (2008); Schaeck and Cihak (2011)). However, shocks to the actual and optimal capital ratios may create a wedge between the two. In this paper, we investigate, in a global context, an important aspect of bank capital management, i.e. the adjustment process to target capital. In particular, we provide answers to the following three questions. If banks' observed capital ratio deviates from their optimal or target capital ratio, which adjustments do they make to achieve those targets? Is the speed of adjustment to the target capital ratio homogeneous across countries? What affects the speed at which banks (de)leverage? These questions remain largely unanswered in the academic literature on bank capital, though they are of major importance for understanding adjustment costs, stress tests, the dynamic unwinding of financial crises, and the feedback loops between the financial sector and the real economy.

To address these questions, we model bank capital ratios using a partial adjustment framework with bank-specific and time-varying targets and heterogeneous adjustment to the target. Our empirical setup and rich international sample yield novel results for the capital structure and banking literature streams and offer new insights into an optimal regulatory design. Our contribution is twofold.

The first contribution of this study is an assessment of the balance sheet transactions banks rely on when they need to alter their capital ratio to reach the target level. We decompose

the growth of equity, assets, and liabilities into their constituents and explore the underlying drivers. On the one hand, banks that need to reduce their leverage[3] primarily raise equity (either through share sales or retained earnings), rather than by curtailing asset growth. While asset growth is lower for under-capitalized banks, it is still positive. This phenomenon is perhaps surprising because it is generally thought that undercapitalized banks confront large costs of raising equity. Furthermore, in sample splits based on bank size, we find that smaller institutions are more prone to rely on fire sales for de-levering. On the other hand, banks that are above their target capital ratio lever up by expanding assets rather than by reducing capital. For such banks, the growth in reserves and retained earnings is slower. At the same time, assets grow substantially faster. The results of these analyses shed more light on the ongoing debate of whether and how firms and banks manage their capital structure.

Previous work primarily focuses on the impact of the bank's environment on its optimal capital ratio (in limited samples). In line with Shrieves and Dahl (1992) and the corporate finance literature, the modeling approach often allows for partial adjustment to these equilibrium target ratios. However, most studies assume that the speed of adjustment is uniform across all banks.[4] Our second contribution is to relax the homogeneity assumption in the speed of adjustment. We document a substantial amount of cross-country heterogeneity in bank adjustment speeds across the globe. The average speed of adjustment in the overall sample is 0.29. This indicates that each year, the typical bank closes about a third of the gap between its actual and its desired capital ratio. Put differently, it takes on average two years for a typical bank to close half the gap

[3] We use the terms "leverage" and "bank capital" interchangeably to refer to the equity-to-asset ratio.

[4] The few banking studies that allow for heterogeneous adjustment predominantly focus on a single country and examine whether undercapitalized banks exhibit faster adjustment (e.g., Berger, DeYoung, Flannery, Lee, and Oztekin (2008) and Memmel and Raupach (2010)).

between its actual and target capital ratio.[5] The cross-country standard deviation in the speed of adjustment is 0.15, implying a half-life of 4.26 years for sluggish adjusters (i.e., banks whose speed of adjustment is one standard deviation below the sample mean) and a half-life of 1.15 years for flexible adjusters.

We investigate how cross-country variations in the macroeconomic and regulatory environment affect the speed at which banks converge to their target capital ratios. The speed at which banks reverse the deviations from their target capital ratio should vary with the cost and benefits of adjusting the leverage. We show that adjustment speeds plausibly vary with factors affecting the costs of external financing, bank financial flexibility, and the costs of financial distress. More specifically, we find that banks operating in countries with stricter capital requirements and multiple supervisors adjust more quickly. These findings suggest that stricter capital requirements reduce agency conflicts between equity holders and debt holders, whereas better supervision mitigates information asymmetries among financial agents, resulting in lower external financing costs. Similarly, more developed stock markets decrease the transaction costs associated with external financing and lead to faster adjustment, especially for undercapitalized and less profitable banks that do not or cannot readily rely on their retained earnings for the capital structure adjustments. Inflationary environments are associated with lower financial flexibility and slower adjustment. Banks also make faster capital structure adjustments in times of crisis, probably because of closer scrutiny by supervisors and other stakeholders. These effects are also large in economic magnitude. In general, our conclusions continue to hold in alternative subsamples that exclude crisis periods or focus on commercial banks and banks that are not

[5] The half-life, i.e. the time it takes to close half of the gap between the current value and the target, is an often used concept in partial adjustment models. It is computed as log(0.5)/log(1 – speed of adjustment).

restructuring. These findings reveal the importance of a country's macroeconomic and regulatory framework for bank capital structure management.

The paper is organized as follows. Section 2 introduces our dataset and evaluates some established stylized facts in the literature for our worldwide sample of banks. Section 3 documents the capital structure adjustments banks make to get back to target when they are over- or undercapitalized. Section 4 consists of three subsections (hypotheses, empirical methodology, and results) dealing with the sources of heterogeneity in the speed of adjustment. Section 5 concludes the paper with suggestions for further research and policy implications.

2. Bank Capital Structure: An Initial Observation

To benchmark our results with the existing empirical corporate and bank capital structure literature streams, we reassess some of the typical attributes of non-financial corporations and confirm that they also hold for our global sample of banks. In particular, we investigate whether (1) bank fixed effects dominate the variation in bank leverage, (2) the reliably important factors of corporate leverage explain bank leverage, and (3) the adjustment to bank target leverage is partial and heterogeneous. To begin, we discuss the sample construction and the partial adjustment model commonly used in the literature.

2.1. Data

To gain insights into how banks worldwide manage their capital structure, we combine data from several sources. We obtain information on banks' balance sheets and income statements from Bankscope, a database compiled by Fitch/Bureau Van Dijk from publicly available data. The database is adjusted (e.g., to account for differences in accounting standards) to facilitate the international comparison of banks' financial statements. Although most of the

bank-specific variables are ratios, variables in levels (e.g., bank size) are also adjusted for inflation and are converted into millions of U.S. dollars. The sample covers the 1994–2010 period. We use data on commercial banks, savings banks, cooperative banks, and bank holding companies (BHCs), which represent 61.4%, 13.4%, 14.8%, and 10.4% of the sample, respectively.[6] We apply several selection criteria. First, most of the capital management decisions take place at the ultimate owner level. Therefore, whenever a bank reports both consolidated and unconsolidated bank accounts, we drop the latter to avoid double counting. This affects approximately 6% of our sample. Second, we drop bank-year observations with missing data on basic variables. Third, to avoid short-panel bias, we delete banks that report information for at most three consecutive years. Fourth, to ensure we have reasonable cross-sectional variation within each country, we exclude countries for which we have information on less than 100 bank-year observations. Subsequently, we winsorize all variables (ratios as well as variables in levels) at the 1% and 99% levels to mitigate the impact of outliers.

We link the bank-specific data to various country-level databases that contain information on the macroeconomic environment as well as the regulatory and supervisory framework. More specifically, we obtain data from the Bank Regulation and Supervision database, compiled by the World Bank (Barth, Caprio, and Levine (2008)), the World Development Indicators database, and a worldwide database on deposit insurance (Demirguc-

[6] The sample of BHCs is spread across 41 countries, but is more concentrated in the U.S. The ratio of the BHC observations to the total number of observations is approximately 15% in the U.S. and 2% in the rest of the world. We include Bank Holding Companies in our sample since they are the ultimate owners and capital management generally takes place at the consolidated level. This sampling strategy also permits ready comparison with existing studies (see e.g. Gropp and Heider (2010)). However, the exclusion of the BHCs from the sample does not affect our conclusions.

Kunt, Karacaovali, and Laeven (2005)). Filtering the bank-specific data and matching it with the country-level data yields a sample of 20,073 banks from 64 countries, totaling 154,065 bank-year observations. The sample consists of a mix of developed and developing countries. Table 1 provides information on the definition, source, and construction of the variables used to explain the variation in bank capital structure.

<Insert Table 1 around here>

2.2. Partial Adjustment Model

We follow common practice in the empirical capital structure literature and model leverage using a partial adjustment framework. In a frictionless world, banks would always maintain their target capital ratio. However, if adjustment costs are significant, the bank's decision to adjust its capital structure depends on the trade-off between the adjustment costs and the costs of operating with suboptimal leverage (Flannery and Rangan (2006)). In a partial adjustment model, a bank's current capital ratio, $K_{ij,t}$, is a weighted average (with weight $\lambda \epsilon [0,1]$) of its target capital ratio, $K^*_{ij,t}$, and the previous period's capital ratio, $K_{ij,t-1}$, as well as a random shock, $\varepsilon_{ij,t}$:

$$K_{ij,t} = \lambda K^*_{ij,t} + (1-\lambda)K_{ij,t-1} + \varepsilon_{ij,t}. \quad (1)$$

Each year, the typical bank closes a proportion λ of the gap between its actual and target capital levels. The smaller the lambda, the more rigid bank capital is, and the longer it takes for a bank to return to its target after a shock to bank capital. Thus, we can interpret λ as the speed of adjustment and its complement $(1-\lambda)$ as the portion of capital that is inertial.

Banks' target capital ratio is unobserved and is not necessarily constant over time. We model each bank's target level of bank capital as a function of observed (lagged) bank and country characteristics, $X_{ij,t-1}$. We follow the recent literature on the selection of the variables

that determine leverage targets. Brewer, Kaufman, and Wall (2008) and Gropp and Heider (2010) provide surveys and investigate motivations on the factors that explain banks' target capital ratio.[7]

$$K^{*}_{ij,t} = \beta X_{ij,t-1}. \tag{2}$$

We also account for two sources of unobserved heterogeneity: bank fixed effects (which subsume country fixed effects) and year fixed effects. Flannery and Rangan (2006), Lemmon, Roberts, and Zender (2008), Huang and Ritter (2009), and Gropp and Heider (2010) advocate the importance of including firm (bank) dummies for an unbiased estimation of targets.

Substituting the equation of target leverage, equation (2), in equation (1) yields the following specification:

$$K_{ij,t} = \lambda\beta X_{ij,t-1} + (1-\lambda)K_{ij,t-1} + \varepsilon_{ij,t}. \tag{3}$$

In the presence of a lagged dependent variable and a short panel, using ordinary least squares (OLS) or a standard fixed effects model would yield biased estimates of the adjustment speed. Therefore, following Flannery and Hankins (2013), we estimate equation (3) using Blundell and Bond's (1998) generalized method of moments (GMM) estimator.

2.3. Initial Findings

Table 2 presents the summary statistics on the bank- and country-level variables. Table 2, Panel A, lists summary statistics on the book equity-to-asset ratio.[8] The average equity-to-asset

[7] See Gungoraydinoglu and Oztekin (2011) for a recent study that incorporates country-level characteristics into the traditional set of determinants to explain a firm's leverage.

[8] We prefer book leverage to market leverage because restricting the sample to listed banks substantially biases the sample toward the largest banks. Moreover, the decision to be listed could be affected by the country characteristics we investigate. In addition, we use a simple leverage ratio rather than the regulatory capital ratio because it enables

ratio over all banks and periods is 10%. With regard to the first finding, a variance decomposition analysis confirms that the fraction of the total variation in banks' capital ratios due to time-invariant bank characteristics (bank fixed effects) is 85%, in line with Lemmon et al. (2008) and Gropp and Heider (2010).

<Insert Table 2 around here>

Regarding our second aim, that is, to assess whether the reliably important factors of corporate leverage also explain bank leverage, we report the coefficient estimates and the significance levels of the country-specific (Panel B) and bank-specific (Panel C) drivers[9] of the target capital ratios [from the estimation of equation (3)] in columns 6 and 7 of Table 2. Smaller, more profitable, and cost-efficient banks have higher capital ratios. Lower credit risk and higher price inflation induce banks to hold less capital. We consider these variables the banking counterparts of the set of firm-specific factors that Frank and Goyal (2009) and Öztekin (forthcoming) label "reliably important" for corporate capital structure of U.S. and international firms. Gropp and Heider (2010) also confirm these variables for a sample of large U.S. and European banks. In addition to these standard factors, we find significant associations of other bank and country characteristics [loans to total assets (–) and ln(Total assets/gross domestic product) (+)] [capital stringency (–), deposit insurance coverage (+), multiple supervisors (–), gross domestic product [GDP] per capita growth (–), stock market capitalization (+), and systemic stability (+)] with capital structure.

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ready comparison with a plethora of corporate leverage studies. Furthermore, plain leverage is an important component in the new capital adequacy guidelines of Basel III.

9 To conserve space, we do not discuss the summary statistics, which are comparable to those of previous studies such as Beck, De Jonghe and Schepens (2013).

In unreported tests, we evaluate the sensitivity of the target capital ratio to potential model misspecifications that could arise from omitted bank- or country-specific variables. The miscategorization of targets when bank characteristics are ignored is trivial as long as bank fixed effects are included. Ignoring the variation in the targets created by country characteristics is even less harmful than ignoring within-bank variation. Overall, model misspecification due to omitted bank or country characteristics seems to have little or no effect on the estimated targets.

Using Blundell and Bond's (1998) GMM estimator and allowing variation in the target due to bank and country characteristics as well as firm and year fixed effects, we find that the estimated speed of adjustment (λ) is 0.29 for our worldwide sample of banks. A speed of adjustment parameter of 0.29 implies that the adjustment to bank target leverage is partial and that half the gap between the actual and the target capital ratio is closed in two years. We compute the half-life as log(0.5)/log(1 – speed of adjustment). This point estimate is in the range obtained for corporations (0.25 for U.S. firms in Lemmon et al. (2008), and 0.21 for corporations worldwide in Oztekin and Flannery (2012), both of which use system GMM) and large banks (0.40 for U.S. banks in Berger et al. (2008), using system GMM, and 0.47 for banks in the United States and 15 European countries in Gropp and Heider (2010), using fixed-effects regressions).

We also estimate the partial adjustment model [Equation (3)] on a country-by-country basis. Using a large global database and a uniform methodology for all countries, we find that the estimated bank adjustment speeds vary considerably across countries. Figure 1 depicts the

heterogeneity in the speed of adjustment of bank capital across 64 countries using harmonized data, a similar methodology, and a common period.[10]

<Insert Figure 1 around here>

The average adjustment speed across countries, based on a country-by-country estimation, is 29.7% (which is in line with the pooled full sample estimate of 29%). The standard deviation of the 64 country-specific estimates is 15%, with a minimum of 0.01% in Colombia and a maximum of 74% in Panama. Moreover, 90% of the mass of the distribution lies in the interval of 10%–52% (5th and 95th percentiles, respectively). Germany and the United Kingdom have adjustment speeds below 20%, while the United States (34%) is slightly above average. In the Netherlands and Denmark, the adjustment speed exceeds 35%. Thus, the differences in the estimates are not purely driven by a developed versus developing country distinction. For example, a significant dispersion in the adjustment speed estimates occurs even among the G7 countries (13% in France and 34% in United States). The economic magnitude of this dispersion is large. On average, the half-life is 2 years. However, the half-life is 4.26 (1.15) years in countries in which the speed of adjustment is one standard deviation below (above) than the average. Thus, our data confirm that the adjustment to their target leverage is partial and heterogeneous for a worldwide sample of banks.

Some studies find that the estimation of equation (3) could generate evidence in favor of rebalancing toward a target even with random financing (e.g., Chang and Dasgupta (2009),

[10] Studies on corporate capital structure often use partial adjustment models in a single-country setup. Oztekin and Flannery (2012) are the first to compare firms' capital structure adjustments across countries in a uniform setting. Their sample consists of all nonfinancial firms in the COMPUSTAT Global Vantage database from 37 countries during the 1991–2006 period. For an indication of the heterogeneity in firms' speed of adjustment, see Table 2 of their study.

Hovakimian and Li (2011)). These studies argue that tests based on the financing behaviour (rather than leverage changes only) have the power to reject alternatives. Our data would lend support to the power of a partial adjustment specification of capital ratios if rebalancing activities are actually reflected in bank balance sheets and adjustment speeds vary plausibly with macroeconomic and regulatory variables. We investigate both issues in Section 3 and Section 4, respectively.

3. Capital Structure Adjustments of Banks

If banks make adjustments when there is a wedge between the target and the actual capital ratio, hereinafter called "the gap" and defined as $GAP_{ij,j,t-1} = K^{*}_{ij,t} - K_{ij,t-1}$, these adjustments should be reflected in their observed balance sheet transactions. In this section, we investigate how banks adjust their capital structure to close their deviation from the target. We evaluate the percentage growth rates in various balance sheet components for three quintiles of the gap. To do this, we first allocate banks to quintiles based on their gap at the end of year. Subsequently, we compute the yearly change in the relevant variable in the following year. We then average these growth rates across all bank-year observations in that quintile. We present our results for the overall sample (Section 3.1) as well as subsamples of bank size and type (Sections 3.2.1 and 3.2.2, respectively). We also discuss some robustness tests on the target estimation in Section 3.3.

3.1. Main results

First, we report the results for the overall sample in Table 3. The first column documents the mean values of the balance sheet components (scaled by total assets, total liabilities, and total equity in Panel B, Panel C, and Panel D, respectively) in the overall sample to assess the

economic significance of our results. The second column corresponds to the first quintile and represents overcapitalized banks with a negative gap. The third column represents banks with a negligible gap. The fourth column corresponds to the fifth quintile and represents undercapitalized banks with a positive gap. On average, the difference between an overcapitalized (undercapitalized) bank's capital ratio and its target, defined as $GAP_{ij,j,t-1} = K^{*}_{ij,t} - K_{ij,t-1}$, is -5% (4%). In columns 5 and 6, we report the *p*-values of difference in means tests using the middle quintile (banks close to their target) as the benchmark.

<Insert Table 3 around here>

Table 3, Panel A, contains information on capital ratio changes. First, we focus on the adjustments made by overcapitalized banks, which should reduce their capital ratio to arrive at their target. The growth rate of the capital ratio for overcapitalized banks is significantly negative (-10.98%), consistent with the conjecture that bank managers make proactive efforts to converge to their target. In this quintile, the growth in bank equity is almost zero, while the asset growth is large (11.31%) and significantly exceeds the 4.27% growth rate of the middle quintile. Thus, leveraging takes place by means of an aggressive asset expansion strategy and a slower-than-average equity growth (but not a reduction in the capital base).

What are the channels through which this leveraging takes place? If banks expand, do they lend aggressively, or do they hoard cash or invest in securities? Is the expansion in bank size financed by retail or wholesale funding? To address these questions, we examine various subcomponents of bank assets and liabilities in Table 3, Panels B and C, respectively. The results in Panel B indicate that when banks are overcapitalized, they expand all components of the asset side of the balance sheet. This expansion is roughly similar for loans (10.47%) and other earning assets (9.68%) but is considerably larger for nonearning assets (15%). The starting ratio of non-

earning assets to total assets is 6% on average, indicating that this growth rate is not trivial in economic terms. Thus, banks that need to lever up tend to hoard more of the additional deposits they raise as nonearning assets, of which more than half is cash (for the median bank).[11] Not surprisingly, not much variation exists in the growth of fixed assets, though the growth rate is slightly higher than the middle group. The low to moderate growth in fixed assets is also an indication that asset expansion is most often realized without involvement in a large merger and acquisition (M&A). A large M&A transaction would lead to substantial growth in property and other fixed assets in the early stage of the acquisition because divestitures only occur when restructuring the newly merged entity. The results in Panel C indicate that retail (demand and savings deposits) and wholesale funding (interbank funding and large time deposits) sources play an equally important role in the financing of the expansion in the overcapitalized banks.[12] The numbers and patterns are similar for both sources of funding and indicate a substantially higher growth rate in both core deposits and other sources of funding.

Second, we investigate the adjustments made by undercapitalized banks that need to increase their capital ratio to reach their target. The growth rate of the capital ratio for undercapitalized banks is significantly positive (8.48%), implying that bank managers actively rebalance their capital structure to converge to their target. How does this deleveraging take place? It may be more cost-efficient for banks to improve their capital ratios through asset reduction rather than capital injection if raising new capital is costly. However, the extent to which banks can shrink their assets depends on the number of assets maturing in the current

[11] The larger growth of non-earning assets vis-à-vis loans suggests that banks pursue a conservative rather than an aggressive loan strategy.

[12] The deposit (both retail and wholesale) growth difference between undercapitalized and 'on target' banks is statistically significant but economically small.

period and the capital losses that might result from selling off illiquid, nonmaturing assets. We observe a combination of asset liquidation and recapitalization. In the fifth quintile of the gap, asset growth is significantly lower (3.68% vs. 4.27%), but equity growth is significantly higher (11.66% vs. 4.81%) than the middle (banks close to their target) quintile. In other words, most of the increase in the capital ratio is realized by recapitalizing rather than downsizing the bank.

How does this recapitalization occur? Do banks manage their capital ratios mostly using external funds, or do they mainly rely on internal funds? To shed light on this issue, we distinguish between internal and external sources of capital and report the results in Table 3, Panel D. External capital is the outcome of issuances and/or repurchases of preference and/or common shares. Internal capital denotes changes in retained earnings, minority interests, and other equity reserves[13] and constitutes a cheaper and steadier source of bank financing. The results indicate that undercapitalized banks mainly use equity issuances to recapitalize. Although both internal and external capital contributes to equity growth, the economic impact is higher with the latter. The increase in undercapitalized banks' capital ratio is 5.2 times larger than the middle quintile with external capital (12.54% vs. 2.40%) and only 1.3 times greater with internal capital (8.60% vs. 6.42%).[14]

[13] Due to data limitations, we are not able to single out retained earnings for all banks. Therefore, we use 'total equity reserves' as our proxy for internal capital. This includes retained earnings, minority interests, and other equity reserves. However, for those banks that report the breakdown of total equity reserves (which constitutes 75% of the sample), on average, 94 per cent of total equity reserves are due to retained earnings.

[14] Due to missing data, we refrain from incorporating dividend distributions to our main analysis. However, in unreported tests conducted in the limited sample, we observe that banks do not cut back on dividends when they need to raise equity. However, when they are overcapitalized and must increase their leverage, they tend to

3.2. Subsample results

Our finding that undercapitalized banks do not primarily adjust by selling assets is important because regulators are concerned that large-scale asset sales might induce a crisis. (Unexpected) Sales of assets in large amounts may temporarily depress their market prices and hence lead to contagious effects on the value of the balance sheet of other banks. Moreover, in a fair-value accounting framework, it may lead to a decrease in capital at other banks, potentially leading to further (fire) sales of assets. As such, it could be a major source of financial instability, especially at larger banks that tend to hold a larger proportion of marketable assets. To assess whether asset sales might be a threat to the financial system stability when banks need to de-lever, we examine capital structure adjustment patterns for a variety of bank size categories and report the results in Table 4. Furthermore, mutual institutions may differ sharply from shareholder-owned institutions in terms of their mechanisms for making leverage adjustments. In particular, cooperative banks and saving banks should make most of their adjustments via asset size since they are not-for-profit institutions that cannot issue shares. To be able to draw generalizations about shareholder- vs. depositor-based institutions, we examine capital structure adjustment patterns for a variety of bank type categories and report the results in Table 5. Since our focus here is on the asset sales and equity adjustments, for brevity, we only document information for these variables (i.e. information corresponding to Panels A and D of Table 3).

<Insert Tables 4 and 5 around here>

distribute larger dividends more than the middle quintile (5.40% vs. 1.53%). Data on share repurchases is not available in Bankscope.

3.2.1. Sample splits based on size

In table 4, we split the sample in four quartiles based on total assets. The cutoff values of the quintiles are 105, 300, and 1000 US$ million, respectively. In addition, we also look at the subsample of banks in the top 5 per cent of the asset distribution (total assets in excess of US$ 13 billion). The patterns on asset and equity growth mimic our original results documented in Panel A of Table 3. Important to note is that, for the very large banks (i.e. fourth quartile and top 5 per cent), asset growth of undercapitalized banks (6.70% for Q4 and 7.44% for the top 5%) and banks close to target (6.38% for Q4 and 7.43% for top 5%) is not significantly different. However, for banks in the first three quartiles of the size distribution, the difference in asset growth of undercapitalized banks and banks that are near target is statistically significant. Furthermore, the (forced) sale (or slower expansion) of real assets in smaller banks is likely driven by their lower external financing capacity: the growth rate of external equity is only 7.55% for small banks (Q1) when undercapitalized but over 16% for larger banks (Q4 and the top 5%). In general, when banks are undercapitalized, we find that the scope for external financing adjustments increases with bank size, which prevents large banks from having to sell assets. Another important difference across small and large banks is that smaller banks (below the median size) do not (or cannot) rely on internal financing to make capital structure adjustments.[15] Internal capital growth of smaller banks is not statistically different across quintiles of the gap. Finally, the differences in the asset growth rates across bank size subsamples are negligible when banks are overcapitalized.

[15] This finding is consistent with Smirlock (1985) who documents a positive and significant relationship between bank size and profitability, suggesting a role for economies of scale in banking.

In sum, these results are informative and assuring for policymakers seeking to tackle systemic risk. We find that the smaller institutions are more prone to rely on fire sales for de-levering, whereas undercapitalized large banks' assets continue to grow. Since smaller banks have lower leverage and are less connected, their fire sales are not likely to be a de-stabilizing mechanism when banks need to de-lever.

3.2.2. Sample splits based on bank type

In Table 5, we expand our analysis to separate out several types of banks (commercial banks, mutual institutions, and bank holding companies). For brevity, in each subcategory, we focus on the extreme quintiles of the gap (i.e. quintiles 1 and 5). In addition, we take the commercial bank subsample as the benchmark and compare the capital management patterns of the mutual institutions (i.e. savings and cooperative banks) and bank holding companies in each quintile with that of the commercial banks.

We include Bank Holding Companies in our main sample for a number of reasons. First, they are the ultimate owners and capital management generally takes place at the consolidated level. Hence excluding them from the sample could lead to biased and misguided conclusions on banks' mix between internal and external sources of capital. A second reason is related to the classification and labelling of Bankscope. What Bankscope classifies as Bank Holding companies are not only the U.S. BHCs, but also Universal Banks operating in Europe or Asia. A more appropriate labelling (by Bankscope) would perhaps be financial conglomerates (with a banking focus). Thirdly, this sampling strategy also permits ready comparison with existing studies (see e.g. Gropp and Heider (2010)). By isolating BHCs from commercial banks, we now explore the extent to which they differ in terms of capital management. BHCs exhibit similar capital ratio growth rates as banks, regardless of whether they are over- or undercapitalized (the

capital ratio growth rates across undercapitalized BHCs and undercapitalized banks are statistically different, but are close in economic magnitude). The main disparity between banks and BHCs is the more pronounced differences in asset growth between over- and undercapitalized for the former (12.95% when overcapitalized and 3.55% when undercapitalized for banks vs. 8.96% when overcapitalized and 6.02% when undercapitalized for the BHCs). In addition, in contrast to the commercial banks, BHCs seem to heavily rely on internal capital to make adjustments: in the BHC subsample, the growth rate differential between quintiles 1 and 5 is more than 14%, whereas among the commercial banks, the growth in internal capital is similar whether they are overcapitalized (7%) or undercapitalized (8.4%).

Capital management decisions of the mutual institutions differ from that of the commercial banks as well. For the mutual institutions, the growth rates of the capital ratio are smaller (in absolute value) compared to commercial banks, both for the over- and undercapitalized. The more moderate growth of the capital ratio for undercapitalized mutual institutions (compared to commercials) is mainly due to lower asset growth, whereas the more moderate growth when overcapitalized is mainly due to lower equity growth. Furthermore, in the mutual institution subsample, the growth rate of internal capital is significantly different for the over- versus underlevered (-1.8% vs. 6.37%), whereas it is not the case for commercial banks (p-value of 0.21). However, consistent with their business strategy, external capital is not (cannot be) used by mutual institutions to manage bank capital as their respective growth rates do not differ in the extreme quintiles (p-value of 0.24), while the opposite is true for the commercial banks, which extensively rely on external capital (2.32% vs. 13.15%) Hence, commercial banks benefit more from the additional flexibility of raising internal capital to get back to their target more quickly.

An important caveat is that these are univariate sample splits. Hence, attributing similarities or differences in results purely to bank types may be incorrect, especially since BHCs are on average larger than the commercial banks. The observed differences between BHCs and banks (in terms of asset growth and internal capital adjustments) are consistent with the results reported in the size-based sample splits, which makes it difficult to attribute the findings to a size or a type effect.

3.3. Robustness on the target

In unreported tests, we conduct additional analyses using a variety of alternative target estimation techniques to ensure that our model specification does not drive the results. First, we estimate a regression that includes the lagged dependent variable, bank fixed effects, and time fixed effects [equation (3) without bank-specific and country-specific controls]. Second, we run a static regression [equation (3) with the exclusion of the lagged dependent variable]. Finally, we use the Fama and MacBeth (1973) cross-sectional leverage regressions estimated annually. Our main conclusions largely hold regardless of how we specify the target estimation model.

4. Sources of Cross-Country Variation in Banks' Speed of Adjustment

In Section 2.3, we document significant heterogeneity in the country-level adjustment speeds of banks. In this section, our goal is to uncover the sources of this heterogeneity. More specifically, we assess the following question: What factors lead to cross-country differences in the speed of adjustment? We first introduce the testable hypotheses. Next, we discuss the empirical setup. Finally, we present the results.

4.1. Hypotheses

In Section 3, we examine various balance sheet mechanisms through which banks alter their capital ratio to achieve their long-term desired level. These actions necessitate either external financing (new security issues) or financial flexibility (cash slack or internal capital). To the extent that the bank's environment is more conducive to easy access to capital markets or greater financial flexibility, altering the capital ratio to revert to the target becomes less burdensome, implying faster adjustment. Therefore, the speed at which bank managers reverse the deviations from their optimal capital ratio varies with the costs as well as the benefits of adjusting the leverage. The testable hypotheses are summarized in Table 6 and discussed in more detail below.

<Insert Table 6 around here>

We divide adjustment costs into two components: (1) the costs of external financing and (2) the extent to which banks' financial flexibility is constrained by various factors. According to the first component, higher costs of external financing should result in slower adjustment for three reasons. First, the owners of a highly levered firm transfer value to fixed income claimants when they raise new equity, as in the classic "debt overhang" situation (Myers (1977)). However, bank-specific regulation may limit the scope of risk shifting related to agency problems. Banks that are subject to stricter capital requirements should be perceived as being less risky, all else equal, as their capital holdings are risk-based and the sources of capital are verified by supervisory authorities (and are thus an effective external disciplining mechanism on self-interested managers and shareholders). This, in turn, lowers the agency cost between shareholders and debtholders and beneficially affects the price and/or availability of debt and equity financing. Therefore, greater capital stringency should be associated with faster adjustments.

Second, information asymmetries between bank managers and investors could negatively affect capital structure rebalancing by creating a wedge between internal and external financing costs (Myers (1984), (2003) and Myers and Majluf (1984)). Information asymmetries about banks' financial health can be relieved by supervisory and private monitoring. Better supervision should make it easier for investors to understand (and hence to value) banks. A higher level of regulatory governance as indicated by the multiple supervisors variable should lead to faster capital adjustments if the market perceives the greater supervisory discipline as effective. In addition, stronger external governance enables market participants to assess the risk profile and capital adequacy of the bank more efficiently. Therefore, this form of private monitoring (directly imposed by rating agencies and auditors, or indirectly imposed by stronger accounting standards) should also be associated with lower external financing costs and faster adjustment.

Third, raising equity by selling new shares may entail significant transaction costs or share price reductions. If access to capital markets is easier, banks can repeatedly adjust their equity to reach their target capital ratio, rather than waiting until access becomes available or relatively cheaper. Accordingly, higher stock market development should facilitate bank access to capital, leading to lower transaction costs and faster adjustment.

According to the second component, the costs of adjustment are partly determined by the degree to which regulatory and market conditions constrain banks' financial flexibility. On the one hand, regulatory limitations on banks' permissible range of activities may curb their profit opportunities and adversely affect their performance and financial flexibility (Barth, Caprio, and Levine (2004)). The variable activity restrictions captures the severity of regulatory constraints that impede banks' ability to engage in non-traditional banking activities (e.g., insurance, underwriting, real estate activities) that could generate significant fee income and pump up bank

earnings (Rice and DeYoung (2004) and Baele, De Jonghe, and Vander Vennet (2007)). Lower profits could render cash management and earning retention more difficult, meaning that less financial slack will be available to conduct capital structure adjustments. More restrictions should lead to slower adjustment.[16] On the other hand, banks should be able to make faster adjustments toward their target leverage in macroeconomic states that increase bank profitability and create more financial flexibility. Since bank profitability increases during economic expansions and inflationary periods (Demirguc-Kunt and Huizinga (1999)), we expect a positive impact of GDP per capita growth and inflation on the speed of adjustment.

The speed of rebalancing should also depend on the benefits of adjustment. Convergence to the target is most valuable in regulatory settings in which financial distress is more likely (and costly) or the risks of bank insolvencies tend to be more important. First, the odds of bank insolvencies are substantially greater in times of financial crises, leading to higher adjustment benefits for surviving incumbent banks (Perotti and Suarez, 2002) and, in turn, to faster adjustment. We obtain crisis episodes from the systemic banking crisis database constructed by Laeven and Valencia (2010) and analyze whether adjustment speeds differ in crisis and normal times. Second, regulators have more incentives to bail out banks if default is systemic rather than idiosyncratic (Acharya and Yorulmazer (2007)). Thus, higher values of the systemic stability variable should be associated with faster adjustments because regulatory decisions are less likely to suffer from the "too-many-to-fail" belief. Third, on the one hand, the possibility of a bank run

[16] The proxies we adopt should not be interpreted narrowly. For instance, greater activity restrictions may both limit profitability of the banks and decrease the volatility of their earning streams, in which case not only the adjustment costs would increase, but the adjustment benefits would decrease as well. Furthermore, allowing banks to engage in arm's length, transaction-based, and hence more flexible or scalable non-traditional banking activities such as trading and securitization may facilitate capital structure adjustments via the denominator.

(depositor discipline) is substantially lower in countries in which the regulatory framework provides substantial deposit insurance coverage to depositors, leading to smaller adjustment benefits and, in turn, slower adjustment. On the other hand, deposit insurance may reduce the debt overhang problem and/or create banking system instability (Demirgüc-Kunt and Detragiache, 2002), leading to a potentially swifter adjustment towards target.

4.2. Empirical Methodology

To test these hypotheses, we modify the empirical setup described in Section 2.2 and adjust the model such that the adjustment speed, λ, can vary over time, banks, and countries:

$$\lambda_{ij,t} = \lambda_0 + \Lambda Z_{ij,t-1}, \tag{4}$$

where Λ is a vector of coefficients for the adjustment speed function and $Z_{i,j,t-1}$ is a set of covariates that could affect the adjustment speed. Substituting equation (4) in equation (3) yields the equation for a partial adjustment model with heterogeneity in the speed of adjustment:

$$\Delta K_{ij.t} = (\lambda_0 + \Lambda Z_{ij,t-1})\left(\beta_j X_{ij,t-1} - K_{ij,t-1}\right) + \varepsilon_{i,t}. \tag{5}$$

To explore which factors are related to the observed cross-country differences in the adjustment speeds, we follow Berger et al. (2008) and Oztekin and Flannery (2012) and estimate equation (5) in two steps. In the first step, we estimate equation (3) country by country using system GMM and obtain an estimate of target capital ratio using equation (2). The country-by-country estimation permits heterogeneity in the coefficient estimates of the determinants of bank capital ratios across countries. Using the results from the first step, we calculate each bank's deviation from its (estimated) target capital ratio, which we label $GAP_{i,j,t-1}$, and substitute this estimated gap in equation (5) to obtain the following:

$$\Delta K_{ij.t} = (\lambda_0 + \Lambda Z_{ij,t-1}) GAP_{ij,t-1} + \varepsilon_{i,t}. \tag{6}$$

This second step involves a pooled OLS regression of the dependent variable on a set of variables defined as the product of $GAP_{ij,t-1}$ and the aforementioned covariates affecting the adjustment speed. The vector of estimated coefficients allows us to test various hypotheses on the determinants of the adjustment speed. To ease economic interpretation, we standardize the independent variables before interacting them with $GAP_{ij,t-1}$. Hence, the coefficient λ_0 can be interpreted as the average speed of adjustment in the sample. We cluster the standard errors at the country-year level, allowing the residuals to be correlated among the same banks in a given country in a given year (alternative clustering methods yield less conservative standard errors).[17]

4.3. Results

4.3.1. Baseline Results

Table 7 reports regression results for the country-level determinants of the adjustment speeds. Column 1 illustrates the results of our baseline specification.

<Insert Table 7 around here>

We find significant influence of the regulatory, supervisory, and macroeconomic framework on bank adjustment speeds. First, we find support for the three hypotheses related to the cost of external financing. Countries that are one standard deviation above the mean of the Capital Stringency index adjust significantly faster (0.030). A more stringent capital ratio requirement induces a result that is intended – a reduction in agency costs, an increase in the probability of a desirable portfolio adjustment behavior, and consequently faster adjustment. A one standard deviation increase in the multiple supervisors variable leads to an increase in the

[17] Our inferences are qualitatively and quantitatively unchanged when we bootstrap the standard errors, indicating that the potential bias caused by the generated regressor (GAP) is inconsequential in our sample. Since bootstrapping is computationally intensive, we choose to report robust standard errors clustered at the country-year level.

average adjustment speed of 0.037, indicating that the market perceives the greater supervisory discipline as effective in mitigating the information asymmetry costs. Whereas having multiple supervisors positively affects the adjustment speed, external governance reverses approximately half this increase (–0.020) and therefore has adverse effects on capital adjustments, raising the possibility that public and private information gathering and supervision are substitute mechanisms for each other. Alternatively, the direct costs associated with private monitoring (e.g., compulsory external audit by a licensed auditor, rating by an international credit rating agency) more than outweigh the (disciplinary) benefits of adjustment. These findings raise a cautionary flag regarding reform strategies that place excessive reliance on the private-sector monitoring and supervision of banks to alleviate the information asymmetry costs. In addition, well-developed stock markets result in faster adjustment (0.029) by reducing external financing costs and increasing the ability to raise capital. These effects are statistically significant and economically sizable. For example, a one standard deviation increase in multiple supervisors increases the average speed of adjustment by 0.037 (compared to a baseline adjustment speed, $\widehat{\lambda_0}$, of 0.247) and explains 25% of the observed cross-country standard deviation in the speed of adjustment (recall from Figure 1 that the cross-country standard deviation in the speed of adjustment is 0.15).

Second, we find partial support for the hypothesis related to the benefits of financial flexibility. Activity restrictions and GDP per capita growth do not have statistically significant effects on the adjustment speed. On the other hand, inflation "greases the wheels" of adjustments (0.111) similar to many other economic problems (e.g., the labor market and wage flexibility as in Tobin (1972) and Groshen and Schweitzer (1999)). This effect has a significant economic

impact: a one standard deviation change in the inflation variable corresponds to almost 70% of the observed cross-country dispersion in the adjustment speeds.

Third, we find only partial support for the hypothesis regarding the disciplining effect of the insolvency risk and financial distress. Only one out of three variables related to this hypothesis is significant. Systemic stability does not have a statistically significant impact on capital structure adjustments. However, the adjustment benefits are higher and the adjustment speed is significantly faster (0.115) in times of crisis, explaining about 70% of the observed cross-country dispersion. Finally, the deposit insurance coverage loads with a negative sign. However, its impact on the speed of adjustment is statistically and economically insignificant, possibly because of the opposing effects of lower depositor discipline on the hand and less debt overhang problems on the other hand.

In terms of broad policy implications, our findings are consistent with the view that regulations that impose higher capital standards and public supervisory practices that promote accurate information disclosure work best to assist banks in conducting their desired capital structure changes. Regulatory practices that limit activity restrictions and deposit insurance coverage to enhance stability and protect depositors do not seem to have an effect on bank capital adjustments.

4.3.2. Robustness

We conduct many sensitivity analyses on our baseline results. Specifically, we rerun our results with an alternative estimation methodology (weighted least squares); conduct sample splits with respect to bank type (commercial banks only), pace of asset growth, and time period

(crisis, no crisis); and employ an alternative definition of the capital ratios. We document our findings in columns 2-6 of Table 7.[18]

In column 2, we test the impact of the dominance of U.S. banks and other large countries in our sample. We rerun our estimation with weighted least squares in which weights are proportional to the inverse number of observations in each country. Our results are largely similar. One notable difference is that the variable stock market capitalization is insignificant, while GDP per capita is significant and has the expected positive sign. In addition, the variable activity restrictions becomes highly significant, while it is borderline insignificant (with the expected negative sign) in the setup without sample weights.

In column 3, we analyze the subsample of commercial banks, which constitute 61% of the entire sample. Eliminating the bank holding companies, cooperative banks, and savings banks does not affect the results, except for external governance, which is borderline significant in the baseline and which now becomes insignificant at the conventional significance levels.[19] External governance index, which captures information on financial statement transparency, external audits, and bank ratings, may matter less for banks without publicly traded equity.

[18] In addition to the results that we tabulate and describe in this subsection, we also confirm robustness to adding additional controls, namely, the interaction terms between the gap and (1) a quadratic inflation term, (2) the real interest rate, (3) the tax rate, (4) the marketwide price–earnings ratio, (5) bank-level variables, and (6) additional country characteristics (such as formal or informal institutions). For the sake of space, we do not report these tests.

[19] In additional (untabulated) results, we test whether the speed of adjustment differs across bank types, by adding bank type dummies to our baseline specification (column 1 of Table 7). We find that the speed of adjustment of mutual institutions (26.8% for cooperative banks and 28% for savings banks) is less than shareholder-owned institutions (31.2% for commercial banks and 32.4% for BHCs).

Therefore, we also analyze a subsample where we delete banks that have publicly traded equity. The (untabulated) results with non-listed banks (of any type) mimic the results of the commercial bank sample (as reported in column 3).

In column 4, we drop bank observations with substantial changes in the growth of total assets to exclude M&As and divestitures. We define a substantial change in total assets as an annual growth less than –10% or greater than 15% (though alternative growth cutoffs lead to similar results). Our conclusions are unaffected, indicating that our results are not simply driven by M&As or divestitures.

In column 5, we exclude systemic banking crisis episodes. Systemic banking crises comprise approximately 14% of the bank-year observations. Our baseline results (Table 7, column 1) continue to hold except for external governance. In unreported results, we restrict the sample to crisis times and find that the capital structure management is substantially different in a crisis. On the one hand do we find that during systemic banking crises, the adjustment speed is significantly faster (35.8% vs. 24.7%), which is consistent with our result reported in Table 7, column 1. On the other hand, none of the country characteristics seem to play a role for capital structure adjustments in crisis times, except for external governance, which substantially slows down (–13.3%) the adjustment speed.

In column 6, we use the regulatory capital ratio, defined as Tier 1 capital divided by risk-weighted assets.[20] Deposit insurance coverage does not affect the adjustment speeds using the simple capital ratio but significantly negatively affects the adjustment speeds using the

[20] The proportion of banks that report both risk-weighted and plain leverage ratios varies substantially across countries. In unreported tests, we employ a Heckman selection model using a disclosure index (and other bank-level controls) as an instrument and obtain similar results. Moreover, an alternative definition of the regulatory capital ratio (the sum of Tier 1 and Tier 2 capital scaled by risk-weighted assets) leads to similar conclusions.

regulatory capital ratio. Stock market capitalization has opposite implications for the capital structure adjustments using the regulatory and simple capital ratios. Finally, capital stringency, external governance, and the crisis period do not have statistically significant influences on capital structure adjustments with the regulatory capital ratio. Are these differences due to a different dependent variable, or to a different set of observations? To find out, in unreported results, we examine the influences of the regulatory and macroeconomic attributes on the adjustment speeds using plain capital ratios for the subsample of banks for which we have information on both ratios. While capital stringency, external governance, stock market capitalization and crisis period lose their significance, deposit insurance coverage becomes significantly negative in the reduced sample using plain leverage ratio, indicating that the differences are due to the reduced sample size rather than the definition of the capital ratio.

4.3.3. Asymmetric response to adjustment factors

It is possible that the impact of the country-level variables on the adjustment speed depends on bank characteristics. To test this assertion, we rerun our baseline estimation [equation (6)], separately for quintiles based on the *GAP* and profitability and report the results in Table 8. For brevity, we specifically focus on the discrepancies in results across the quintiles of these bank-level variables because they enable us to fine-tune the empirical tests of the aforementioned hypotheses.

<Insert Table 8 around here>

The results based on the quintiles of the deviation from the target capital ratio indicate a strong and economically large difference between the speed of adjustment of banks that are

below and above target (20.3% and 30.6%, respectively).[21] This is consistent with our earlier assessment of the capital structure adjustments in Section 3. Bank capital management critically depends on whether the bank is over- or undercapitalized, with overcapitalized banks achieving leveraging through asset expansion and earnings retention, and undercapitalized banks delevering using external capital and at a much slower pace. As expected, banks in the middle quintile do not seem to undertake corrective actions to their capital structure, as their deviation from the target is small (in either direction). The adjusted R-square of the regression for the middle quintile is close to zero, and bank's environment does not matter for the speed of adjustment, which is reassuring. If the gap is small, the changes to capital structure should be due to random shocks rather than intended adjustments. Allowing for asymmetric response to the country-level characteristics based on the bank's position relative to its target yields important insights. On the one hand, stock market capitalization (0.035^{***}) and crisis periods (0.178^{***}) facilitate capital structure adjustments only for undercapitalized banks. Higher stock market development reduces the cost of external financing, which is especially valuable for undercapitalized banks that must resort to external capital and crisis periods have a disciplining effect only among the undercapitalized banks. On the other hand, multiple supervisors (0.045^{***}) and external governance (-0.019^{*}) are only significant for overcapitalized banks consistent with the expectation that information asymmetry costs would be more prevalent with equity.

The quintile results on bank profitability indicate that profitable banks can adjust more quickly during crisis periods (0.129^{***}), possibly because they benefit more from the "last bank standing" effect of surviving incumbent banks (Perotti and Suarez (2002)). Profitable banks'

[21] The corporate finance literature documents a similar asymmetry for corporations (e.g., 19% vs. 41% in Warr, Elliott, Koeter-Kant, and Oztekin (2012)).

capital buffer can facilitate internal capital management (through higher retained earnings) and external capital management by inducing investors and/or supervisory authorities to provide financial support to sound banks during a crisis. The positive effect of stock market development on the adjustment speeds is significant except for the most profitable banks, plausibly because it is easier and cheaper for these banks to simply use their retained earnings rather than issue equity.

In summary, many country-specific features have economically and statistically significant effects that prevail even after we control for asymmetric response to adjustment factors. The differences across quintiles observed in certain cases are consistent with the adjustment patterns documented in Section 3 and the underlying logic of our hypotheses on the determinants of bank adjustment speeds.

5. Conclusion

This article evaluates the regulatory, supervisory, and macroeconomic determinants of measured adjustment speeds in different countries, conditional on the partial adjustment model of capital structure. Using bank-level data from 64 countries spanning 17 years, we illustrate that the capital structure of a bank reflects not only its own characteristics but also the environment in which it operates.

We contribute to the bank and capital structure literature streams in two ways. First, we investigate which balance sheet transactions banks choose to undertake if they need to alter their capital ratio to achieve the target level. Deleveraging is mainly achieved through external capital management rather than a substantial change in the asset base. In contrast, leveraging is accomplished through internal capital management, mainly through substantial asset expansion

and reduced earnings retention. Second, our partial adjustment statistical results show significant international variation in the speed of adjustment to target capital structure, varying from six months to cover half the distance to the target to near persistent effects of shocks. We tie this international variation in estimated adjustment speeds to differences in the regulatory, supervisory, and economic systems in which banks operate. Different environments impose different adjustment costs and benefits on firms, and we find that these differences are reflected in our estimated adjustment speeds. We also find that many country-specific features have economically and statistically significant effects that prevail even after we control for asymmetric response to adjustment factors and conduct various sample splits. The evidence that bank balance sheets reflect active rebalancing of capital ratios and that the estimates of adjustment speeds plausibly reflect country-specific features in our large international sample provides support for the applicability of a partial adjustment model of capital ratios to banks.

Our findings offer directions for further research and notable insights for policy makers. From an academic point of view, researchers aiming to embed a banking sector in a macroeconomic model with financial frictions should adequately control for supply-side factors of credit. We show in an international context that macroeconomic conditions affect bank capital dynamics and, thus, the resilience to or propagation of shocks. From a policy perspective, our results based on the simple leverage ratio (recently added to pillar I of Basel III) might be helpful in analyzing and fine-tuning the Basel III agreement. In general, Basel II and Basel III follow a one-size-fits-all countries approach. However, we show that country characteristics affect bank capital structure adjustments and hence a conditional or state-contingent policy may be more desirable. Our findings also shed some light on how the three pillars of the capital adequacy guidelines interact and influence bank capital structure management. Effective public monitoring

and supervision (emphasized by pillar II under supervisory review), on the one hand, and well-functioning capital markets (stressed in pillar III under market discipline), on the other hand, positively affect the speed of adjustment toward target leverage (as implicitly targeted in pillar I under the capital requirements). However, external governance (another component of pillar III) has the opposite effect on bank capital structure adjustments.

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TABLE 1

Data Description, Source, and Construction

Panel A contains information on the source and description of the country-specific regulatory and supervisory characteristics as well as the macroeconomic environment. Panel B provides information on the bank-specific characteristics. For each bank-specific feature, we report how the variable (ratio) is constructed and the corresponding Bankscope item codes.

Panel A: Country-specific characteristics		
Name	Source	Description
Activity Restrictions	Bank regulation and supervision database - Barth et al. (2000, 2003, 2008)	Degree to which banks can participate in various non-interest income activities (e.g. insurance, real estate, underwriting, etc.)
Capital Stringency	Bank regulation and supervision database - Barth et al. (2000, 2003, 2008)	The strength of capital regulation in a country
Deposit Insurance Coverage	Deposit insurance around the world database - Demirguc-Kunt et al. (2005)	Deposit insurance coverage relative to GDP per capita
Multiple Supervisors	Bank regulation and supervision database - Barth et al. (2000, 2003, 2008)	Equals 1 if there are multiple bank supervisors, zero otherwise
External Governance Index	Bank regulation and supervision database - Barth et al. (2000, 2003, 2008)	The strength of external auditors, financial statement transparency, and the existence of an external rating
GDP per Capita Growth	World Bank - World Development Indicators	Annual percentage GDP per capita growth
Stock Market Capitalization	World Bank - World Development Indicators	Market capitalization of listed companies (% of GDP)
Inflation	World Bank - World Development Indicators	Inflation, consumer prices (annual %)
Crisis Years	Laeven and Valencia (2010)	Equals 1 if the country experiences a systemic banking crisis in a given year, zero otherwise
Systemic Stability	Bankscope, own calculations	Z-score computed as the sum of aggregate profits and aggregate capital divided by the volatility of aggregate profits
Panel B: Bank-specific characteristics		
Name	Ratio Construction	Corresponding Bankscope Item Codes
Capital Ratio	Equity / Total Assets	data2055 / data2025
ln(Total Assets)	Natural Logarithm of Total Assets (inflation adjusted, expressed in US dollars)	ln(data2025)
Return on Average Assets	Net Income/ (Total Assets(t) + Total Assets(t-1))/2	data4024 = data2115 / data2025AVG * 100
Cost to Income Ratio	Overheads / (Net Interest Revenue + Other Operating Income)	data4029 = data2090 / (data2080 + data2085) * 100
Liquidity Ratio	Liquid Assets / Deposits and short term funding	data4035 = data2075 / data2030 * 100
Loan Loss Provisions Ratio	Loan Loss Provisions / Net Interest Revenue	data4002 = data2095 / data2080 * 100
Retail Funding Share	Total Deposits / (Total Deposits + Total Money Market Funding)	data6080 / (data6080 + data6160)
Loans to Total Assets	Total Loans (Net) / Total Assets	data5330 / data2025
Net Interest Income Share	|Net Interest Rev.| / (|Net Interest Rev.|+|Total Operating Income - Net Interest Rev.|)	|data6530| / (|data6530| + |data6640-data6530|)
Fixed Assets to Total Assets	Fixed Assets / Total Assets	data2015 / data2025
ln(Total Assets/GDP)	ln(Total Assets/GDP), with GDP (constant 2000 US$) taken from WDI	data2025/GDP

TABLE 2

Summary Statistics

The table presents summary statistics on three sets of variables. In panel A, we report information on the book equity-to-asset ratio. Panels B and C contain information on the country- and bank-specific characteristics, respectively. The definitions, units and the sources of the variables are provided in Table 1. In columns 1–5, we report the mean, standard deviation, fifth percentile, median, and 95th percentile for each variable. Columns 6 and 7 report the coefficients and standard errors (clustered at the country-year level) from the following partial adjustment model, where λ is the adjustment parameter, x is a set of bank and country characteristics, K is the book equity ratio, and ε is a random-error term:

$$K_{ij,t} = \lambda\beta X_{ij,t-1} + (1-\lambda)K_{ij,t-1} + \varepsilon_{ij,t}.$$

We estimate this equation for the full sample using Blundell and Bond's (1998) GMM estimator to mitigate the bias induced by including bank fixed effects in a model with a lagged dependent variable. The reported estimate for the capital ratio refers to the coefficient on the lagged dependent variable, $(1-\lambda)$. The unbalanced panel consists of a sample of 20,073 banks from 64 countries over the period 1994–2010, totaling 154,065 bank-year observations. We winsorize all variables at the 1% and 99% levels. *, **, *** indicate significance at the 90%, 95%, and 99% confidence levels, respectively.

Summary Statistics	(1) Mean	(2) Std. Dev	(3) 5%	(4) 50%	(5) 95%	(6) Coefficients		(7) Std Errors
Panel A: Equity-to-total assets ratio								
Capital Ratio	0.099	0.056	0.040	0.090	0.187	0.710	***	(0.022)
Panel B: Country-specific characteristics								
Activity Restrictions	9.453	2.311	5.000	10.000	13.000	0.036		(0.042)
Capital Stringency	5.751	1.797	3.000	6.000	9.000	-0.079	**	(0.031)
Deposit Insurance Coverage	-0.652	1.712	-1.661	-1.661	1.787	0.103	***	(0.030)
Multiple Supervisors	0.147	0.355	0.000	0.000	1.000	-0.048	*	(0.029)
External Governance Index	13.131	1.915	10.000	13.200	16.000	-0.009		(0.033)
GDP per Capita Growth	2.579	3.379	-3.701	2.711	7.905	-0.149	***	(0.048)
Stock Market Capitalization	62.946	62.794	5.443	40.782	183.762	0.113	**	(0.054)
Inflation	5.574	7.710	0.164	3.277	15.928	-0.207	*	(0.110)
Systemic Stability	3.687	1.037	1.980	3.649	5.446	0.094	***	(0.016)
Panel C: Bank-specific characteristics								
ln(Total Assets)	5.913	1.808	3.429	5.667	9.424	-1.984	**	(0.804)
Return on Average Assets	0.008	0.011	-0.006	0.007	0.022	0.171	***	(0.062)
Cost to Income Ratio	68.797	20.037	43.500	67.070	96.700	-0.090	*	(0.051)
Liquidity Ratio	17.439	21.326	2.500	10.790	58.140	-0.003		(0.099)
Loan Loss Provisions Ratio	13.207	22.407	0.000	6.760	49.230	0.074	**	(0.031)
Retail Funding Share	0.960	0.097	0.810	0.999	1.000	0.015		(0.061)
Loans to Total Assets	0.614	0.173	0.279	0.638	0.858	-0.598	***	(0.068)
Net Interest Income Share	0.779	0.154	0.461	0.811	0.956	-0.023		(0.050)
Fixed Assets to Total Assets	0.018	0.015	0.002	0.015	0.042	-0.109		(0.076)
In(Total Assets/GDP)	-9.260	2.803	-12.728	-9.928	-3.693	0.884	**	(0.410)

TABLE 3

Growth in Bank Characteristics in Various Quintiles of the Capital Ratio Gap

This table presents average growth rates of various bank-level variables: (1) variables directly related to the capital ratio in panel A, (2) the asset composition variables in panel B, (3) funding structure variables in panel C, and (4) variables related to (changes in) equity in panel D. We estimate the following reduced-form model of the capital ratio, where λ is the adjustment parameter, X is a set of bank and country characteristics, K is the capital ratio, and ε is a random-error term:

$$K_{ij,t} = \lambda\beta X_{ij,t-1} + (1-\lambda)K_{ij,t-1} + \varepsilon_{i,t}.$$

We estimate this equation for the full sample using Blundell and Bond's (1998) GMM estimator to mitigate the bias induced by including bank fixed effects in a model with a lagged dependent variable. This estimation provides an initial set of estimated βs and λ, which we use to calculate an initial estimated target leverage ratio ($K^{*}_{\mathrm{ij,t}} = \beta \mathrm{X}_{\mathrm{ij,t-1}}$) and deviation from the target leverage ratio ($GAP_{\mathrm{ij,t-1}} = \mathrm{K}^{*}_{\mathrm{ij,t}} - \mathrm{K}_{\mathrm{ij,t-1}}$) for each bank-year. Column 1 reports the mean values of the bank-level variables scaled by total assets, total liabilities, and total equity in panels B, C, and D, respectively. Columns 2–4 report average yearly growth rates of the (unscaled) bank-level variables for three of five quintiles (bottom, middle, and top quintile) of the gap between the estimated target and lagged actual capital ratio (banks are allocated to quintiles based on the gap at time t-1 and growth is measured over the subsequent year, from t-1 to t). The unbalanced panel consists of a sample of 20,073 banks from 64 countries over the period 1994–2010, totaling 154,065 bank-year observations. We also report the number of observations per group (in parentheses), because not all variables are available for each bank. Columns 5 and 6 contain *p*-values of the pairwise t-tests of equality of means (with unequal variances) of the bottom and top group compared with the middle group, respectively. *, **, *** indicate significance at the 90%, 95%, and 99% confidence levels, respectively.

	(1) Sample	(2) Quintile 1 Most overcapitalized	(3) Quintile 3 Closest to target	(4) Quintile 5 Most undercapitalized	(5) Quintile 1 vs. 3	(6) Quintile 3 vs. 5
	Mean	Mean/Observations			P-value/Significance	
Gap		-0.05	0.00	0.04	0.00	0.00
		(30,982)	(30,981)	(30,981)	***	***
Panel A: Capital ratio						
Equity to Total Assets		-10.98	0.52	8.48	0.00	0.00
		(30,982)	(30,981)	(30,981)	***	***
Equity		0.71	4.81	11.66	0.00	0.00
		(30,982)	(30,981)	(30,981)	***	***
Total Assets		11.31	4.27	3.68	0.00	0.00
		(30,982)	(30,981)	(30,981)	***	***
Panel B: Assets						
Loans	61.12	10.47	4.24	5.24	0.00	0.00
		(30,868)	(30,958)	(30,688)	***	***
Other Earning Assets	30.42	9.68	2.81	-0.88	0.00	0.00
		(30,829)	(30,935)	(30,915)	***	***
Non-Earning Assets	6.48	15.18	6.71	5.60	0.00	0.00
		(30,963)	(30,977)	(30,941)	***	***
Fixed Assets	1.76	3.37	2.50	4.03	0.00	0.00
		(30,643)	(30,881)	(30,500)	***	***
Panel C: Liabilities						
Demand and Savings Deposits	83.85	11.31	3.95	3.19	0.00	0.00
		(26,177)	(29,289)	(26,568)	***	***
Other Funding	14.81	12.85	3.15	2.12	0.00	0.01
		(26,161)	(29,286)	(26,557)	***	***
Panel D: Equity						
External Capital	60.42	3.15	2.40	12.54	0.00	0.00
		(25,516)	(23,815)	(21,592)	***	***
Internal Capital	39.58	4.16	6.42	8.60	0.00	0.00
		(24,015)	(22,669)	(20,278)	***	***

TABLE 4

Bank Capital Structure adjustments: Size-based sample splits

This table presents average growth rates of the capital ratio, bank equity, total assets as well as sources of capital (internal versus external capital) in various quintiles of the capital ratio gap. Banks are allocated to quintiles based on the gap at time t-1 and growth is measured over the subsequent year, from t-1 to t. We report this information for five size-based sample splits: four quartiles based on total assets (of which the cutoff values are 105, 300, and 1000 US$ million, respectively) as well as the subsample of the 5 per cent largest banks in the sample (total assets in excess of US$ 13 billion). Each subpanel is constructed in a similar fashion and consists of three columns corresponding with three of five quintiles (bottom, middle, and top quintile) of the gap between the estimated target and lagged actual capital ratio. Quintile 1 corresponds with the most overcapitalized banks (largest negative gap), Quintile 3 banks are closest to their capital ratio target, whereas banks in quintile 5 are the most undercapitalized (largest positive gap). For each variable, we report the average growth rate, the number of observations per group (as not all variables are available for each bank, in parentheses) and the p-value of pairwise t-tests of equality of means (with unequal variances) of the extreme quintiles compared with the middle quintile, respectively. *, **, *** indicate significance at the 90%, 95%, and 99% confidence levels, respectively.

	Size (TA) Quartile 1			Size (TA) Quartile 2			Size (TA) Quartile 3			Size (TA) Quartile 4			Size (TA) Top 5 percent		
	Q1	Q3	Q5	Q1	Q3	Q5	Q1	Q3	Q5	Q1	Q3	Q5	Q1	Q3	Q5
	Mean/Observations/ P-value/Significance			Mean/Observations/ P-value/Significance			Mean/Observations/ P-value/Significance			Mean/Observations/ P-value/Significance			Mean/Observations/ P-value/Significance		
Equity to Total Assets	-12.24	-0.23	7.95	-11.71	0.37	8.32	-10.43	0.83	8.34	-9.53	1.04	9.17	-8.16	0.90	9.38
	(7,753)	(7,753)	(7,752)	(7,742)	(7,741)	(7,741)	(7,746)	(7,745)	(7,745)	(7,742)	(7,741)	(7,741)	(1,549)	(1,548)	(1,548)
	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00
	***		***	***		***	***		***	***		***	***		***
Equity	-0.59	2.04	7.18	1.01	4.41	10.66	0.86	6.10	12.33	2.04	7.43	15.35	3.21	8.36	16.49
	(7,753)	(7,753)	(7,752)	(7,742)	(7,741)	(7,741)	(7,746)	(7,745)	(7,745)	(7,742)	(7,741)	(7,741)	(1,549)	(1,548)	(1,548)
	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00
	***		***	***		***	***		***	***		***	***		***
Total Assets	11.54	2.24	-0.12	12.41	4.03	2.77	10.78	5.24	4.44	11.01	6.38	6.70	10.77	7.43	7.44
	(7,753)	(7,753)	(7,752)	(7,742)	(7,741)	(7,741)	(7,746)	(7,745)	(7,745)	(7,742)	(7,741)	(7,741)	(1,549)	(1,548)	(1,548)
	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.26	0.00		0.98
	***		***	***		***	***		***	***			***		
External Capital	1.22	-0.41	7.55	3.83	1.19	11.19	3.96	3.74	14.72	4.52	6.84	16.13	3.24	7.16	16.75
	(6,673)	(7,256)	(6,350)	(6,495)	(6,469)	(5,606)	(5,990)	(5,073)	(4,480)	(6,219)	(4,757)	(5,436)	(1,369)	(1,287)	(1,322)
	0.00		0.00	0.00		0.00	0.71		0.00	0.00		0.00	0.00		0.00
	***		***	***		***			***	***		***	***		***
Internal Capital	2.72	3.34	2.56	6.32	7.73	9.22	4.32	7.85	10.82	3.65	9.14	11.20	2.77	10.76	16.12
	(6,241)	(6,969)	(5,987)	(6,049)	(6,105)	(5,227)	(5,586)	(4,813)	(4,164)	(5,998)	(4,563)	(5,166)	(1,350)	(1,252)	(1,291)
	0.650		0.500	0.360		0.260	0.040		0.060	0.010		0.280	0.030		0.130
							**		*	***			**		

Quintile 1 (Q1) = Most overcapitalized; Quintile 3 (Q3) = Closest to Target; Quintile 5 (Q5) = Most Undercapitalized

TABLE 5

Bank Capital Structure adjustments: Bank type sample splits

This table presents average growth rates of the capital ratio, bank equity, total assets as well as sources of capital (internal versus external capital) in various quintiles of the capital ratio gap. Banks are allocated to quintiles based on the gap at time t-1 and growth is measured over the subsequent year, from t-1 to t. We report this information for three sample splits according to bank type: commercial banks, bank holding companies and mutual institutions (savings and cooperative banks). The first two columns in each subpanel correspond with the observations in the outer quintiles of the gap between the estimated target and lagged actual capital ratio. Quintile 1 corresponds with the most overcapitalized banks (largest negative gap), whereas banks in quintile 5 are the most undercapitalized (largest positive gap). For each variable, we report the average growth rate, the number of observations per group (as not all variables are available for each bank, in parentheses) and the p-value of pairwise t-tests of equality of means (with unequal variances) of the first and fifth quintiles. For the subsample of bank holding companies and the mutual institutions, we also report the p-value of a pairwise t-test of equality of means (with unequal variances) of a specific growth rate in a given quintile with the corresponding growth rate for commercial banks. *, **, *** indicate significance at the 90%, 95%, and 99% confidence levels, respectively.

	Commercial Banks		BHCs				Mutuals (Coop and Savings)			
	Q 1	Q 5	Q 1	Q 5	$Q1_{Comm}=Q1_{BHC}$	$Q5_{Comm}=Q5_{BHC}$	Q 1	Q 5	$Q1_{Comm}=Q1_{Mutual}$	$Q5_{Comm}=Q5_{Mutual}$
	Mean / Obs / P-val (Q1=Q5) / Significance		Mean / Obs / P-val (Q1=Q5) / Significance		P-value/Significance		Mean / Obs / P-val (Q1=Q5) / Significance		P-value/Significance	
Equity to Total Assets	-12.53	9.40	-12.01	8.06	0.14	0.00	-6.71	6.66	0.00	0.00
	(19,333)	(19,332)	(2,986)	(2,986)		***	(8,663)	(8,662)	***	***
	0.00		0.00				0.00			
	***		***							
Equity	0.84	12.22	-2.42	13.77	0.00	0.00	1.71	9.87	***	***
	(19,333)	(19,332)	(2,986)	(2,986)	***	***	(8,663)	(8,662)		
	0.00		0.00				0.00			
	***		***							
Total Assets	12.95	3.55	8.96	6.02	0.00	0.00	8.24	3.30	0.00	0.23
	(19,333)	(19,332)	(2,986)	(2,986)	***	***	(8,663)	(8,662)	***	
	0.00		0.00				0.00			
	***		***							
External Capital	2.32	13.15	0.17	13.89	0.00	0.37	7.60	8.52	0.00	0.00
	(16,362)	(15,926)	(2,624)	(2,586)	***		(5,617)	(3,298)	***	***
	0.00		0.00				0.24			
	***		***							
Internal Capital	7.02	8.40	-2.02	12.23	0.00	0.00	-1.80	6.37	0.00	0.36
	(15,826)	(15,303)	(2,612)	(2,576)	***	***	(4,380)	(2,646)	***	
	0.21		0.00				0.00			
			***				***			

Quintile 1 (Q1) = Most overcapitalized; Quintile 5 (Q5) = Most Undercapitalized

TABLE 6

Predictions of the Impact of the Regulatory and Macroeconomic Variables on Bank Adjustment Speeds

The table presents the major hypotheses tested. The definitions and the sources of the variables are provided in Table 1.

Variable name	Hypothesis	Expected sign
A. Adjustment Cost Factors		
A1. External financing costs		
A1.1. Agency costs	Lower agency costs result in lower external financing costs, which in turn lead to faster adjustment.	
Capital stringency	Capital regulations have a disciplining effect on bank managers, lowering the agency costs and leading to faster adjustment.	+
A1.2. Information asymmetry costs	Lower information asymmetry costs result in lower external financing costs, which in turn lead to faster adjustment.	
Multiple supervisors	Better supervision helps investors value banks more efficiently, reduces the information asymmetry costs, and leads to faster adjustment.	+
External governance index	Stronger external governance enables market participants to assess the risk profile and capital adequacy of the bank more efficiently, resulting in lower information asymmetry costs and thus faster adjustment.	+
A1.3. Ease of access	Easier capital market access results in lower external financing costs, which in turn lead to faster adjustment	
Stock market capitalization	Higher stock market development should facilitate bank access to capital, leading to lower transaction costs and faster adjustment.	+
A2. Financial flexibility	Greater financial flexibility facilitates capital structure adjustments, leading to faster adjustment.	
Activity restrictions	Restrictions on nontraditional banking activities that increase bank earnings lowers bank financial flexibility, leading to slower adjustment.	-
GDP per capita growth	Bank profitability increases during economic expansions, creating more financial flexibility, leading to faster adjustment.	+
Inflation	Bank profitability increases during inflationary periods, creating more financial flexibility, leading to faster adjustment.	+
B. Adjustment Benefit Factors		
Systemic stability	Adjustment benefits are higher when the risks of bank insolvencies are more important, leading to faster adjustment.	+
Crisis period	The odds of bank insolvencies are greater in crises times, leading to higher adjustment benefits and, in turn, faster adjustment.	+
Deposit insurance coverage	Bank runs are less likely due to deposit insurance coverage, leading to smaller adjustment benefits and, in turn, slower adjustment.	-
	Deposit insurance may reduce the debt overhang problem and/or create banking system instability, leading to faster adjustment.	+

TABLE 7

Determinants of the Variation in the Speed of Adjustment

The table provides information on the cross-country drivers of the heterogeneity in the speed of adjustment. In the (unreported) first stage, we estimate the following reduced-form model of the capital ratio, where λ is the adjustment parameter, X is a set of bank characteristics, K is the capital ratio, and ε is a random-error term:

$$K_{i,t} = \lambda\beta X_{i,t-1} + (1-\lambda)K_{i,t-1} + \varepsilon_{i,t}.$$

We estimate this equation separately for each country using Blundell and Bond's (1998) GMM estimator to mitigate the bias induced by including bank fixed effects in a model with a lagged dependent variable. This estimation provides an initial set of estimated βs and λs, which we use to calculate an initial estimated target leverage ratio ($K^{*}_{\mathrm{ij,t}} = \beta_j \mathrm{X}_{\mathrm{ij,t-1}}$) and deviation from the target leverage ratio ($GAP_{\mathrm{ij,t-1}} = \mathrm{K}^{*}_{\mathrm{ij,t}} - \mathrm{K}_{\mathrm{ij,t-1}}$) for each bank-year. In the second stage, we substitute the estimated deviation from the target leverage ratio into the following equation to produce estimates of the determinants of bank adjustment speeds:

$$\Delta K_{ij.t} = (\lambda_0 + \Lambda Z_{ij,t-1})GAP_{ij,t-1} + \varepsilon_{i,t},$$

where Z is a vector of country characteristics and λ_0 and Λ are vectors of coefficients. Unless otherwise noted, we report the coefficient estimates from ordinary least square (OLS) regressions. The definitions and the sources of the variables are provided in Table 1. Column 1 documents the results for the equity-to-asset ratio using the entire sample. Column 2 reports the results using weighted least squares. The weights are inversely related to the number of observations by country-year combination. In columns 3–5, we estimate our baseline specification for alternative subsamples: commercial banks only; only including banks with a moderate annual change in total assets (more than –10% and less than 15%); and excluding systemic banking crisis periods. Column 6 reports the determinants of bank adjustment speeds using the regulatory capital ratio, defined as Tier 1 capital over total risk-weighted assets. We transform continuous independent variables to standard normal variables before being interacted with $\mathrm{GAP}_{\mathrm{i,j,t-1}}$. Hence, the coefficient λ_0, can be interpreted as the speed of adjustment of a typical country (average in all dimensions). We cluster standard errors at the country-year level and report them beneath the coefficient estimates. *, **, *** indicate significance at the 90%, 95%, and 99% confidence levels, respectively.

	(1) Baseline	(2) Weighted least squares (WLS)	(3) Commercial banks only	(4) Normal growth -0.10<Gr(TA)<0.15	(5) No crisis	(6) Regulatory capital
Constant, λ_0	0.247***	0.239***	0.252***	0.130***	0.247***	0.434***
	(0.015)	(0.010)	(0.015)	(0.008)	(0.015)	(0.033)
Capital Stringency	0.030***	0.023***	0.036***	0.014*	0.030**	0.007
	(0.011)	(0.009)	(0.012)	(0.008)	(0.012)	(0.014)
Multiple Supervisors	0.037***	0.027**	0.038***	0.038***	0.039***	0.032***
	(0.010)	(0.012)	(0.011)	(0.003)	(0.011)	(0.010)
External Governance Index	-0.020*	-0.022*	-0.018	-0.026***	-0.015	-0.002
	(0.012)	(0.013)	(0.013)	(0.007)	(0.012)	(0.014)
Stock Market Capitalization	0.029**	-0.002	0.030**	0.012*	0.032**	-0.056***
	(0.012)	(0.011)	(0.013)	(0.006)	(0.013)	(0.017)
Activity Restrictions	-0.018	-0.058***	-0.021	-0.006	-0.020	0.009
	(0.013)	(0.010)	(0.014)	(0.006)	(0.013)	(0.017)
GDP per Capita Growth	0.016	0.028**	0.017	-0.022***	0.015	0.025
	(0.014)	(0.011)	(0.015)	(0.006)	(0.015)	(0.021)
Inflation	0.111***	0.076***	0.117***	0.079***	0.117***	0.112***
	(0.021)	(0.017)	(0.023)	(0.015)	(0.025)	(0.040)
Systemic Stability	-0.009	0.004	-0.012	-0.007	-0.011	0.002
	(0.013)	(0.010)	(0.014)	(0.005)	(0.015)	(0.015)
Crisis Period	0.115***	0.129***	0.114***	0.035**		0.009
	(0.036)	(0.039)	(0.036)	(0.017)		(0.030)
Deposit Insurance Coverage	-0.013	0.000	-0.014	-0.036***	-0.013	-0.049***
	(0.018)	(0.020)	(0.021)	(0.006)	(0.020)	(0.011)
Observations	154,065	154,065	94,610	107,724	132,271	101,856
Adjusted R-squared	0.337	0.340	0.352	0.176	0.299	0.338
Number of Countries	64	64	64	64	64	35

TABLE 8

Asymmetric Response to Adjustment Factors

The table provides evidence of whether the cross-country drivers of heterogeneity in the speed of adjustment vary with the magnitude of the GAP and bank profitability. In the left part of the table, we split the sample into quintiles according to the gap between the target and actual capital ratios and report the results from splits based on quintiles 1, 3, and 5 of the gap in column 1. In the right part of the table, we report the results from splits based on quintiles 1, 3, and 5 of return on assets.

In the (unreported) first stage, we estimate the following reduced-form model of the capital ratio, where λ is the adjustment parameter, X is a set of bank characteristics, K is the capital ratio, and ε is a random-error term:

$$K_{i,t} = \lambda\beta X_{i,t-1} + (1-\lambda)K_{i,t-1} + \varepsilon_{i,t}.$$

We estimate this equation separately for each country using Blundell and Bond's (1998) GMM estimator to mitigate the bias induced by including bank fixed effects in a model with a lagged dependent variable. This estimation provides an initial set of estimated βs and λs, which we use to calculate an initial estimated target leverage ratio ($K^{*}_{\mathrm{ij,t}} = \beta_j \mathrm{X}_{\mathrm{ij,t-1}}$) and deviation from the target leverage ratio ($GAP_{\mathrm{ij,t-1}} = \mathrm{K}^{*}_{\mathrm{ij,t}} - \mathrm{K}_{\mathrm{ij,t-1}}$) for each bank-year. In the second stage, we substitute the estimated deviation from the target leverage ratio into the following equation to produce estimates of the determinants of a bank's adjustment speed:

$$\Delta K_{ij.t} = (\lambda_0 + \Lambda Z_{ij,t-1})GAP_{ij,t-1} + \varepsilon_{i,t},$$

where Z is a vector of country characteristics and λ_0 and Λ are vectors of coefficients.

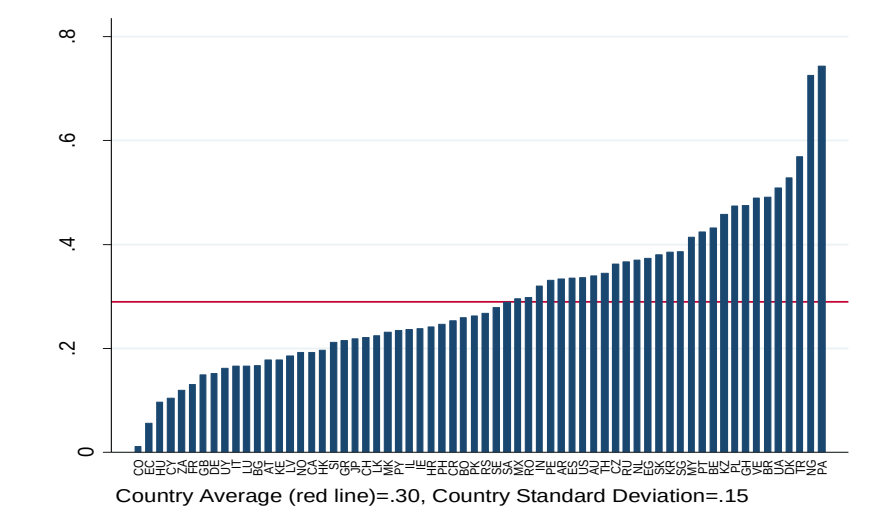
We report the coefficient estimates from ordinary least square (OLS) regressions. The definitions and the sources of the variables are provided in Table 1. Continuous independent variables are transformed to standard normal variables before being interacted with $\mathrm{GAP}_{\mathrm{i,j,t-1}}$. Standard errors are clustered at the country-year level and are reported beneath the coefficient estimates. *, **, *** indicate significance at the 90%, 95%, and 99% confidence levels, respectively.

	GAP			Profitability		
	Quintile 1 Most overcapitalized	Quintile 3 Closest to target	Quintile 5 Most undercapitalized	Quintile 1 Least profitable	Quintile 3 Medium profitability	Quintile 5 Most profitable
Constant, λ_0	0.306***	0.265*	0.203***	0.298***	0.232***	0.255***
	(0.012)	(0.161)	(0.016)	(0.021)	(0.021)	(0.016)
Capital Stringency	0.019**	0.061	0.032**	0.016	0.022**	0.037***
	(0.009)	(0.061)	(0.012)	(0.018)	(0.011)	(0.014)
Multiple Supervisors	0.045***	0.004	0.017	0.038***	0.035***	0.020*
	(0.008)	(0.019)	(0.011)	(0.014)	(0.012)	(0.011)
External Governance Index	-0.019*	-0.034	-0.009	0.001	-0.022	-0.022
	(0.010)	(0.053)	(0.016)	(0.021)	(0.016)	(0.014)
Stock Market Capitalization	0.004	0.022	0.035***	0.045**	0.032**	0.004
	(0.009)	(0.040)	(0.013)	(0.020)	(0.016)	(0.012)
Activity Restrictions	-0.027***	0.046	-0.018	0.012	-0.004	-0.050***
	(0.010)	(0.029)	(0.013)	(0.020)	(0.013)	(0.012)
GDP per Capita Growth	0.006	-0.128**	0.034***	0.012	0.025	0.020
	(0.014)	(0.060)	(0.012)	(0.016)	(0.015)	(0.017)
Inflation	0.076**	0.140	0.126***	0.115***	0.165***	0.096***
	(0.032)	(0.291)	(0.024)	(0.036)	(0.039)	(0.030)
Systemic Stability	-0.008	-0.028	0.010	-0.012	0.010	-0.002
	(0.009)	(0.028)	(0.013)	(0.017)	(0.015)	(0.012)
Crisis Period	0.053	-0.018	0.178***	0.030	0.146***	0.129***
	(0.034)	(0.058)	(0.034)	(0.039)	(0.037)	(0.043)
Deposit Insurance Coverage	-0.027**	-0.001	0.011	-0.023	0.010	0.014
	(0.012)	(0.037)	(0.023)	(0.018)	(0.025)	(0.019)
Observations	30,786	30,815	30,820	31,626	31,377	30,703
Adjusted R-squared	0.485	0.009	0.276	0.389	0.332	0.344
Number of Countries	64	61	64	64	64	63

FIGURE 1

Country-Specific Adjustment Speeds

The figure contains information on the adjustment speed estimates for the 64 countries in our sample and are obtained from the estimation of $K_{i,t} = \lambda\beta X_{i,t-1} + (1-\lambda)K_{i,t-1} + \varepsilon_{i,t}$ separately for each country using the Blundell and Bond (1998) GMM estimator. λ is the adjustment parameter; X is a set of bank-level and macroeconomic characteristics; K is the book equity ratio; and ε is a random-error term. The definitions and the sources of the variables are provided in Table 1.//



ARGENTINA	AR	0.33	HONG KONG	HK	0.20	PERU	PE	0.33
AUSTRIA	AT	0.18	CROATIA	HR	0.24	PHILIPPINES	PH	0.25
AUSTRALIA	AU	0.34	HUNGARY	HU	0.10	PAKISTAN	PK	0.26
BELGIUM	BE	0.43	IRELAND	IE	0.24	POLAND	PL	0.47
BULGARIA	BG	0.17	ISRAEL	IL	0.24	PORTUGAL	PT	0.42
BOLIVIA	BO	0.26	INDIA	IN	0.32	PARAGUAY	PY	0.24
BRAZIL	BR	0.49	ITALY	IT	0.17	ROMANIA	RO	0.30
CANADA	CA	0.19	JAPAN	JP	0.22	SERBIA	RS	0.27
SWITZERLAND	CH	0.22	KENYA	KE	0.18	RUSSIAN FEDERATION	RU	0.37
COLOMBIA	CO	0.01	KOREA	KR	0.39	SAUDI ARABIA	SA	0.29
COSTA RICA	CR	0.25	KAZAKHSTAN	KZ	0.46	SWEDEN	SE	0.28
CYPRUS	CY	0.10	SRI LANKA	LK	0.22	SINGAPORE	SG	0.39
CZECH REPUBLIC	CZ	0.36	LUXEMBOURG	LU	0.17	SLOVENIA	SI	0.21
GERMANY	DE	0.15	LATVIA	LV	0.19	SLOVAKIA	SK	0.38
DENMARK	DK	0.53	MACEDONIA	MK	0.23	THAILAND	TH	0.34
ECUADOR	EC	0.06	MEXICO	MX	0.30	TURKEY	TR	0.57
EGYPT	EG	0.37	MALAYSIA	MY	0.41	UKRAINE	UA	0.51
SPAIN	ES	0.34	NIGERIA	NG	0.73	USA	US	0.34
FRANCE	FR	0.13	NETHERLANDS	NL	0.37	URUGUAY	UY	0.16
UNITED KINGDOM	GB	0.15	NORWAY	NO	0.19	VENEZUELA	VE	0.49
GHANA	GH	0.47	PANAMA	PA	0.74	SOUTH AFRICA	ZA	0.12
GREECE	GR	0.22						