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How have banks adjusted to higher capital requirements?[1]

Spurred by stronger regulatory requirements, banks have steadily increased their capital ratios since the financial crisis. For a sample of 82 large global banks from advanced and emerging economies, retained earnings accounted for the bulk of the increase in risk-weighted capital ratios over the period 2009–12, with reductions in risk weights playing a lesser role. On average, banks continued to expand their lending, though lending growth was slower among advanced economy banks from Europe. Lower dividend payouts and wider lending spreads contributed to banks' ability to use retained earnings to build capital. Banks that came out of the crisis with higher capital ratios and stronger profitability were able to expand lending more.

JEL classification: E44, G21, G28.

The global financial crisis of 2007–09 highlighted the need for banking systems to be less leveraged, more liquid, more transparent and less prone to take on excessive risk. In the years since the crisis, both the private and public sectors have exerted pressure on banks to build larger buffers of high-quality capital and reduce the riskiness of their portfolios.

This feature documents the broad patterns in banks' approaches to achieving higher risk-weighted capital ratios since the crisis. It is essentially descriptive, and does not examine the reasons behind their different strategy choices. However, it presents the results against the background of concerns raised during the early debates over regulatory reform, such as the fear that, if regulators and markets forced banks to build up capital too rapidly, this would impose considerable short-term macroeconomic costs by inducing banks to pull back from lending to finance investment.[2]

A key finding is that the bulk of the adjustment has taken place through the accumulation of retained earnings, rather than through sharp adjustments in lending or asset growth. In a sample of 82 large global banks, banks from advanced economies increased their assets by 8% from 2009 to 2012, while emerging

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[2] Some of the analyses of the likely macroeconomic impact of regulatory reform include: Macroeconomic Assessment Group (2010a, 2010b, 2011); BCBS (2010a); IIF (2011); Slovik and Cournède (2011); Elliott et al (2012); Miles et al (2013); and Oxford Economics (2013).

economy banks increased assets by 47%. However, European banks increased their lending more slowly than banks based in other regions. Among the advanced economy banks, a reduction in risk-weighted assets relative to total assets also played a role, albeit a secondary one. More profitable banks expanded assets and lending faster than others. There is some evidence for the importance of starting points – banks that came out of the crisis with relatively low levels of capital were more likely to pursue adjustment strategies involving slow asset growth.

The next section reviews the different strategies that banks can use to increase their capital ratios and the differing macroeconomic implications of these strategies if pursued on a large scale.[3] We then look at broad evidence on whether, and in what ways, some of these potential macroeconomic impacts materialised. The following sections look more closely at the adjustment paths taken by the banks in the sample. Changes in capital ratios are decomposed into factors reflecting changes in capital and changes in assets, and then each of these is studied in more detail. A concluding section recaps the main findings.

Channels of adjustment

A bank that seeks to increase its risk-adjusted capital ratio has a number of options at its disposal.

One set of strategies targets the bank's *retained earnings*. The bank could seek to reduce the share of its profit it pays out in dividends. Alternatively, it may try to boost profits themselves. The most direct way to do so would be by increasing the spread between the interest rates it charges for loans and those it pays on its funding. While competitive pressures may limit how much an individual bank can widen these spreads, lending spreads could rise across the system if all banks followed a similar strategy and alternative funding channels (such as capital markets) did not offer more attractive rates. Other ways to increase net income include increasing profit margins on other business lines, such as custody or advisory services, and reducing overall operating expenses.

A second strategy is to *issue new equity*, such as through a rights issue to existing shareholders, an equity offering on the open market or placing a bloc of shares with an outside investor. This is likely to be the least attractive option, however, given that a new share issue tends to reduce the market value of the existing shares.[4]

A third set of adjustment strategies involves changes to the *assets* side of the bank's balance sheet. The bank can run down its loan portfolio, or sell assets outright, and use the proceeds of loan repayments or asset sales to pay down debt. Less drastically, it can slow down lending growth, thereby allowing retained earnings and hence capital to catch up. In some cases, an asset sale can boost

[3] Higher capital requirements are only one element of a range of financial regulatory reforms that have been put in place since the crisis. Other key elements include liquidity requirements for banks, central clearing of standardised OTC derivatives and strengthened resolution regimes for financial entities. While some of these reforms may have potentially significant macroeconomic effects, they are not considered here.

[4] See Myers and Majluf (1984).

capital through an accounting gain, as the assets are revalued relative to their purchase cost.

Finally, a bank can seek to reduce its *risk-weighted assets* by replacing riskier (higher-weighted) loans with safer ones, or with government securities.[5]

Banks' choices from among these various strategies will determine the macroeconomic impact of an increase in regulatory capital ratios. For example, if banks seek to slow lending, or reduce lending to riskier projects, this could constrain investment (and possibly consumption). Evidence that a slowdown in bank lending growth results from reduced bank loan supply, as opposed to reduced demand for loans from borrowers, would emerge in the form of tighter bank lending standards. A widening of bank lending spreads could also reduce investment on the margin, especially if it feeds into lending rates available in capital markets or through non-bank lenders. By contrast, if banks reduce dividend payouts or issue new shares, this may reduce the returns received by existing bank shareholders, but would have little or no impact on the broader macroeconomy.

It should be emphasised that neither a reduction in outstanding bank loans nor a slowdown in the growth of bank lending would necessarily be bad for the macroeconomy in the longer term. This is especially the case in the aftermath of a crisis that followed an unsustainable debt boom and left debt overhangs in its wake, as is the case at present. In the near term, as a precondition for a sustained recovery, non-performing and underperforming legacy assets are being written off and overleveraged borrowers are paying down their debts. The process of adjustment to a less leveraged economy has necessarily involved an extensive period of balance sheet clean-up and a shortfall of aggregate demand, a process that is by no means complete.[6] To support growth over the longer term, financial and non-financial actors will need to adapt to conditions of lower economy-wide leverage, in which only durably profitable projects are funded and unsustainable booms are avoided.

Bank capital, lending and growth in the aggregate

A series of Quantitative Impact Studies (QIS) conducted by the Basel Committee on Banking Supervision offer evidence of a significant aggregate rise in banks' capital ratios in recent years. The studies estimate average capital adequacy ratios for a global sample of banks according to the definitions that are scheduled to come into force in the Basel III framework.[7] Weighted average capital ratios for large, internationally active banks rose from 5.7% at the end of 2009 to 8.5% at end-June

[5] Given the wide range of outcomes that can emerge from commonly used risk models, a bank that uses internal models to derive its risk weights may have scope to "optimise" supervisory risk-weighted assets through modelling choices without making significant changes in its portfolio. See BCBS (2013c, 2013d).

[6] Takáts and Upper (2013) find that declining bank credit to the private sector does not necessarily constrain growth in the aftermath of a financial crisis, in cases where such a crisis followed a rapid increase in debt. Bech et al (2012) find that private sector deleveraging during and after a crisis can even lead to a stronger recovery.

[7] See BCBS (2010b, 2012a, 2012b, 2013a).

2012.[8] Those for a sample of smaller banks rose from 7.8% to 9.0% over the same period (Graph 1).

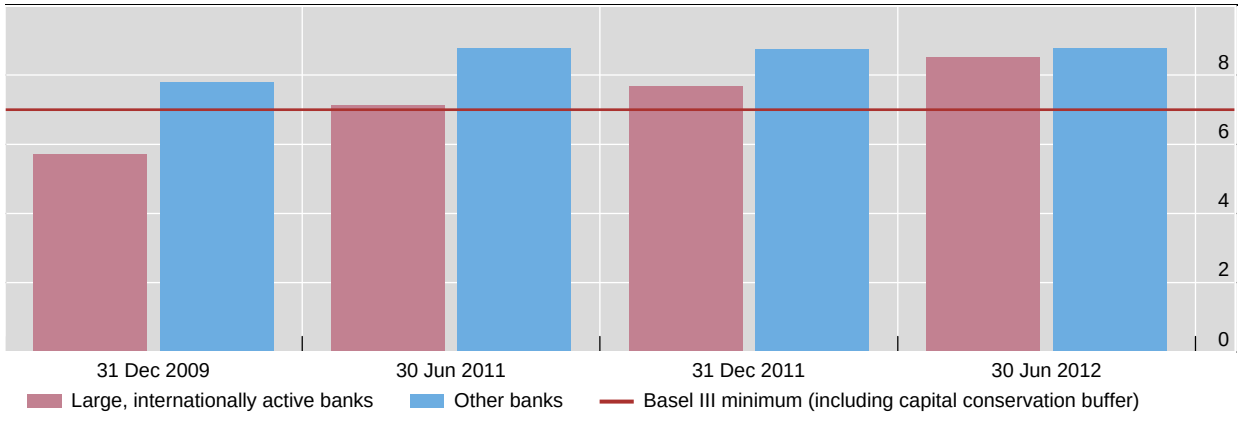
Leverage ratios (capital under the fully phased-in Basel III definition divided by total unweighted exposures) increased in parallel, from 2.8% to 3.7% for the first group and from 3.8% to 4.4% for the second. While the 2009 and 2012 figures for risk-weighted capital ratios and leverage ratios are not fully comparable, given differences in the sample, data quality and some of the relevant definitions, the size and direction of the true increase is likely to have been broadly in line with these results.

Many national authorities have also published figures on bank capital adequacy, though these do not always use common definitions for either the numerator (capital) or denominator (assets). They tend to confirm a picture of broadly rising capital ratios in the global banking system. For example, the ratio of capital to total assets for US commercial banks rose from 11.2% in December 2009 to 11.6% in December 2012.[9] The ratio for euro area monetary financial institutions, measured on a consolidated basis, increased from 7.6% to 9.1% over the same period.[10]

While bank capital has risen more or less steadily worldwide, the performance of credit aggregates and GDP has been mixed (Graph 2). In most advanced economies (top panels), a slow and uneven pace of recovery since the crisis has been accompanied by weak or contracting credit aggregates. This is so regardless of whether one looks at overall credit to the economy (top centre panel) or at bank-intermediated credit alone (top right-hand panel).[11] Many emerging economies,

Common equity risk-weighted capital ratios under Basel III definitions

In per cent — Graph 1



Source: Basel Committee on Banking Supervision.

[8] According to BCBS (2013e), the ratios for the group of larger banks rose to approximately 9% at end-2012.

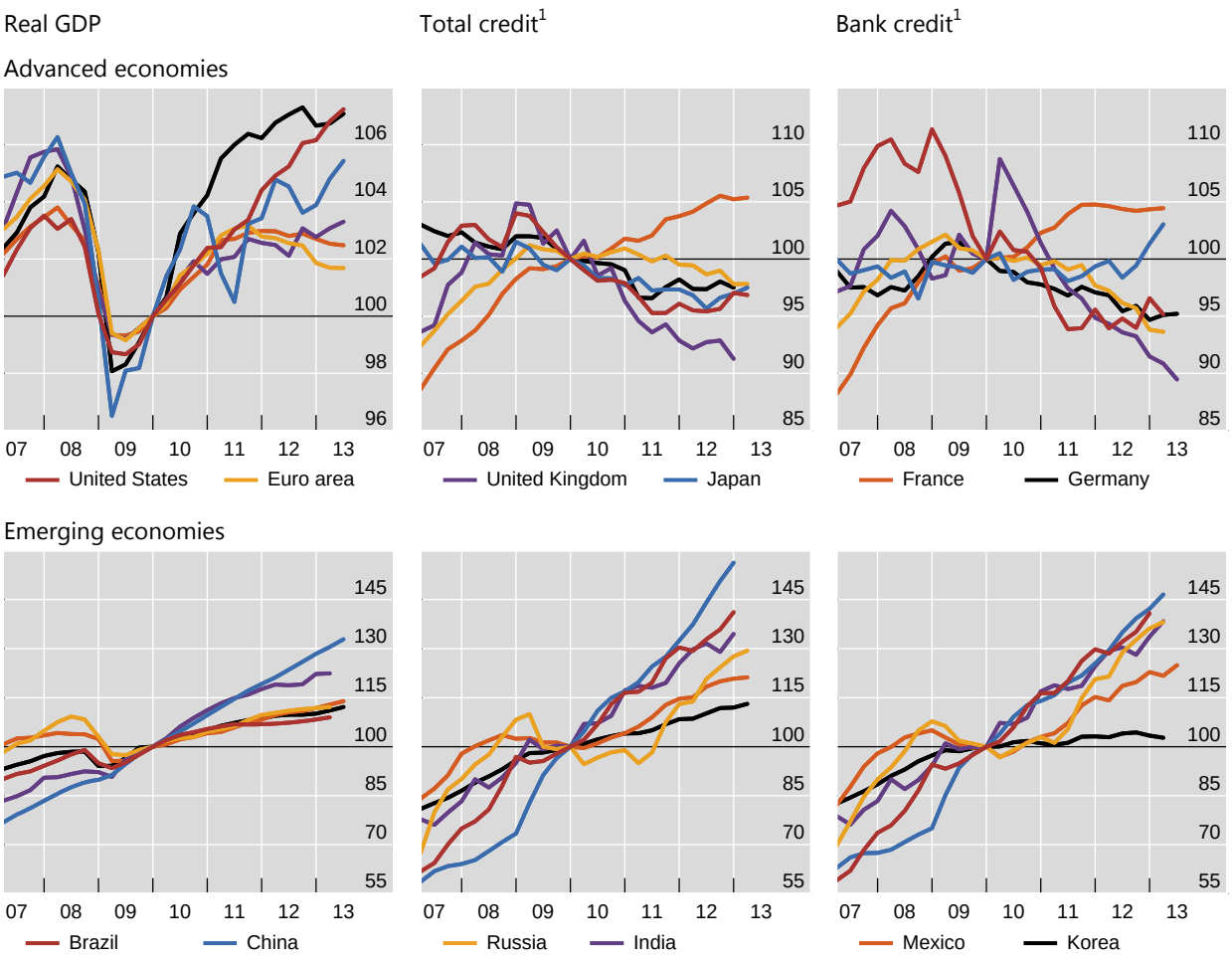
[9] www.federalreserve.gov/releases/h8/current/default.htm.

[10] www.ecb.europa.eu/stats/money/aggregates/bsheets/html/index.en.html. The US and European ratios are not strictly comparable, given differences in accounting conventions and reporting populations (for example, the European data include money market funds).

[11] The sharp increase in the bank credit figure for the United Kingdom in early 2010 reflects the return of certain formerly securitised assets to bank balance sheets.

GDP growth and lending to the private non-financial sector in selected economies

2009 Q4 = 100 Graph 2



[1] Real, deflated by CPI.

Sources: OECD; Datastream; national data.

meanwhile, have enjoyed rapid GDP growth, often accompanied by even more rapid expansion of credit (bottom panels).

Graph 2 illustrates how GDP growth and aggregate credit growth have not always tracked one another since the crisis, especially in the advanced economies. This reflects the fact that many firms and households have been reducing their debt, even as new lending supports investment and consumption elsewhere in the economy. A key question is thus to what extent slow lending growth reflects post-crisis macroeconomic challenges that have constrained loan demand, especially sectoral debt overhangs and the euro area sovereign crisis, and to what extent it reflects tighter loan supply by banks.

Decomposing changes in the risk-weighted capital ratio

A closer look at bank balance sheet adjustments can shed further light on how banks have responded to tighter capital requirements. To understand these adjustments, we can decompose the change in risk-weighted capital requirements as follows:

$$\frac{K_1/RWA_1}{K_0/RWA_0} = \frac{\left(1 + \frac{Inc_1}{K_0} - \frac{Div_1}{K_0} + \frac{Oth_1}{K_0}\right)}{\left(\frac{RWA_1/TA_1}{RWA_0/TA_0}\right)\left(\frac{TA_1}{TA_0}\right)} \quad (1)$$

where K_i is capital, RWA_i is risk-weighted assets and TA_i is total assets, at time i; while Inc_1 is net income, Div_1 is dividends and Oth_1 is other changes to capital (calculated as a residual) between time 0 and time 1. This decomposition allows us to isolate the three factors that influence a risk-weighted capital ratio: changes to capital, changes to the ratio of risk-weighted assets to total assets, and changes to total assets.

To analyse these factors, we drew data from the Bankscope database for a set of 82 banks. The sample was chosen so as to include as many significant institutions from the main global financial centres as possible, as well as banks from smaller centres and emerging economies. In some cases, these data were supplemented with financial statement figures reported by Bloomberg. Banks were included if they reported several years of reliable data in the relevant categories.

The sample thus covers banks from a wide range of advanced and emerging economies, though emerging regions outside Asia are under-represented.[12] It includes all but two of the 28 institutions identified by the Financial Stability Board as globally systemically important banks (G-SIBs) based on the methodology developed by the Basel Committee on Banking Supervision.[13] It covers 55% of the assets of all institutions in the Bankscope database, and 60% of the assets of the top 1,000 global banks as listed by *The Banker*.

In terms of weighted averages, using end-2012 total assets as weights,[14] the banks in our sample increased their risk-weighted common equity capital ratio from 11.6% at end-2009 to 14.2% at end-2012. Risk-weighted assets in the Bankscope database are measured using Basel II definitions. Since risk weights for many asset classes are higher under Basel III than Basel II, it is not surprising that these ratios are appreciably (5–6 percentage points) higher than those calculated by the Basel Committee in the QIS, which use Basel III weights. Despite this higher overall level, the increase in capital ratios from end-2009 to end-2012, which equals 2.7 percentage points after rounding, is in line with the QIS finding of an increase of 2.8 percentage points from end-2009 to June 2012.

[12] The dataset includes banks from 23 jurisdictions. The home economies classified as advanced are Australia, Austria, Belgium, Canada, France, Germany, Ireland, Italy, Japan, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States, The home economies classified as emerging are Brazil, China, Chinese Taipei, India, Korea, Malaysia, Russia and Thailand.

[13] See FSB (2012) and BCBS (2013b). The two excluded G-SIBs are Banque Populaire of France and ING Groep of the Netherlands, for which we could not obtain a sufficient time series of risk-weighted asset data.

[14] Unless otherwise stated, the figures in the text, graphs and tables in the remainder of the feature are weighted averages with end-2012 assets as weights.

The increase in reported risk-weighted capital ratios in the Bankscope data largely resulted from higher capital rather than lower risk weights or smaller assets. Common equity capital (the numerator of the right-hand side of equation (1)) increased by 34%, while risk-weighted assets (the denominator) rose by 5%. The overall increase in risk-weighted assets in turn resulted from an 8% decrease in the ratio of risk-weighted to total assets and a 14% increase in the level of total assets.

In order to better understand the impact of different factors, it is helpful to transform equation (1) so that the different quantities can be expressed as additive components of the percentage point change in the risk-weighted capital ratio. To do this we can take logarithms of both sides of equation (1) and then multiply both sides by a common factor. The resulting decomposition is as follows:

$$\frac{K_1}{RWA_1} - \frac{K_0}{RWA_0} = F \ln\left(1 + \frac{Inc_1}{K_0} - \frac{Div_1}{K_0} + \frac{Oth_1}{K_0}\right) - F\left(\ln\left(\frac{RWA_1}{TA_1}\right) - \ln\left(\frac{RWA_0}{TA_0}\right)\right) - F\ln\left(\frac{TA_1}{TA_0}\right) \quad (2)$$

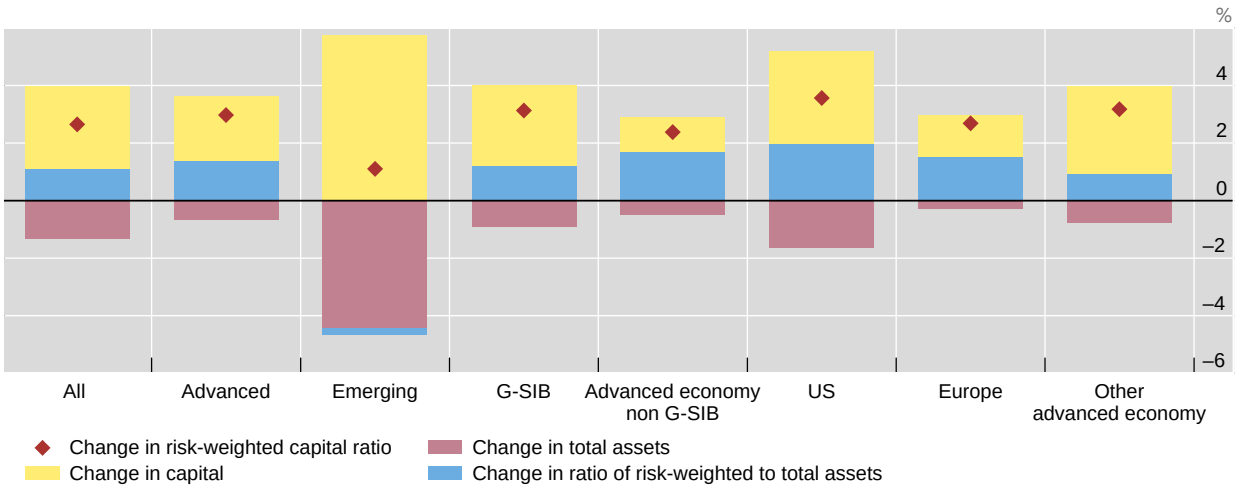
where F, the normalisation factor, equals $(K_1/RWA_1 - K_0/RWA_0)/(\ln(K_1/RWA_1) - \ln(K_0/RWA_0))$.

Calculating the elements of equation (2) confirms that increases in capital drove increases in the overall ratio, both for the full sample and for most subsamples (Graph 3).[15] For the advanced economy banks, roughly three quarters of the overall increase of 3.0 percentage points reflected higher capital, while the rest resulted from a decline in risk-weighted assets. Total assets rose, subtracting the equivalent of 0.7 percentage points from the ratio, but this was counteracted by a significant fall in the ratio of risk-weighted to total assets, which added 1.4 percentage points.

Emerging economy banks, by contrast, increased both capital and total assets substantially. Their overall risk-weighted capital ratio increase of 1.1 percentage points reflects the fact that higher capital, which added 5.8 percentage points to the

Sources of changes in bank capital ratios, end-2009–end-2012

Normalised to percentage points of end-2009 risk-weighted assets — Graph 3



The graph shows the change in the ratios of common equity to risk-weighted assets at the (fiscal) year-end of 2009 and 2012, in percentage points. The overall change is shown by the red diamonds. The components of this change are the terms on the right-hand side of equation (2) in the text. All figures are weighted averages, using end-2012 assets as weights.

Sources: Bankscope; Bloomberg; BIS calculations.

[15] Detailed figures are available in a data appendix on the BIS website: www.bis.org/publ/qtrpdf/r_qt1309e_appendix.xlsx.

risk-weighted capital ratio, outpaced the increase in risk-weighted assets, which subtracted 4.7 percentage points. Unlike the advanced economy banks, the increase in the risk-weighted assets of emerging economy banks actually outpaced their increase in total (unweighted) assets – in other words, their average level of risk weights increased.

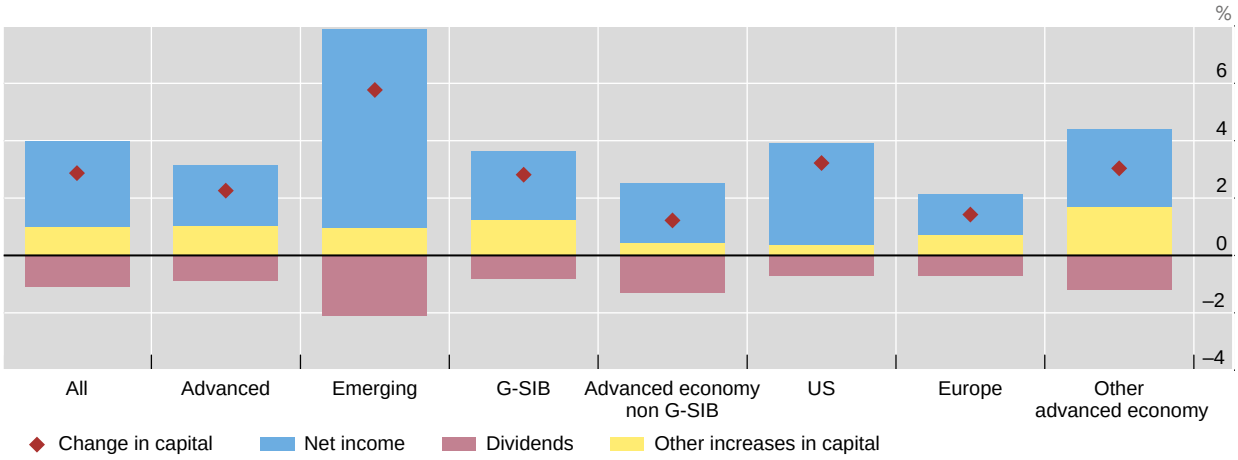
The G-SIBs[16] increased their capital, assets and overall risk-weighted capital ratios by more than did the non-G-SIB advanced economy banks in the sample. The G-SIBs' common equity capital ratios increased by 3.1 percentage points. Most of this resulted from higher capital, which contributed 2.8 percentage points to the overall increase in the ratio. The reduction in the ratio of risk-weighted assets to total assets added a further 1.2 percentage points to the G-SIBs' capital ratio – but this was mostly counteracted by an increase in total assets, which reduced the capital ratio by 0.9 percentage points. Non-G-SIB advanced economy banks, by contrast, increased their capital ratios by 2.4 percentage points, of which about half reflected higher capital and half a reduction in risk-weighted assets. An increase in the ratio of risk-weighted to total assets was also an important contributing factor to the higher risk-weighted capital ratios of European banks.

Decomposing changes to capital

For the full sample, and for most subsamples, retained earnings (net income minus dividends) accounted for the bulk of the increase in capital from 2009 to 2012 (Graph 4). Graph 4 breaks down the increase in capital for the firms in the sample according to the three components in the numerator of the expression on the right-hand side of equation (1): net income,[17] dividends and other changes to

Sources of increases in bank capital, end-2009–end-2012

Normalised to percentage points of end-2009 risk-weighted assets — Graph 4



Sources: Bankscope; Bloomberg; BIS calculations.

[16] All of the G-SIBs but one (Bank of China) are based in advanced economies.

[17] Net income is defined as earnings after taxes and before other changes, such as revaluation of available-for-sale securities, that do not flow through the income statement.

capital, using the transformation described in the previous section. This last term is calculated as a residual, based on reported data on common equity, net income and dividends. It comprises share issues and items that are not included in net income, such as gains and losses on fixed assets and available-for-sale securities. For the full sample of banks, retained earnings accounted for 1.9 out of the 2.9 percentage point increase in capital, while capital from other sources accounted for 1 percentage point.

For the G-SIBs, as well as for the advanced economy banks as a group, retained earnings were more than half of the overall increase in capital, accounting for 1.6 percentage points of the overall capital increase of 2.8 percentage points. Capital generated from other sources provided the rest, and was roughly equal to dividends paid. Retained earnings were more important for non-G-SIBs in the advanced economies than for G-SIBs, contributing 0.8 percentage points to an overall capital increase of 1.2 percentage points.

For banks in emerging economies, retained earnings were still more significant, contributing more than 80% to the overall increase in capital – 4.8 out of the total 5.7 percentage points. Dividend payouts were roughly twice other increases in capital for these banks (2.1 percentage points versus 0.9 percentage points). A very rapid accumulation of net income (corresponding to almost 7 percentage points in capital ratio terms) allowed these banks to increase their common equity quite substantially despite their relatively high dividend payouts.

The ability of banks to increase their capital by accumulating retained earnings did not result from especially strong improvements in profitability. Net income as a share of assets fell from 0.71% in the three years before the crisis to 0.52% in the 2010–12 period across the banks in the sample (Table 1). This ratio fell even more sharply for advanced economy banks – from 0.67% to 0.37% – but it rose for emerging economy banks, from around 1% to 1.23%. The fall in the return on assets

Changes in components of bank income

As a percentage of total assets — Table 1

	2005–07				2010–12			
	Net income	Net interest income	Operating expenses	Other income	Net income	Net interest income	Operating expenses	Other income
	a	b	c	d	a	b	c	d
All	0.71	1.34	1.61	0.98	0.52	1.62	1.64	0.54
Advanced	0.67	1.19	1.60	1.09	0.37	1.41	1.68	0.65
Emerging	1.02	2.91	1.71	–0.18	1.23	2.64	1.46	0.05
G-SIB	0.65	1.13	1.59	1.11	0.38	1.35	1.69	0.72
Non-G-SIB	0.76	1.41	1.61	0.96	0.42	1.62	1.60	0.40
United States	1.07	1.88	2.81	2.00	0.69	2.22	3.15	1.62
Europe	0.58	1.01	1.35	0.92	0.22	1.23	1.38	0.35
Other advanced	0.67	1.28	1.41	0.80	0.56	1.29	1.24	0.51

The figures in the table are weighted averages (using end-period assets as weights) for the ratios of different components of income to total assets, for the banks in the sample. They are related to one another as follows: a = b – c + d.

Sources: Bankscope, Bloomberg; BIS calculations.

primarily reflected a decline in "other income", which is calculated as a residual based on net income, net interest income and operating expenses.

One of the predictions about the impact of the transition to higher bank capital ratios – that it would lead to wider lending spreads – appears to be confirmed, though the widening was rather mild. Net interest income rose from 1.34% of assets to 1.62% for the full sample. This 28-basis point increase in the spread between banks' gross interest earnings and their funding costs works out to 11 basis points per percentage point of increase in the capital ratio – which is towards the bottom of the range of estimates for the likely increase in lending spreads produced by a number of studies before the crisis.[18]

Two other predictions – that banks would increase their income from non-interest sources and that they would reduce their operating expenses – do not seem to be supported. Operating expenses as a share of total assets were roughly unchanged. Income from sources besides net interest income fell for advanced economy banks, though it rose (from a net loss to a small profit) for banks in the emerging economies.

While overall profitability fell, increased earnings retention enabled banks to devote a greater share of income to accumulating capital (Table 2, first and third columns). Dividends fell from almost 40% of income before the crisis for banks in the sample to 27%. This decline entirely reflected a reduction in dividend payouts

Dividend payouts and returns on equity

In per cent Table 2

	2005–07		2010–12	
	Div payout ratio	Return on equity	Div payout ratio	Return on equity
All	39.6	20.7	27.0	8.1
Advanced	41.3	21.2	26.3	5.7
Emerging	27.0	15.9	30.1	18.8
G-SIB	40.1	22.8	21.1	7.0
Advanced non-G-SIB	45.8	16.6	41.0	3.7
United States	58.2	15.9	20.1	7.6
Europe	36.7	22.6	21.7	3.9
Other advanced	31.0	21.5	43.8	9.5

Dividend payout ratio is dividends divided by net income. Return on equity is net income divided by common equity. Both are weighted averages across the corresponding group of banks, using end-period assets as weights.

Sources: Bankscope; Bloomberg; BIS calculations.

[18] For example, the Macroeconomic Assessment Group (2010a) estimated that every percentage point of increased bank capital ratios would lead to a 15–17 basis point (bp) widening of lending spreads. IIF (2011) forecast a 30–80 basis point widening of spreads per additional percentage point of capital – while also estimating that banks would need to raise capital ratios by up to 5 percentage points. Elliott et al (2012), looking at the combined impact of higher capital and other regulatory reforms along with likely bank adjustment strategies, estimated that spreads would widen by 18 basis points in Europe, 8 basis points in Japan and 28 basis points in the United States. Miles et al (2013) find that every percentage point increase in the capital ratio from its 2009 level leads to around a 10 basis point increase in the lending rate. Oxford Economics (2013) estimates that a 1 percentage point rise in the common equity Tier 1 capital ratio for US banks would raise lending rates by 15 basis points.

by advanced economy banks, while the payout ratio rose slightly for emerging economy banks.

Falling profitability and rising capital have led to a decline in returns on equity. The ratio of net income to book equity fell sharply for the full sample, from almost 21% to around 8%, again reflecting a decline among the advanced economy banks (Table 3, second and fourth columns). Investors, not surprisingly, have not accepted lower returns on bank equity with equanimity; price-to-book ratios for many banks have been at or below 1 since the crisis, reflecting scepticism about earnings prospects as well as asset quality. However, a broad decline in returns on bank equity is to be expected as part of a shift to a less leveraged, better capitalised banking system.

Assets and lending

As already noted, the banks in our sample tended to see their assets grow during the period under consideration. They achieved increases in capital ratios by effecting greater increases in equity capital and, at least in the advanced economies, reducing their ratio of risk-weighted to total assets.

From 2009 to 2012, bank assets grew by 14.6%, based on a weighted average, across the sample (Table 3). Assets of emerging economy banks grew by 47.1%, much faster than advanced economy bank assets (7.6%). G-SIBs increased their assets slightly faster (9.5%) than did non-G-SIB advanced economy banks (7.3%), though the increase in gross lending by both of these groups was about the same.

Lending growth, whether calculated before (gross loans) or after (net loans) reserves for impaired and non-performing loans, largely tracked asset growth for most subsamples. For the US banks in the sample, assets grew by 12% while lending grew by 33%. However, for European banks, lending growth lagged far behind asset growth. Instead, these banks appear to have accumulated large amounts of "other assets", including cash and government securities.

Growth in categories of bank assets, 2009–12

In per cent — Table 3

	Assets	Gross loans	Net loans	Trading securities	Other assets
All	14.6	16.1	16.7	42.9	24.8
Advanced	7.6	9.1	9.4	–6.5	20.5
Emerging	47.1	48.7	49.2	283.2	44.8
G-SIB	9.5	10.0	11.6	–5.4	23.5
Advanced non-G-SIB	7.3	10.2	7.5	–6.8	16.4
United States	12.4	33.0	34.7	45.8	10.3
Europe	5.6	0.6	2.4	–27.5	25.9
Other advanced	12.4	14.9	11.1	4.0	18.1

The figures in the table are weighted averages of the percentage growth from end-2009 to end-2012 in the categories shown, using end-2012 assets as weights. Net loans are gross loans minus reserves against possible losses on impaired or non-performing loans.

Sources: Bankscope; Bloomberg; BIS calculations.

It should be emphasised that the figures in Table 3 break down asset growth by the nationality of the bank, not that of the borrower. While the Bankscope data do not separate foreign from domestic assets, the pullback in lending by European banks does not necessarily correspond to a reduction in credit provided to the banks' domestic economies. As documented by BIS (2012), European banks have moved to reduce their cross-border assets more readily than domestic assets in recent years.[19]

Some analysts have predicted that regulatory reforms and the experience of the crisis would induce banks to pull back from trading activities. Banks will need to hold more capital against securities inventories and derivatives positions, and some will be subject to structural regulatory initiatives such as the "Volcker rule" in the United States that place restrictions on trading. Advanced economy banks did reduce their stock of trading securities, by 6.5% from 2009 to 2012 (Table 3, fourth column). Emerging economy banks, by contrast, increased trading securities dramatically, almost tripling their holdings over this time, albeit from a relatively low base. Despite this rapid growth, at end-2012 trading securities accounted for only 3% of emerging economy bank assets, compared with 8% for advanced economy banks.

A closer look at adjustment strategies

A crucial question is the degree to which differences in growth rates of bank assets, and other adjustment measures undertaken by banks, reflect transitions to higher capital ratios as opposed to other factors such as macroeconomic conditions in the home economy. Table 4 presents the outcomes of regressions of different bank asset aggregates on increases in capital and other factors. The models are of the form:

$$Adj_i = (\beta_1 + \beta_2 Europe_i + \beta_3 Emerging_i) * \left(\frac{K_{i,0}}{RWA_{i,0}}\right) + (\beta_4 + \beta_5 Europe_i + \beta_6 Emerging_i) * \Delta\left(\frac{K_i}{RWA_i}\right) + (\beta_7 + \beta_8 Europe_i + \beta_9 Emerging_i) * \left(\frac{Net\ Inc_i}{Assets_i}\right) + \overrightarrow{Geog_i} \cdot \beta_{10\ldots13} + \varepsilon_i \quad (3)$$

where *i* indexes banks, Adj_i is a variable measuring some aspect of banks' adjustment strategies, $Europe_i$ is a dummy variable set equal to one if a bank is based in an advanced European economy, $Emerging_i$ equals one if a bank is based in an emerging economy, and $Geog_i$ is the full vector of dummy variables where the bank's home country or region is equal to one.[20] Changes are measured from end-2009 to end-2012, while the net income-to-assets ratio is an average for the years 2010, 2011 and 2012. The interaction terms allow us to test the factors affecting the adjustment strategies of two sets of banks that stood out in the previous discussion, namely banks based in Europe and banks based in emerging economies. For the dependent variable, the four columns of Table 4 look at growth

[19] Avdjiev et al (2012) document how euro area banks reduced cross-border lending to emerging economies more than did banks based in other regions after the crisis.

[20] Along with *Europe* and *Emerging*, dummies are included for the United States and for the other advanced economies.

in assets, gross loans, risk-weighted assets and the bank's stock of trading securities.

Banks which had strong risk-weighted capital ratios at end-2009 and high profitability in 2010–12 tended to increase their assets more than their peers (Table 4, first column). Specifically, a bank which had a 1 percentage point higher capital ratio at end-2009 was likely to have a 3 percentage-point higher rate of asset growth over the subsequent three years. A bank which had a half percentage point higher return on its assets in 2010–12, which is about one standard deviation for this sample of banks, tended to have a 12 percentage point higher rate of asset growth during this time. Once these effects are accounted for, the increase in the capital ratio does not have a statistically significant impact on asset growth. A similar relationship holds between the starting capital ratio, profitability and gross lending, though in this case the significance levels are weak (Table 4, second

Capital ratios, profitability and adjustment strategies

Table 4

Dependent variable	Growth in assets	Growth in gross loans	Growth in risk-weighted assets	Growth in trading securities
	1	2	3	4
Capital ratio End-2009	2.93**	2.17	0.41	45.96**
	(5.31)	(1.00)	(0.52)	(3.52)
Capital ratio* Europe	–3.14**	–2.45	–0.42	–43.00**
	(–3.12)	(–1.01)	(–0.39)	(–3.26)
Capital ratio* Emerging	–6.60**	–5.80*	–3.17	26.48
	(–3.43)	(–1.84)	(–1.41)	(0.35)
Change in capital ratio 2009–12	0.12	0.35	–0.30	4.58**
	(0.95)	(0.54)	(–1.35)	(3.09)
Change in capital ratio* Europe	–0.28*	–0.51	0.05	–4.47**
	(–1.81)	(–0.77)	(0.22)	(–2.96)
Change in capital ratio* Emerging	0.56**	0.57	0.84**	5.74
	(2.94)	(0.86)	(2.58)	(0.53)
Net income/assets 2010–12	24.54**	11.76	14.88	89.81
	(3.30)	(0.39)	(0.96)	(1.61)
Net income/assets* Europe	–5.29	11.56	13.02	–64.12
	(–0.58)	(0.37)	(0.80)	(–1.12)
Net income/assets* Emerging	33.73**	45.28	56.67**	24.22
	(3.17)	(1.47)	(3.40)	(0.11)
R^2	0.67	0.17	0.73	0.25
Number of observations	81	80	81	74

The table shows the coefficients from OLS regressions of the stated dependent variable on the independent variables and dummies for the United States, Europe, other advanced economies and emerging economies. Coefficients on the geographical dummies are not shown. T-statistics are in parentheses, based on White (heteroskedasticity-robust) standard errors. Assets, risk-weighted assets, gross loans and trading securities are measured from end-2009 to end-2012. "Europe" refers to European advanced economies. Risk-weighted assets use Basel-II risk weights. Gross loans are loans before provisions for impairments and non-performing loans. * and ** = significantly different from 0 at a 90% and 95% confidence level, respectively.

Sources: Bankscope; Bloomberg; BIS calculations.

column).[21] Put another way, the effects of starting conditions on bank asset growth hold *regardless* of how quickly the bank moved to increase its capital ratio.[22]

These effects varied in important ways for European and emerging economy banks. The coefficients on the interaction terms suggest that neither the starting capital ratio nor the increase in the capital ratio had an impact on how quickly European banks expanded assets and lending. The tendency for profitable banks to increase lending was the same for European as for other banks.

Emerging economy banks with high capital ratios in 2009 seem to have grown more slowly than those with lower ratios. However, emerging economy banks that increased their capital ratios during 2009–12 grew more quickly. And more profitable banks in the emerging world grew even more quickly than did profitable banks in advanced economies.

While banks that raised their risk-weighted capital ratio more sharply between 2009 and 2012 did not reduce their total assets or overall lending, they did tend to cut back on risk-weighted assets, though the effect is not significant (Table 4, third column). For every percentage point by which a bank increased its capital ratio during this period, its risk-weighted assets fell by about three tenths of a percentage point – though this effect went in the opposite direction for the emerging economy banks.

Banks that had high risk-weighted capital ratios in 2009, and those that increased their capital ratios subsequently, were more likely to increase their trading portfolios (Table 4, fourth column). A bank that had a one percentage point higher capital ratio at the end of 2009 was likely to increase its trading portfolio by almost half over the following three years, relative to other banks. Every percentage point increase in the risk-weighted capital added a further 5% of growth to trading assets. These effects were even stronger for banks from emerging economies, but they did not hold for European banks.

Conclusions

The process of adjustment to Basel III is not yet complete. The evidence presented here, however, suggests that most banks have achieved most of the adjustment to date through the accumulation of retained earnings. Banks in advanced economies have reduced dividend payouts as part of this process. Banks in emerging economies have enjoyed high earnings and asset growth, and have had little trouble using some of their strong earnings to increase their capital ratios. An additional, though secondary, role has been played by the shift to assets with lower risk weights by advanced economy banks. Banks in advanced economies have benefited from modestly wider net interest margins. Reductions in operating expenses do not appear to have played much of a role.

Banks in aggregate do not appear to have cut back sharply on asset or lending growth as a consequence of stronger capital standards. However, banks that had high capital ratios at the start of the process or strong profitability in the post-crisis

[21] The fall in significance appears to be due mostly to one outlying observation.

[22] Kapan and Minoiu (2013) find that banks with higher, better-quality capital did not reduce lending during the financial crisis as much as did other banks.

years did tend to grow more than other banks. This points to the importance of solid bank balance sheets in supporting lending.

There has been a pronounced shortfall in lending growth among European banks, though they have accumulated other assets in the form of cash and securities. Some banks, especially in Europe, have cut back their trading portfolios.

Further research is needed to understand the interplay among these different adjustment strategies, and to trace their macroeconomic effects. It will be especially important to look more closely at the relative roles of regulation, macroeconomic factors, sovereign risk concerns and the disposal of legacy assets in the balance sheet adjustments that have been made by European banks.

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