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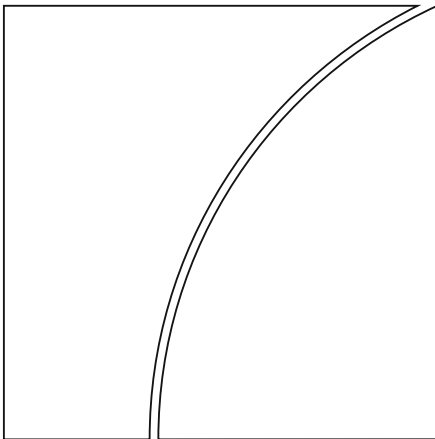
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## Banks and capital requirements: channels of adjustment

by Benjamin H Cohen and Michela Scatigna

Monetary and Economic Department

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Keywords: banks, bank capital, regulation, capital ratios, Basel III.

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# Banks and capital requirements: channels of adjustment

Benjamin H Cohen and Michela Scatigna<sup>1</sup>

Bank capital ratios have increased steadily since the financial crisis. For a sample of 94 large banks from advanced and emerging economies, retained earnings account for the bulk of their higher risk-weighted capital ratios, with reductions in risk weights playing a lesser role. On average, banks continued to expand their lending, though lending growth was relatively slower among European banks. Lower dividend payouts and (for advanced economy banks) wider lending spreads have 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.

Keywords: banks, bank capital, regulation, capital ratios, Basel III.

JEL classification: E44, G21, G28.

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## Introduction

In the years since the global financial 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 paper examines the broad patterns in how banks have gone about achieving higher risk-weighted capital ratios since the crisis.

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. The advanced-economy banks in the sample increased their assets by 8% from 2009 to 2012, while the emerging-economy banks increased assets by 47%. However, European banks have increased their lending more slowly than banks based in other regions. In the advanced economies, a reduction in risk-weighted assets relative to total assets has also played a role, albeit a secondary one. More profitable banks have 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 lower levels of capital have been 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 banks pursue them on a large scale. We then look at broad evidence on whether, and in what ways, some of these potential macroeconomic impacts have taken place. The following sections look more closely at the adjustment paths taken by a sample of 94 large global banks. 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.

## 1. Channels of adjustment

A bank that seeks to increase its risk-adjusted capital ratio has a number of options at its disposal.<sup>2</sup>

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. Lending spreads would 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, or reducing overall operating expenses. Higher bank lending spreads or fees need not be

<sup>2</sup> Higher capital requirements were only one element of a range of financial regulatory reforms that have been put in place since the crisis. Some of the other key elements include liquidity requirements for banks, central clearing of standardised OTC derivatives, and strengthened resolution regimes for financial entities. While many of these reforms may have potentially significant macroeconomic effects, they are not considered here.

evidence of cartel behaviour – rather, they would simply reflect the incorporation of higher industry-wide costs (in this case, the cost of accumulating additional capital) into a higher required return on assets.

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 for bank shareholders, however, given that a new share issue tends to reduce the market value of the existing shares.<sup>3</sup>

A third set of adjustment strategies involves changes to the *asset* 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 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.<sup>4</sup>

Banks' choices across this set of 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 the slowdown results from reduced bank lending supply, as opposed to reduced demand for loans by 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 to a sustained recovery, nonperforming and underperforming legacy assets are being written off and overleveraged borrowers are paying down their debts. The adjustment process 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.<sup>5</sup>

<sup>3</sup> See Myers and Majluf (1984).

<sup>4</sup> 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 Basel Committee on Banking Supervision (2013c, 2013d).

<sup>5</sup> 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.



## The impact of a one percentage point increase in capital ratios: Selected forecasts

Table 1

	Lending spread	Lending Volume	Growth annual rate
MAG (2010a)	+15–17 basis points	–1–2%	– 4 basis points over 4 years
BCBS (2010a)	+13 basis points	(not estimated)	– 9 basis points, permanent
IIF (2011)*	+30–80 basis points	–0.8–1 %	–6–12 basis points over 5–10 yrs
Cournede & Slovik, OECD (2011)	+ 8–20 basis points	(not estimated)	–4 basis points over 9 years
Elliott et al, IMF (2012)*	+5–15 basis points	(not estimated)	(not estimated)
Miles et al (2013)	+5.5 basis points	(not estimated)	–4.5 basis points permanent
Oxford Economics (2013)*	+15 basis points	(not estimated)	–1.6 basis points over 9 years

\* Also includes impact of other regulatory measures.

Sources: As listed; BIS calculations.

Some observers have expressed concern 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. In response to these concerns, a number of studies attempted to assess the scope of the potential macroeconomic impact of stronger regulation. Most of these studies used an approach that translated increases in bank capital into increases in lending spreads, and in some cases into changes in lending volumes. Spread and volume effects were typically estimated per percentage point of higher risk-weighted capital ratios (Table 1). Macroeconomic impacts were then derived by multiplying these effects by the number of percentage points by which capital ratios were expected to rise as a result of the reforms (Table 2).

## The overall impact of banking sector capital requirements on capital ratios and growth: selected forecasts

Table 2

	Required increase in capital percentage points	Growth annual rate
MAG (2010a)	1.3 pp	– 5 basis points over 4 years
IIF (2011)*	4.8 pp	–30–60 basis points over 5 yrs
Cournede & Slovik, OECD (2011)	3.7 pp	–15 basis points over 9 years
Elliott et al, IMF (2012)*	1.2–2.7 pp	(not estimated)
Miles et al (2013)	3.3 pp	– 15 basis points, permanent**
Oxford Economics (2013)*	4–10 pp	–7–16 basis points over 9 years

\* Also includes impact of other regulatory measures.

Sources: As listed; BIS calculations.

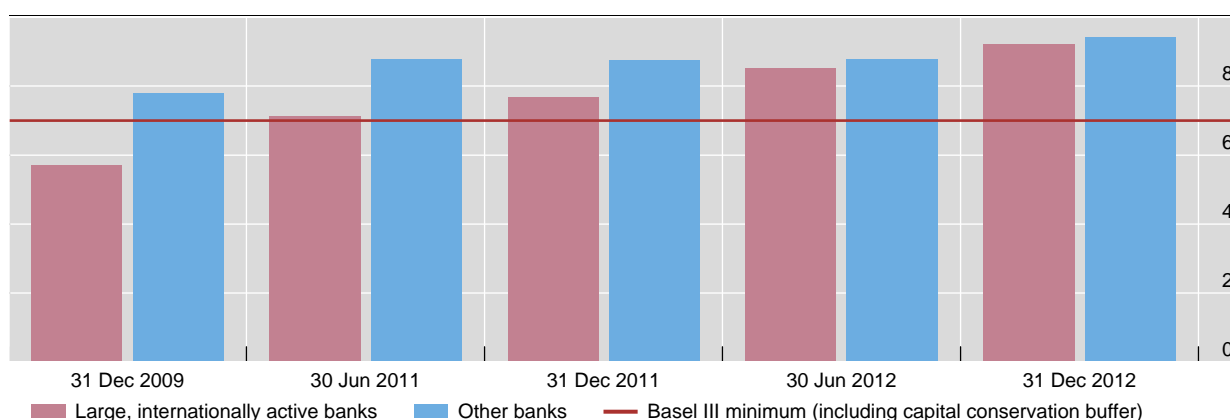
## 2. Bank capital, lending and growth in the aggregate

A series of Quantitative Impact Studies (QIS) conducted by the Basel Committee on Banking Supervision offer evidence for 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.<sup>6</sup> Weighted average capital ratios for large, internationally active banks have risen from 5.7% at the end of 2009 to 9.2% at end-2012. Those for a sample of smaller banks have risen from 7.8% to 9.4% over the same period (Graph 1).

### Common equity risk-weighted capital ratios under Basel III definitions

In per cent

Graph 1



Source: Basel Committee on Banking Supervision.

Leverage ratios (capital under the fully phased-in Basel III definition divided by total unweighted exposures) have increased in parallel, from 2.8% to 3.7% for the first group and from 3.8% to 4.2% 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 (not risk-weighted) assets for US commercial banks rose from 11.3% in December 2009 to 11.8% in December 2012.<sup>7</sup> The ratio for euro area monetary financial institutions, measured on a consolidated basis, increased from 7.6% to 9.1% over the same period.<sup>8</sup>

<sup>6</sup> See Basel Committee on Banking Supervision (2010b, 2012a, 2012b, 2013a, 2013e).

<sup>7</sup> [www.federalreserve.gov/releases/h8/current/default.htm](http://www.federalreserve.gov/releases/h8/current/default.htm).

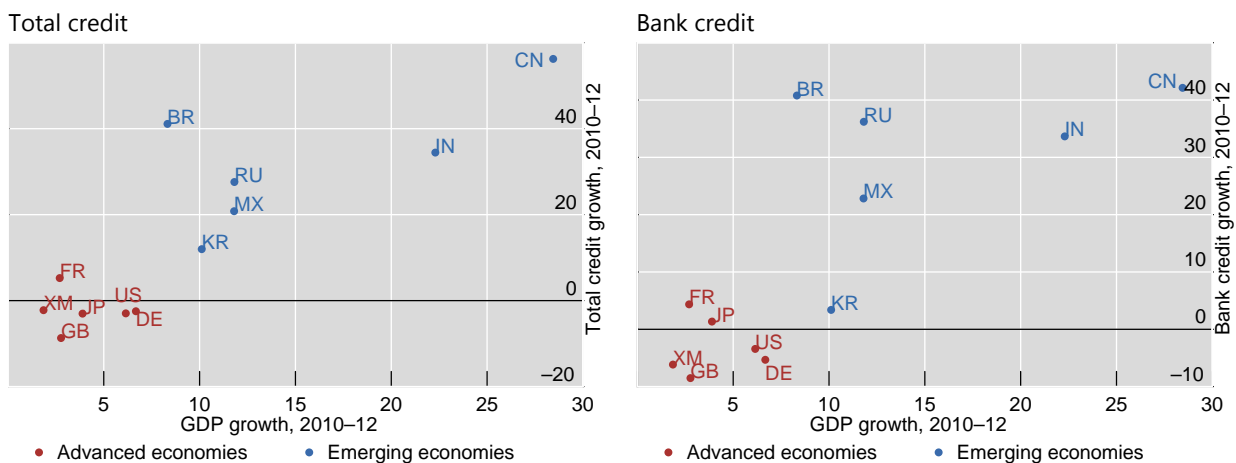
<sup>8</sup> [www.ecb.europa.eu/stats/money/aggregates/bsheets/html/index.en.html](http://www.ecb.europa.eu/stats/money/aggregates/bsheets/html/index.en.html). The US and European ratios are not strictly comparable, given differences in accounting conventions (for example, the

While bank capital has risen more or less steadily worldwide, the performance of credit aggregates and GDP have been mixed (Graph 2). In most of the advanced economies (red dots), 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 (left-hand panel) or at bank-intermediated credit alone (right-hand panel).<sup>9</sup> Many emerging economies, meanwhile, have enjoyed rapid GDP growth, often accompanied by even more rapid expansion of credit (blue dots).

## Credit and GDP growth

In per cent

Graph 2



Sources: BIS; national data.

Graph 2 illustrates the absence of a strong cross-sectional relationship between credit growth and GDP since the crisis, especially in the advanced economies. This is true whether one looks at total credit provided to the economy from all sources, or only at credit provided by banks. 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.

As discussed in the previous section, if a drive for higher capital ratios were constraining the willingness of banks to lend, we would see evidence of this in the form of tighter bank lending standards and wider lending spreads.

Surveys of bank lending officers in different economies do not point to a sustained tightening of lending standards across all global regions in recent years (Graph 3). In the US, UK and euro area, the net balance of responses (the percent of respondents reporting tighter conditions minus the percent reporting looser ones),

accounting standards used in Europe have stricter rules about using the net value of matched derivatives positions, resulting in higher measured bank assets) and reporting populations (for example, the European data include money market funds).

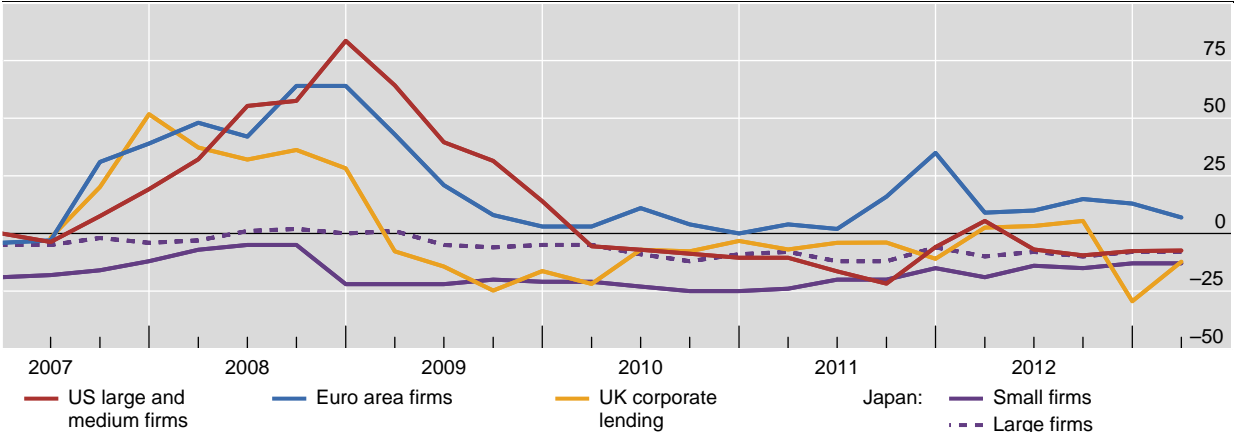
<sup>9</sup> The sharp increase in the bank credit figure for the UK in early 2010 reflects the return of certain formerly securitised assets to bank balance sheets.

point to considerably easier lending conditions than those that prevailed during the financial crisis. In the US and Japan, these indicators have been consistently negative since early in 2010 (for the US) or 2009 (for Japan). The UK responses have also tended to indicate looser conditions, except for a period in mid-2012. The surveys for the euro area, however, have suggested an ongoing tightness of bank lending conditions, particularly at the height of the sovereign debt concerns in the second half of 2011.<sup>10</sup>

Survey responses on banking standards<sup>1</sup>

Net tightening, in percentage points

Graph 3



<sup>1</sup> Difference between banks reporting tighter lending conditions during the previous quarter and those reporting looser conditions.

Sources: Bank of England; Bank of Japan; European Central Bank; Federal Reserve Board.

Lending spreads also offer a mixed picture. Graph 4 compiles a variety of lending spreads from different advanced economies, maturities and sectors. The spread between Baa and Aaa-rated corporate bonds in the US is included as an indicator of spreads in the broader financial system. Most of these spreads, both banking and non-banking, have been stable or narrower since the crisis. As with bank lending standards, the euro area (in this case, the spread between 1–5 year business loans and 3-month euribor) again stands as an exception: this spread has widened from around 260 basis points in early 2009 to more than 300 basis points more recently. The timing of the movement of this indicator suggests that the sovereign debt crisis in the euro area has played a substantial role: it widened sharply during the crisis, narrowed somewhat thereafter, then widened again in late 2011 when sovereign credit concerns intensified.<sup>11</sup>

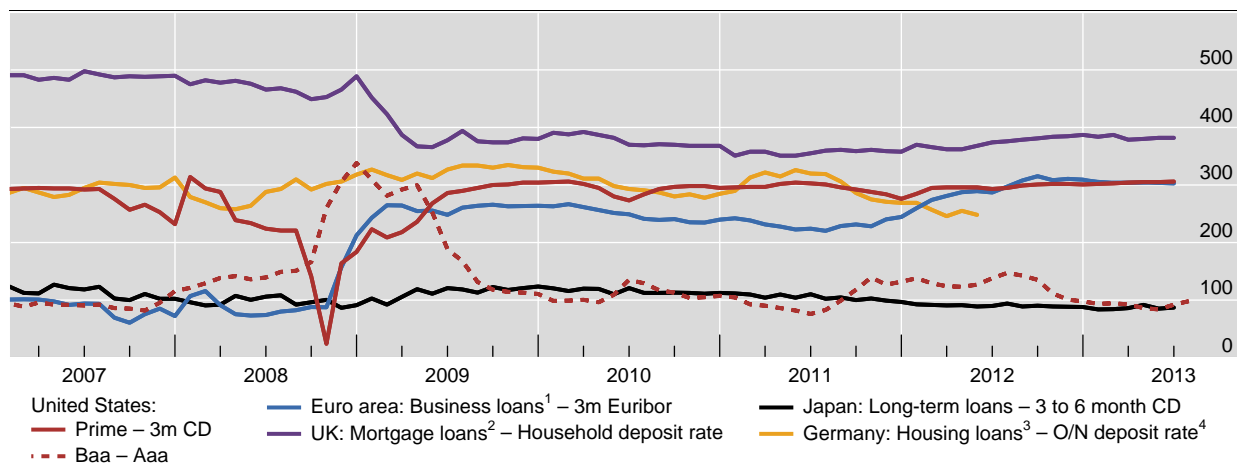
<sup>10</sup> Although these surveys typically ask banks whether they are “tightening” their lending conditions, research has found that the survey responses might better be interpreted as an indicator of whether conditions are “tight”. For example, De Bondt et al (2010) find that, for the euro area, the level of this indicator, rather than its quarter-to-quarter change, is significant in forecasting bank credit and real GDP growth for subsequent quarters.

<sup>11</sup> Illes and Lombardi (2013) examine the behaviour of lending spreads in different economies since the crisis, including divergences between core and peripheral euro area economies.

## Lending spreads in selected economies

In basis points

Graph 4



<sup>1</sup> One to five year business loans. <sup>2</sup> Variable rate mortgages. <sup>3</sup> One to five years housing loans. <sup>4</sup> Deposits of non-financial corporates.

Source: National data.

### 3. 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 have drawn data from the Bankscope database for a set of 94 banks (Table 3). 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 data from the Bloomberg and SNL databases. 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.<sup>12</sup> It includes all of the 29 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.<sup>13</sup> It covers 64% of the assets of the top 1000 global banks as listed by *The Banker*.

Banks included in analysis

Table 3

Country	Bank	Assets at end 2012 US\$ billion	GSIB
<b>Europe</b>			
Austria	Erste Group Bank AG	282	
	Raiffeisen Zentralbank Oesterreich AG	193	
Belgium	Dexia	471	
	KBC Group	339	
France	Banque Populaire CdE	1023	X
	BILLIONP Paribas	2517	X
	Crédit Agricole S.A.	2431	X
	Credit Mutuel	851	
Germany	Société Générale	1650	X
	Commerzbank AG	839	
	Deutsche Bank AG	2655	X
	Deutsche Postbank AG	256	
Ireland	Landesbank Hessen- Thueringen	263	
	Bank of Ireland	195	
Italy	Gruppo Monte dei Paschi di Siena	289	
	Intesa Sanpaolo	889	
	UniCredit SpA	1223	X
Netherlands	ING Groep NV	1542	X
Poland	PKO Bank Polski	62	
Portugal	Banco Comercial Português, SA	118	
Russia	Sberbank of Russia	497	
Spain	Banco Bilbao Vizcaya Argentaria SA	842	X
	Banco Popular Espanol SA	208	
	Banco Santander SA	1675	X

<sup>12</sup> 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 Russia, Brazil, China, India, Korea, Malaysia, Taiwan (Chinese Taipei) and Thailand.

<sup>13</sup> See Financial Stability Board (2013) and Basel Committee on Banking Supervision (2013b).

Country	Bank	Assets at end 2012 US\$ billion	GSIB
Sweden	Nordea Bank AB	894	X
	Skandinaviska Enskilda Banken AB	377	
	Svenska Handelsbanken	367	
	Swedbank AB	284	
Switzerland	Banque Cantonale Vaudoise	43	
	Credit Suisse AG	991	X
	UBS AG	1374	X
Switzerland	Banque Cantonale Vaudoise	43	
	Credit Suisse AG	991	X
	UBS AG	1374	X
Turkey	Turkiye Garanti Bankasi A.S.	101	
	Turkiye is Bankasi A.S. - ISBANK	113	
United Kingdom	Barclays Bank Plc	2352	X
	HSBC Holdings Plc	2693	X
	Lloyds Banking Group Plc	1459	
	Nationwide Building Society	311	
	Royal Bank of Scotland Group Plc (The)	2071	X
	Standard Chartered Plc	637	X
<b>North America</b>			
Canada	Bank of Montreal	526	
	Bank of Nova Scotia (The)	668	
	Canadian Imperial Bank of Commerce CIBC	394	
	National Bank of Canada	178	
	Royal Bank of Canada RBC	825	
	Toronto Dominion Bank	811	
Mexico	Banorte	48	
United States	Bank of America Corporation	2210	X
	Bank of New York Mellon Corporation	359	X
	BB&T Corporation	184	
	Capital One Financial Corporation	313	
	Citigroup Inc	1865	X
	Comerica Incorporated	65	
	Fifth Third Bancorp	122	
	Goldman Sachs Group, Inc	939	X
	JP Morgan Chase & Co.	2359	X
	KeyCorp	89	
	Morgan Stanley	781	X
	Northern Trust Corporation	97	

Country	Bank	Assets at end 2012 US\$ billion	GSIB
United States (cont.)	State Street Corporation	223	X
	SunTrust Banks, Inc.	173	
	US Bancorp	354	
	Wells Fargo & Company	1423	X
<b>Asia-Pacific</b>			
Australia	Australia and New Zealand Banking Group	672	
	Commonwealth Bank of Australia	733	
	National Australia Bank Ltd	798	
	Westpac Banking Corporation	706	
China	Agricultural Bank of China Limited	2106	
	Bank of China Limited	2016	X
	Bank of Communications Co. Ltd	838	
	China CITIC Bank Corporation Limited	471	
	China Construction Bank Corporation	2222	
	China Merchants Bank Co Ltd	542	
	Industrial & Commercial Bank of China	2789	X
India	ICICI Bank Limited	121	
	State Bank of India	358	
Japan	Aozora Bank Ltd	62	
	Bank of Tokyo - Mitsubishi UFJ Ltd	2005	X
	Mizuho Financial Group	1964	X
	Nomura Holdings Inc	435	
Korea	Sumitomo Mitsui Financial Group, Inc	1727	X
	Hana Bank	145	
	Kookmin Bank	241	
Malaysia	Woori Bank	231	
	Malayan Banking Berhad - Maybank	162	
	Public Bank Berhad	90	
Taiwan (Chinese Taipei)	Chinatrust Commercial Bank Ltd	67	
Thailand	Bangkok Bank Public Company Limited	79	
<b>South America</b>			
Brazil	Banco Bradesco SA	392	
	Banco Itau Unibanco SA	449	
Chile	Banco Chile	49	



Country	Bank	Assets at end 2012 US\$ billion	GSIB
<b>Africa-Middle East</b>			
Saudi Arabia	National Commercial Bank	92	
South Africa	Absa Bank Ltd	90	
	FirstRand Bank Ltd	84	
	Standard Bank of South Africa Ltd	115	

Source: Bankscope.

The banks in the sample increased their common equity capital by a total of US\$962 billion from end-2009 to end-2012 (Table 4). Their assets rose by nearly \$9 trillion during this time, while risk-weighted assets rose by \$2.3 trillion. Capital rose for all of the subsamples considered in Table 4: advanced-economy banks, emerging-economy banks, G-SIBs, advanced-economy non-G-SIBs, US banks, European banks, and banks from other advanced economies. Total assets rose for all of these groups, except for the European banks. Risk-weighted assets, however, fell for the advanced-economy banks as a whole and for each of the advanced-economy subgroups, though they rose for banks from emerging economies. "Capital" in this table and in the subsequent tables and discussions is defined as common equity. That is, it does not include preferred shares or hybrid securities. Risk-weighted assets are as reported in the Bankscope database, which are measured using Basel II definitions.

## Bank capital and assets, 2009–12

In US\$ billion

Table 4

	End-2009			End-2012			2009–12			Number of banks
	Capital	RWA	Total assets	Capital	RWA	Total assets	Net income	Dividends	Other increases in capital	
All	3194	28354	64278	4156	30695	73232	1077	397	274	94
Advanced	2638	22956	54878	3169	22023	58663	604	242	161	66
Emerging	556	5398	9400	987	8671	14569	473	155	113	28
G-SIB	2044	17665	42852	2570	18053	47228	581	189	134	29
Advanced economy non-G-SIB	771	6914	15034	914	6636	16240	180	110	65	39
US	891	6659	10485	1094	6506	11556	223	45	24	16
Europe	1398	12239	34989	1506	10756	34603	182	95	23	35
Other advanced	349	4058	9404	569	4762	12505	199	102	113	15

The table shows the calculation of the elements of equation (1) in the text for the set of banks indicated. Weighted averages (using end-2012 assets as weights) are shown.

Sources: Bankscope, Bloomberg SNL; BIS calculations.

In terms of weighted averages, using end-2012 total assets as weights,<sup>14</sup> the banks in our sample increased their risk-weighted common equity capital ratio from 11.4% at end-2009 to 13.9% at end-2012 (Table 5).

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

In percent

Table 5

	K/RWA 2009	K/RWA 2012	Increase in capital	Increase in RWA	Increase in RWA/TA	Increase in total assets	Number of banks
All	11.4	13.9	45.6	14.4	-7.7	22.4	94
Advanced	11.8	14.6	31.9	-0.6	-10.6	11.2	66
Emerging	10.2	11.4	100.9	75.0	4.2	67.6	28
G-SIB	11.7	14.5	36.4	5.3	-8.4	14.5	29
Advanced economy non-G-SIB	11.6	14.0	28.0	6.5	-12.9	20.6	39
US	14.0	17.6	24.3	-0.6	-11.6	12.4	16
Europe	12.1	14.5	7.9	-11.2	-9.9	-1.7	35
Other advanced	8.9	11.9	105.2	28.8	-11.8	46.0	15

The table shows the calculation of the elements of equation (1) in the text for the set of banks indicated. Changes are calculated in local currency terms. Weighted averages (using end-2012 assets as weights) are shown.

Sources: Bankscope, Bloomberg SNL; BIS calculations.

The increase in capital ratios from end-2009 to end-2012 in our sample, which equals 2.5 percentage points after rounding, is somewhat below the QIS finding of an increase of 3.5 percentage points over the same period for capital ratios using the fully phased in Basel III definitions. Our ratios are also quite a bit higher (between five and six percentage points) than those calculated by the Basel Committee in the QIS. These discrepancies arise from a number of factors. For one thing, risk-weights for many asset classes are higher under Basel III than Basel II. This will reduce the calculated ratio. A second factor is that regulatory capital, which is in the numerator of the ratios reported by the Basel Committee, is likely to be less than capital as reported on a bank's balance sheet, because of deductions to the regulatory figure for goodwill, securitisation positions, deferred tax assets and other items. This, too, will reduce the overall level of the ratio. Since banks are likely to have taken the regulatory capital ratio as their target rather than the balance sheet ratio that is discussed in this paper, it is not surprising that the regulatory ratio has increased more. Unfortunately, few banks publicly report their fully phased-in Basel III ratios. We therefore study ratios calculated from balance-sheet data as an imperfect substitute.

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.

<sup>14</sup> Unless otherwise stated, the figures in the text, graphs and tables in the remainder of the paper are weighted averages with end-2012 assets as weights. For banks with fiscal years that do not end on Dec 31, data are assigned to the nearest year-end (that is, fiscal years ending from January through June are assigned to the previous year, while fiscal years ending from July through November are assigned to the current year).

Common equity capital (the numerator of the right-hand side of equation (1)) increased 46%, while risk-weighted assets (the denominator) rose 14% (Table 5, third and fourth columns).<sup>15</sup> The overall increase in risk-weighted assets in turn results from an 8% reduction in the ratio of risk-weighted to total assets, and a 22% increase in the level of total assets (Table 5, fifth and sixth columns). Total assets increased for every sub-group considered in Table 5, except for European banks, which saw a 2% decline in assets. For every group except emerging economy banks, risk-weighted assets fell as a share 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 (Table 6, Graph 5). For the advanced economy banks, roughly 2.4 of the overall increase of 2.8 percentage points reflected higher capital, while the rest resulted from a decline in risk-weighted assets. Total assets rose for these banks, subtracting the equivalent of 0.9 percentage point from the ratio, but this was counteracted by a significant fall in the ratio of risk-weighted to total assets, which added 1.35 percentage points.

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

Normalised to percentage points of end-2009 risk-weighted assets

Table 6

	Increase in K/RWA	Increase in capital	Increase in RWA	Increase in RWA/TA	Increase in total assets	Number of banks
	a	b	c	d	e	
All	2.50	3.36	0.86	-0.99	1.85	94
Advanced	2.81	2.36	-0.45	-1.35	0.90	66
Emerging	1.26	6.90	5.64	0.40	5.24	28
G-SIB	2.76	2.95	0.19	-1.06	1.25	29
Advanced economy non-G-SIB	2.38	2.22	-0.16	-1.67	1.52	39
US	3.56	3.23	-0.34	-1.96	1.63	16
Europe	2.48	0.52	-1.96	-1.48	-0.48	35
Other advanced	3.02	4.77	1.76	-0.91	2.67	15

The table shows the calculation of the elements of equation (2) in the text for the set of banks indicated. Changes are calculated in local currency terms. Weighted averages (using end-2012 assets as weights) are shown. The columns are related as follows:  $a = b - c = b - (d + e)$ .

Sources: Bankscope, Bloomberg SNL; BIS calculations.

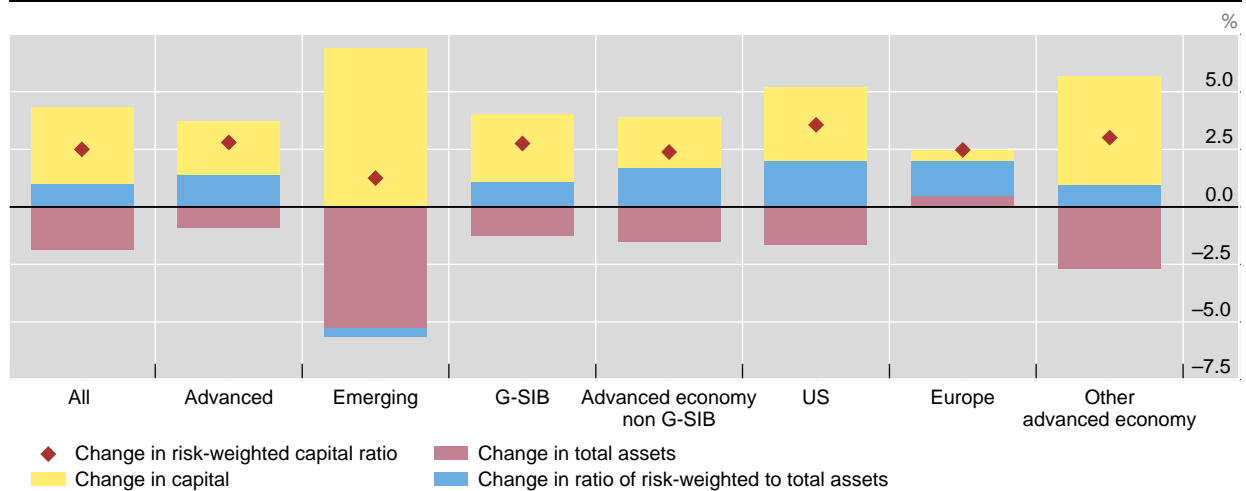
<sup>15</sup> To eliminate exchange-rate valuation effects, these changes are calculated using the local currency of the bank's headquarters.

Emerging economy banks, by contrast, increased both capital and total assets substantially. Their overall risk-weighted capital ratio increase of 1.3 percentage points reflects the fact that higher capital, which added 6.9 percentage points to the risk-weighted capital-ratio, outpaced the increase in risk-weighted assets, which subtracted 5.6 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.

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

Normalised to percentage points of end-2009 risk-weighted assets

Graph 5



The graph shows the change in the ratios of common equity to risk-weighted assets at the (fiscal-year) end of 2009 and 2012, respectively, 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, normalised by the ratio  $(b-a)/(\ln(b) - \ln(a))$ . All figures are weighted averages, using end-2012 assets as weights.

Sources: Bankscope; Bloomberg; BIS calculations.

The G-SIBs<sup>16</sup> increased their capital and overall risk-weighted capital ratios by more than did the advanced economy banks in the sample that are not G-SIBs. The G-SIBs' common equity capital ratios increased by 2.8 percentage points. For these banks, higher capital, which contributed 2.95 percentage points to the overall increase in the ratio, outweighed higher risk-weighted assets, which reduced the ratio by just under 0.2 percentage points. The reduction in the ratio of risk-weighted assets to total assets accounted for a 1.1 percentage point increase in the G-SIBs' capital ratio – but this was counteracted by an increase in total assets, which reduced the capital ratio by 1.25 percentage point. Advanced economy banks that are not G-SIBs, by contrast, increased their capital ratios by somewhat less, namely 2.4 percentage points. As with the G-SIBs, most of this (2.2 percentage points) reflected higher capital and the rest a reduction in risk-weighted assets. The European banks were the only group considered for which the bulk of the increase in the capital ratio resulted from lower risk-weighted assets rather than higher capital.

<sup>16</sup> All of the G-SIBs but two (Bank of China and Industrial and Commercial Bank of China) are based in advanced economies (Table 1).

## 4. Decomposing changes to capital

For the full sample, and for most subsamples, retained earnings (net income minus dividends) accounted for most of the increase in capital from 2009 to 2012. Table 7 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, dividends<sup>17</sup> and other changes to capital. 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 sample of 85 banks for which information was available, retained earnings (net income minus dividends) accounted for about 25 percentage points out of the overall 39% increase in capital from end-2009 to end-2012.

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

In percent

Table 7

As a percent of end-2009 capital								
	K/RWA 2009	K/RWA 2012	Increase in capital, end- 2009-end- 2012	Net income, 2010–12	Dividends, 2010–12	Retained earnings, 2010–12	Other sources of capital, 2010–12	Number of banks
			a	b	c	d	e	
All	11.4	13.9	39.0	39.6	14.9	24.6	14.4	85
Advanced	11.7	14.5	29.4	27.3	11.3	16.1	13.3	61
Emerging	10.2	11.4	77.3	88.4	29.4	59.0	18.6	24
G-SIB	11.7	14.5	36.4	32.9	11.0	21.9	14.5	29
Advanced economy non-G-SIB	11.5	13.7	17.5	28.1	18.6	9.5	8.0	34
US	14.0	17.6	24.3	26.8	5.5	21.3	3.0	16
Europe	12.1	14.5	14.4	15.9	7.6	8.3	6.1	31
Other advanced	8.7	11.8	75.4	58.9	26.7	32.2	43.2	14

The table shows the sources of increases in bank capital for the set of banks indicated. Changes are calculated in local currency terms. Weighted averages (using end-2012 assets as weights) are shown. The variables are related as follows: a = b – c + e = d + e.

Sources: Bankscope, Bloomberg, SNL; BIS calculations.

As in the previous section, it is useful to look at these figures in terms of percentage-point increases in the risk-weighted capital ratio. To create an additive relationship, we need a further transformation, as follows:

$$Fln\left(\frac{K_1}{K_0}\right) = G\left(\frac{Inc_1}{K_0}\right) - G\left(\frac{Div_1}{K_0}\right) + G\left(\frac{Oth_1}{K_0}\right) \quad (3)$$

where the normalisation factor G is defined as  $Fln(K_1/K_0)/(K_1/K_0 - 1)$ .

<sup>17</sup> 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. Dividends are the sum of common and preferred dividends.

## Sources of changes in bank capital, end-2009-end 2012

Normalised to percentage points of end-2009 risk-weighted assets

Table 8

	As a percent of end-2009 capital							Number of banks
	K/RWA 2009	K/RWA 2012	Increase in capital, end-2009-end-2012	Net income, 2010–12	Dividends, 2010–12	Retained earnings, 2010–12	Other sources of capital, 2010–12	
			a	b	c	d	e	
All	11.4	13.9	3.74	3.78	1.43	2.36	1.38	85
Advanced	11.7	14.5	3.01	2.80	1.15	1.65	1.37	61
Emerging	10.2	11.4	6.32	7.23	2.40	4.82	1.52	24
G-SIB	11.7	14.5	2.80	2.53	0.85	1.68	1.12	29
Advanced economy non-G-SIB	11.5	13.7	4.24	6.82	4.52	2.30	1.94	34
US	14.0	17.6	3.23	3.56	0.73	2.83	0.39	16
Europe	12.1	14.5	0.45	0.50	0.24	0.26	0.19	31
Other advanced	8.7	11.8	4.76	3.71	1.68	2.03	2.72	14

The table shows the sources of increases in bank capital for the set of banks indicated, using the normalisation discussed in the text. Changes are calculated in local currency terms. Weighted averages (using end-2012 assets as weights) are shown. The variables are related as follows:  $a = b - c + e = d + e$ .

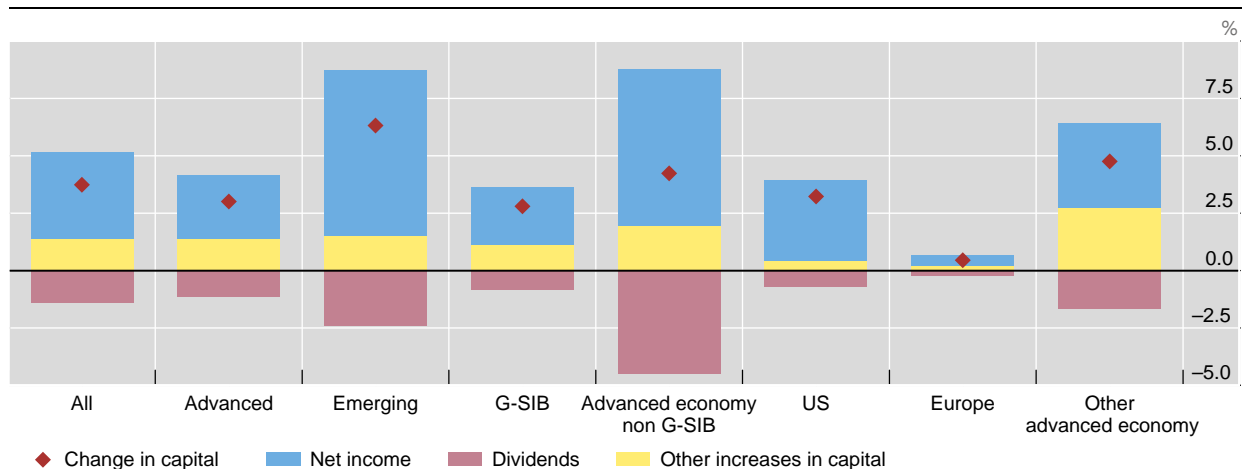
Sources: Bankscope, Bloomberg, SNL; BIS calculations.

Table 8 and Graph 6 report the components of increases in capital, after the transformation set out in equation (3). When expressed in terms of percentage points of the risk-weighted capital ratio, retained earnings accounts for 2.5 out of the 3.9 percentage-point increase in capital, while capital from other sources accounts for the remaining 1.4 percentage points.

## Sources of increases in bank capital, end-2009 to end-2012

Normalised to percentage points of end-2009 risk-weighted assets

Graph 6



Sources: Bankscope; Bloomberg; BIS calculations.

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. Retained earnings by the G-SIBs accounted for 1.7 percentage points of the overall capital increase of 2.8 percentage points. Capital generated from other sources provided the rest.

For banks in emerging economies, retained earnings were somewhat more significant, contributing about three fourths of the overall increase in capital – 5.4 out of the total 7 percentage points. In contrast to the advanced economy banks, dividend payouts were substantially greater than other increases in capital for banks in emerging economies. A very rapid accumulation of net income (corresponding to more than 8 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 0.7% in the three years before the crisis to 0.55% in the 2010–2 period across the banks in the sample (Table 9). This ratio fell even more sharply for advanced-economy banks – from 0.7% to 0.4% – though it rose slightly for emerging economy banks, from around 1.1% to 1.2%. The fall in the return on assets primarily reflected a decline in “other income”, which is calculated as a residual based on net income, net interest income and operating expenses, on the part of the advanced-economy banks.

## Changes in components of bank income

In percent of total assets

Table 9

	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	0.72	1.37	1.64	0.99	0.55	1.67	1.64	0.52
Advanced	0.68	1.20	1.62	1.10	0.37	1.40	1.68	0.65
Emerging	1.11	3.02	1.85	–0.06	1.23	2.68	1.48	0.04
G-SIB	0.65	1.17	1.59	1.07	0.44	1.40	1.64	0.67
Non-G-SIB	0.77	1.43	1.63	0.98	0.44	1.62	1.60	0.41
US	1.07	1.88	2.81	2.00	0.69	2.22	3.15	1.62
Europe	0.58	1.00	1.35	0.93	0.18	1.16	1.34	0.37
Other advanced	0.68	1.30	1.43	0.82	0.58	1.31	1.25	0.52

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, SNL; BIS calculations.

One of the predictions about the impact of the transition to higher bank capital ratios – wider lending spreads – appears to be confirmed, though the widening was rather mild. Net interest income rose from 1.37% of assets to 1.67% for the full sample. This 30-basis point increase in the spread between banks’ gross interest earnings and their funding costs works out to 12 basis points per percentage point of increase in the capital ratio – which is towards the bottom of the range of published estimates for the likely increase in lending spreads (Tables 1 and 2).

Two other predictions – that banks would increase their income from non-interest-paying sources and that they would reduce their operating expenses – do not seem to be supported. Operating expenses were roughly unchanged across the sample, though they do appear to have declined somewhat for the emerging-economy banks. Income from sources besides net interest income fell for the sample as a whole and for the 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 10, first and third columns). Dividends fell from more than 40% of income before the crisis for banks in the sample to 30%. This decline entirely reflected a reduction in dividend payouts on the part of 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 also fell sharply for the full sample, from 18% to around 9%, again reflecting a decline by the advanced economy banks (Table 10, 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 skepticism about earnings prospects as well as asset quality.

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## Dividend payouts and returns on equity

In percent

Table 10

	2005–07		2010–12	
	Div payout ratio	Return on equity	Div payout ratio	Return on equity
All	40.5	18.0	30.3	8.6
Advanced	41.9	18.2	29.4	5.9
Emerging	29.4	16.9	33.6	18.9
G-SIB	39.1	18.4	24.3	7.9
Advanced non-G-SIB	46.7	16.9	47.4	4.2
US	58.1	15.9	20.8	7.6
Europe	38.0	18.0	25.8	3.7
Other advanced	34.0	21.6	46.5	9.8

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, SNL; BIS calculations.

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## 5. 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.



## Growth in categories of bank assets, 2009–12

In percent

Table 11

	Assets	Gross loans	Net loans	Trading securities	Cash and interbank	Other assets
All	19.1	21.0	21.3	45.5	103.8	26.8
Advanced	11.3	12.7	12.8	-3.3	103.8	21.1
Emerging	49.0	52.3	52.6	236.3	103.7	48.2
G-SIB	13.9	14.7	16.0	55.1	100.7	25.3
Advanced non-G-SIB	13.6	16.7	13.7	-0.3	108.3	15.6
US	12.4	33.0	34.7	45.8	32.6	12.6
Europe	6.1	1.0	2.7	-26.3	136.2	23.1
Other advanced	23.6	26.3	22.0	14.5	82.1	22.5

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

Sources: Bankscope; Bloomberg, SNL; BIS calculations.

This section examines developments in different categories of bank assets from end-2009 to end-2012 in two ways: first by taking the weighted average of bank-level asset growth over 2009-2012 for the full sample of banks and different subsamples (Table 11), and second by looking at the aggregate change in different categories of bank assets, in effect pooling the balance sheets across the sample and the various subsamples (Table 12).<sup>18</sup>

## Aggregate growth in categories of bank assets, 2009–12

In percent

Table 12

	Assets	Gross loans	Net loans	Trading securities	Cash and interbank	Other assets
All	14.4	13.1	12.9	-17.0	70.3	21.7
Advanced	7.3	3.5	2.9	-18.8	70.7	16.2
Emerging	53.3	56.1	56.2	48.8	67.3	50.0
G-SIB	10.2	5.2	5.5	-20.9	70.3	21.6
Advanced non-G-SIB	9.2	10.1	8.2	-6.0	73.1	7.3
US	10.3	10.3	11.9	10.1	17.4	10.3
Europe	-1.1	-9.5	-8.5	-33.5	91.6	14.4
Other advanced	33.0	37.4	32.2	22.8	63.3	30.5

The figures in the table are the percentage growth from end-2009 to end-2012 in the aggregate amounts of assets in the categories shown across the relevant subsample, in US dollars. "Net loans" equal "gross loans" minus reserves against possible losses on impaired or non-performing loans. "Other assets" equal assets minus gross loans, trading securities and cash.

Sources: Bankscope; Bloomberg, SNL; BIS calculations.

<sup>18</sup> The first measure uses asset growth figures denominated in local currencies (using the currency of the bank's head office in the case of banks that are active in multiple jurisdictions). The second uses assets denominated in US dollars. This will result in relatively higher asset growth figures using the first measure for banks in countries which experienced depreciation against the US dollar over 2009-12, and lower figures where there was appreciation.

From 2009 to 2012, banks across the full sample saw their assets grow by 19%, based on a weighted average (Table 11, first column). Assets of emerging-economy banks grew an average of 49%, while advanced economy bank assets grew 11%. G-SIBs increased their assets at a slightly faster pace (13.9%) than did advanced economy banks that are not G-SIBs (13.6%).<sup>19</sup>

Similar patterns are also apparent when one looks at aggregate asset growth (Table 12, first column). Assets grew by 14% for all banks, by 7% for the set of advanced economy banks, by 53% for the set of emerging economy banks, by 10% for the G-SIBs, and by 9% for the advanced economy non-G-SIBs.

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 an average of 12% while gross lending grew 33%. However, for European banks, lending growth lagged behind asset growth. The average European bank increased gross lending slightly (by 1%), but European banks as a whole reduced their gross lending by 9.5%. Instead, these banks appear to have accumulated cash and interbank assets at a faster pace than did banks based in other geographical areas. While both advanced and emerging-economy banks tended to double their holdings of cash and interbank claims, European banks increased their holdings in this category by 136% (Table 11, fifth column).

It should be emphasised that the figures in Tables 11 and 12 break down asset growth by the nationality of the bank, not that of the borrower. The pullback in lending by European banks thus 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.<sup>20</sup>

Some analysts have predicted that regulatory reforms and the experience of the crisis would induce a pullback of banks 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 US that place restrictions on trading activities.

The evidence suggests that while many banks did reduce their stock of trading assets, especially in Europe, others maintained or increased them, particularly in the US and emerging economies. This pattern is reflected in the divergence between the bank-level growth rates in the fourth column of Table 11, and the aggregate growth rates in the fourth column of Table 12. These figures should be interpreted with caution; some of the changes reflect changes in the valuation of the assets used, and the classification of assets as "trading securities" is likely to have differed somewhat across banks and jurisdictions, reflecting differences in accounting standards. Nevertheless, certain patterns emerge.

While banks on average increased their holdings of trading securities by 46% (Table 11, fourth column), the stock of trading securities held by the banks in the

<sup>19</sup> The G-SIB figure is nevertheless higher than that for advanced economy banks as a whole because of very rapid asset growth by the one G-SIB (Bank of China) that is not based in an advanced economy.

<sup>20</sup> 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.

sample fell by 17% (Table 12, fourth column). Advanced economy banks on average reduced their stock of trading securities, with a weighted average reduction of about 3% from 2009 to 2012 and an overall reduction of 19% during this time. The aggregate trading securities held by G-SIBs fell 21%. Banks headquartered in Europe were especially aggressive in reducing trading portfolios, with their holdings of such securities declining on average by 26% over this period. The aggregate holding of trading securities by European banks fell 34%. US banks, on average, increased trading portfolios by 46%, but this appears to be due largely to a rapid build-up from a low base by a subset of the US banks in the sample. Using aggregate figures, US banks' holdings of trading securities rose 10%. Emerging economy banks also increased trading securities sharply, with the (weighted) average bank more than doubling its holdings over this time, while the aggregate trading portfolio of the emerging-economy banks rose 49%. However, this rapid growth starts from a relatively low base. At end-2012 trading securities still accounted for only 4% of emerging economy bank assets, compared with 8% for advanced economy banks.

## 6. 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 bank's home economy. Table 13 presents the outcomes of regressions of different bank asset aggregates on increases in capital and other factors. The models are of the form:

$$Adj_i = \beta_0 + \overline{Geog}_i \cdot \beta_{1...3} + (\beta_4 + \beta_5 Europe_i + \beta_6 Emerging_i) * \left( \frac{K_{i,0}}{RWA_{i,0}} \right) + (\beta_7 + \beta_8 Europe_i + \beta_9 Emerging_i) * \Delta \left( \frac{K_i}{RWA_i} \right) + (\beta_{10} + \beta_{11} Europe_i + \beta_{12} Emerging_i) * \left( \frac{Net\ Inc_i}{Assets_i} \right) + \varepsilon_i \quad (4)$$

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 a vector of dummy variables where the bank's home country or region is equal to 1. Geographical dummies are included for *Europe*, *Emerging*, and for the United States. The constant term thus stands for the other advanced economies. Changes in capital and in the dependent variables 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 13 look at growth in assets, gross loans (that is, loans before provisions for impairment and non-performing loans), risk-weighted assets, and the bank's stock of trading securities.

Banks which had high risk-weighted capital ratios at end-2009 and strong profitability in 2010-12 tended to increase their assets more than their peers (Table 13, column 1). Specifically, a bank which had a one percentage-point higher capital ratio at the end of 2009 was likely to have a 3 percentage-point higher rate of asset growth over the subsequent three years. A bank which had a

0.6 percentage point higher ratio of income to assets in 2010–2, which is about one standard deviation for this sample of banks, tended to have a 15 percentage-point higher rate of asset growth during this time. When 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 effects are not statistically significant (Table 13, column 2).<sup>21</sup> 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.<sup>22</sup>

These effects varied in important ways for European and emerging-economy banks.

The coefficients on the interaction terms suggest that the starting capital ratio did not have an impact on how quickly European banks expanded assets and lending. Increased capital ratios for European banks were associated with slower growth in assets and lending: every additional percentage point increase in capital was associated with a 21 basis points reduction in asset growth, and a 36 basis points reduction in loan growth. However, the tendency for profitable banks to increase lending was the same for European as for other banks. The positive coefficient on the dummy for European banks suggests that, once the effects of capital and profitability are accounted for, European banks had faster lending growth than banks in the US or other advanced economies.

Emerging economy banks that had high risk-weighted capital ratios in 2009 grew relatively more slowly than those with lower ratios. However, more profitable banks in the emerging world grew even more quickly than did profitable banks in advanced economies. And emerging economy banks exhibited faster asset growth overall, once the impact of capital and profitability are accounted for.

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 (Table 13, column 3). For every percentage point by which a bank increased its capital ratio during this period, its risk-weighted assets fell by about four tenths of a percentage point. US and European banks tended to reduce risk-weighted assets more aggressively than did banks from other advanced economies, once the impact of starting capital levels, overall capital increases, and bank profitability are removed. Emerging-economy banks that had low capital ratios at the end of 2009 tended to reduce risk-weighted assets more than did others, in line with their tendency to reduce assets overall. But these emerging-economy banks that increased capital ratios most sharply in the subsequent three years also tended to increase their risk-weighted assets over this period. More profitable banks in the sample were more likely to increase risk-weighted assets, though this effect was statistically significant only for the emerging-economy banks.

Banks that had high risk-weighted capital ratios in 2009, those that increased their capital ratios subsequently, and those that enjoyed high profitability were more likely to increase their trading portfolios during 2009–12 (Table 13, column 4).

<sup>21</sup> The fall in significance appears to be due mostly to one outlying observation.

<sup>22</sup> 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.

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 45% over the following three years, relative to other banks. Every percentage point increase in the risk-weighted capital added a further five percentage points to growth in trading assets. However, these effects did not hold for European banks.

Capital ratios, profitability, and adjustment strategies

Table 13

Dependent variable	Growth in assets	Growth in gross loans	Growth in risk-weighted assets	Growth in trading securities
	1	2	3	4
Constant	-0.24** (-2.43)	-0.13 (-0.31)	0.24 (1.26)	-6.27** (-3.12)
US	-0.21** (-5.22)	0.00 (-0.02)	-0.31** (-6.10)	-0.89** (-2.46)
Europe	0.34** (2.34)	0.26 (0.59)	-0.56** (-2.40)	5.68** (2.80)
Emerging	0.71** (4.20)	0.35 (0.73)	0.12 (0.29)	6.58* (1.74)
Capital ratio end-09	2.92** (5.74)	2.37 (1.07)	0.45 (0.60)	44.62** (3.48)
Capital ratio* Europe	-3.26** (-3.39)	-3.18 (-1.29)	1.31 (1.01)	-41.93** (-3.23)
Capital ratio* Emerging	-7.40** (-4.37)	-4.78 (-1.65)	-6.07** (-2.15)	-32.66 (-1.22)
Change in capital ratio 2009–12	0.09 (0.73)	0.28 (0.45)	-0.37* (-1.72)	4.79** (2.98)
Ch in capital ratio* Europe	-0.30** (-2.03)	-0.64 (-0.96)	0.11 (0.47)	-4.76** (-2.93)
Ch in capital ratio* Emerging	-0.13 (-0.60)	-0.21 (-0.29)	1.02** (2.07)	2.17 (0.28)
Net income/Assets 2010–12	25.21** (3.56)	12.17 (0.40)	18.62 (1.29)	88.33* (1.68)
Net income/Assets* Europe	-4.53 (-0.52)	13.74 (0.44)	19.71 (1.28)	-59.61 (-1.11)
Net income/Assets* Emerging	11.43 (0.65)	28.27 (0.85)	37.05* (1.74)	-128.51 (-1.11)
R2	0.63	0.20	0.61	0.17
# of obs	93	92	93	86

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. \*\* Significantly different from 0 at a 95% confidence level. \* Significantly different from 0 at a 90% confidence level.

Sources: Bankscope, Bloomberg; BIS calculations.

## 7. Conclusions

The adjustment process 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 on the part of 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 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 on the part of European banks, though European banks 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 the European banks.

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