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Buffer usability and cyclicality in the Basel framework

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Contents

Glossary

AT1	Additional Tier 1
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
bp	basis point
CBR	Combined buffer requirement
CCoB	Capital conservation buffer
CCyB	Countercyclical capital buffer
CDS	Credit default swap
CECL	Current expected credit losses
CET1	Common Equity Tier 1
CRD	Capital Requirements Directive
DSB	Domestic Stability Buffer
D-SIB	Domestic systemically important bank
ECB	European Central Bank
ECL	Expected credit losses
EDF	Expected Default Frequency
EL	Expected loss
ESRB	European Systemic Risk Board
FSB	Financial Stability Board
FSF	Financial Stability Forum
GDP	Gross domestic product
GFC	Global financial crisis
G-SIB	Global systemically important bank
HP	Hodrick-Prescott
HQLA	High-quality liquid assets
IFRS	International Financial Reporting Standard
IL	Incurred loss
LCR	Liquidity Coverage Ratio
MDA	Maximum distributable amount
MREL	Minimum requirement for own funds and eligible liabilities
MMF	Money market funds
OSFI	Office of the Superintendent of Financial Institutions (Canada)
PCA	Prompt Corrective Action
P&L	Profit and loss
pp	percentage point(s)
RWA	Risk-weighted asset
RWF	Risk-weight factor

S&L	Savings and Loan association
SyRB	Systemic risk buffer
SME	Small and medium-sized entity
SRS	Supervisory Reporting System
TCR	Total capital ratios
TLAC	Total loss-absorbing capacity
USD	US dollar
VIX	Volatility Index

Buffer usability and cyclicality in the Basel framework

Executive summary

1. Beginning in 2009, the Basel Committee on Banking Supervision (BCBS) developed a set of new regulatory standards, commonly referred to as the Basel III reforms, in response to the Global Financial Crisis (GFC) of 2007–09.[1] These standards aimed to strengthen the regulation, supervision and risk management of banks. The BCBS is evaluating the impact of those standards already implemented. As part of this evaluation, it published a report in July 2021 setting out a preliminary assessment of whether the reforms implemented thus far have functioned as intended in light of the Covid-19 pandemic.[2]

2. This report follows up that work with an in-depth examination of several questions regarding buffer usability and cyclicality of the framework. It examines whether the Basel standards are operating in a way that enables the banking sector to dampen, rather than amplify shocks; a subsequent broader report will provide a more holistic evaluation of the reforms.

3. It is hard to draw firm conclusions from any specific analysis given data limitations, variations in experience across jurisdictions, and the difficulty of distinguishing between the effects of the Basel III reforms and the wide-ranging support measures undertaken by authorities to address the economic impact of the pandemic. Given that, the report seeks to draw conclusions by considering a range of different information and analyses at both jurisdictional and global levels, including the use of bank-level data that the Committee has been collecting.[3] Importantly, the report makes no policy recommendations and only presents evaluation findings.

4. Evidence from the July 2021 BCBS report, jurisdictional analysis and a number of recent academic studies indicate that banks close to or below regulatory capital thresholds have lower loan growth than their better-capitalised peers. New empirical work based on the Committee's global panel data set also finds some indications of a positive relationship between capital headroom[4] and lending. While some constraint on lending by less well capitalised banks is to be expected, excessive contraction of credit supply in a systemic stress period could be detrimental to financial stability.

5. Empirical evidence based on the Committee's data indicates that temporary reductions in capital requirements supported lending during the pandemic, although there is weaker evidence for countercyclical capital buffer (CCyB) releases specifically, which may reflect more limited use of the CCyB to date. The evaluation findings of an apparent reluctance of banks to cross regulatory capital thresholds and a positive impact of capital releases on lending, alongside results in a range of academic studies, demonstrate the value of an effective countercyclical regulatory capital regime.

6. There is limited evidence on whether reluctance by banks to use liquid asset buffers has affected their lending and market activity given the short-lived liquidity pressures during the pandemic. Further monitoring of this issue may be helpful.

7. Provisioning could be another source of cyclical pressure on capital. The analysis finds little sign of procyclical effects on lending during the Covid-19 pandemic related to the recent introduction of the expected credit loss (ECL) framework, although effects are hard to discern given the extensive economic

1 Basel III: international regulatory framework for banks (bis.org).

2 Basel Committee on Banking Supervision, Early lessons from the Covid-19 pandemic on the Basel reforms (bis.org), July 2021 (hereinafter, "July 2021 BCBS report").

3 A semiannual data collection through the Basel III monitoring exercise, and data from supervisory reporting systems (SRS).

4 "Capital headroom" is defined as the surplus of a bank's capital resources above all minimum regulatory requirements and buffers.

support provided by authorities. More broadly, there are potential benefits of a forward-looking approach to loan loss provisions, which enables regulatory capital measures to better reflect the underlying resilience of banks.

8. The report comprises the following sections: (i) capital buffer usability (**Section 1**); (ii) countercyclical capital policy (**Section 2**); (iii) liquidity buffer usability (**Section 3**); and (iv) expected credit loss provisioning, capital and procyclicality (**Section 4**).

Capital buffer usability

9. Capital buffers are intended to help banks build sufficient resources in normal times so that in a period of stress they can absorb losses and avoid a disruptive reduction of lending. Some external stakeholders and supervisors have expressed concern about banks' willingness to dip into buffers in stress, suggesting there could be an adverse market reaction.

10. Since the introduction of the buffer framework, there have been cases of individual banks dipping into their capital buffers to absorb large losses, often for a short period of time. A study of the US Prompt Corrective Action (PCA) framework indicates that banks may be reluctant to cross regulatory capital thresholds that could lead to increased supervisory scrutiny, and yields a clear finding that firms that did fall below thresholds in the GFC limited lending relative to better-capitalised firms for an extended time period.

11. A number of academic studies within the EU, the United Kingdom and the United States, and the July 2021 BCBS report have found that, during the pandemic period, lending growth was weaker at banks that were closer to crossing their capital buffer thresholds than at banks with greater capital headroom. New empirical work, using the Committee's global panel data set over an extended time period, although with less frequent and granular data than other studies, finds some indications of a positive relationship between capital headroom and lending. Furthermore, regression analysis indicates that financial markets perceive banks that have lower capital headroom less favourably than peers with greater headroom, which may indicate market participants' concern regarding banks dipping into capital buffers. In addition, parallel requirements such as the leverage ratio, in fulfilling its intended function as a backstop, may limit the availability of buffers for some banks.

Countercyclical capital policy

12. A number of authorities have actively adjusted capital requirements in the light of changes in their assessment of risks to the banking system. For example, most authorities that had positive CCyBs prior to the pandemic released them in order to provide banks with additional capital headroom. Several authorities that did not have positive CCyBs in place lowered other regulatory requirements or buffer levels countercyclically. Several jurisdictions have recently adopted supplementary measures, including positive neutral CCyBs, given the difficulty in identifying when higher releasable capital buffers might be needed to absorb losses from credit downturns, or so that they can lower capital requirements in response to shocks unrelated to the credit cycle, such as the Covid-19 pandemic or Brexit.

13. New empirical analysis suggests that reductions in overall capital requirements helped banks sustain lending during the pandemic, echoing earlier findings in the July 2021 BCBS report. That said, the evidence that reductions in CCyB requirements can support lending is weaker than for other capital releases, perhaps reflecting the more limited use of the CCyB across jurisdictions. Academic studies also tend to find that capital releases support lending. In addition, an evaluation of the historical loss experience of banks indicates that a higher capital buffer may be helpful when risks are elevated.

Liquidity buffer usability

14. The Liquidity Coverage Ratio (LCR) is intended to help banks maintain resilience in the face of liquidity shocks. In a similar way as for capital buffers, some banks and academic studies have expressed concern about supervisory or market reactions to banks dipping into liquidity buffers.

15. There is limited empirical evidence to date on liquidity buffer usability, not least as banks entered the pandemic with robust LCRs and liquidity pressures were short-lived. A few jurisdictions have indicated that banks acted defensively in March 2020 to keep LCRs above 100%, but not in a way that amplified stress, and any liquidity concerns were quickly removed by proactive public liquidity provision by central banks. These support measures and strong deposit inflows helped increase LCRs over the course of the pandemic. Liquidity stress tests by a few jurisdictions indicate a lack of willingness by banks to use liquidity buffers in a systemic event, which may amplify the initial stress. And banks' internal risk limits and data on LCR levels are consistent with banks regarding it as important that they keep LCRs above 100%.

Expected credit loss provisioning, capital and procyclicality

16. In the GFC, incurred loss accounting led to provisions that were "too little, too late" and regulatory capital measures that were not fully reflective of the underlying health of banks. Following the crisis, policymakers asked accounting standard setters to develop a more forward-looking provisioning approach that better reflected potential loan losses. This new ECL approach relies on firms being able to forecast future credit losses, which could be particularly difficult in the event of sudden exogenous shocks such as a pandemic, potentially generating procyclical effects.

17. It is hard to assess the impact of ECL provisioning on capital and the procyclicality of lending given that the new accounting approach was introduced shortly ahead of, or concurrently with, the pandemic. Empirical analysis based on the Committee's data finds some signs of increased sensitivity of lending to capital for banks following adoption of IFRS9, but that sensitivity did not increase further following the onset of the Covid-19 pandemic. Relatedly, the implementation of Current Expected Credit Losses (CECL) had no discernible impact on lending. These findings might reflect the extensive support provided to economies by authorities, which dampened losses. Regulatory authorities also extended the availability of transitional offsets to capital as a countercyclical measure. In addition, firms use management judgment in determining provisions, which helped in this case to mitigate any potential procyclicality from relying only on model-driven approaches. Furthermore, the analysis finds some signs that, during the Covid-19 pandemic, provisioning was positively related to bank capital adequacy, indicating the importance of careful attention by supervisors to firms' provisioning policies in cyclical downturns.

1. Capital buffer usability

18. Capital buffers are a key feature of the Basel III reforms. Introduced after the GFC of 2007–09, they are intended to play an important role in ensuring a resilient banking system that is able to support the real economy through the economic cycle. The intent is that banks build up capital buffers outside periods of stress that can absorb losses under stress and help ensure that banks are able to continue financial intermediation.

19. At the onset of the Covid-19 pandemic, the BCBS and supervisory authorities encouraged banks to make use of their capital buffers.[5] However, several studies, including the July 2021 BCBS report and a report published by the FSB in October 2021,[6] have found some indications of hesitancy by banks to dip into their capital buffers. These studies noted that the potential reluctance to use capital buffers may reflect banks' uncertainty about future losses, capital distribution constraints or the market stigma that a bank might face if it were to operate within its buffers.

20. This section provides a range of analyses on capital buffer usability. After summarising existing empirical findings, the section reports new empirical work on how capital headroom affects lending from a global perspective. A comparative analysis of the US PCA framework provides further insights on banks' responses to tripping regulatory capital thresholds during a previous crisis, and qualitative survey information sheds light on jurisdictional and bank-specific experiences with capital buffer use since 2017. Finally, this section looks into possible explanatory factors for banks' reluctance or inability to dip into their buffers, studying possible stigma effects and interactions between risk-weighted and leverage ratio capital requirements.

1.1 The capital buffer framework

21. The GFC of 2007–09 revealed that regulatory capital requirements were insufficient to allow banks to withstand the crisis. In addition, as banks' capital ratios fell, they cut lending (Graph 1, left-hand panel), while still maintaining dividend payouts (Graph 1, right-hand panel) and bonuses, which may have worsened the effects of the crisis. As a reaction to this, the Basel III capital buffer framework was put in place to enhance loss absorbency and constrain banks from continuing large payouts during periods of sizeable losses.

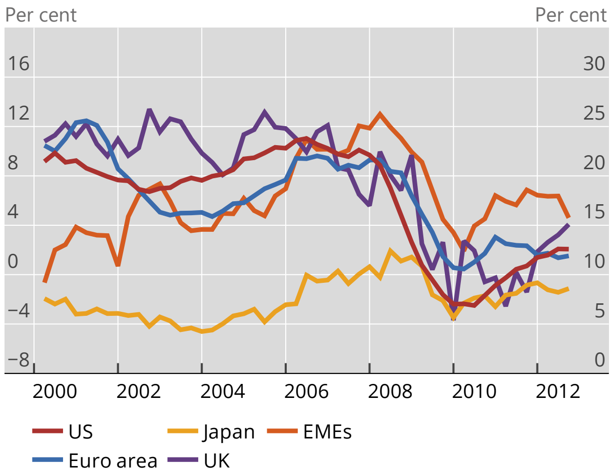
[5] Press release: Basel Committee coordinates policy and supervisory response to Covid-19 (bis.org)

[6] Lessons learnt from the COVID-19 pandemic from a financial stability perspective: Final report - Financial Stability Board (fsb.org)

Lending, losses and dividend payout during the GFC

Graph 1

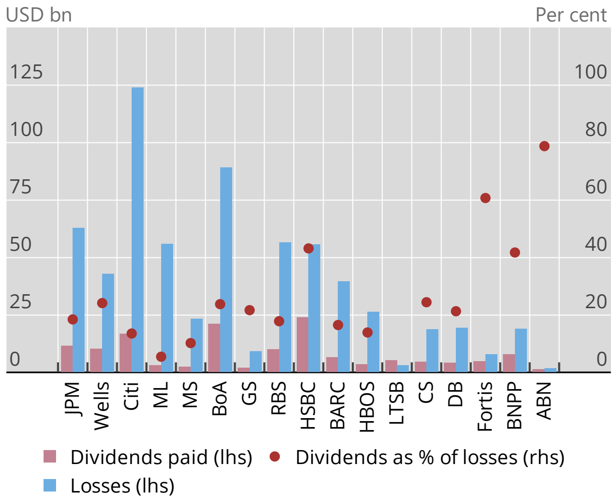
Total credit growth to the private non-financial sector[(a)]



Source: BIS and BCBS calculations

(a) Year-on-year change. EMEs series consists of a weighted average based on the 2005 GDP and PPP exchange rates of 18 EMEs located in Americas, Asia, Africa and Europe.

Cumulative losses incurred and dividends paid for selected banks during 2007–09[(b)]



Source: Acharya et al (2011) and BCBS calculations.

(a) For LTSB, dividends paid out represented 167% of losses incurred during 2007–09.

22. The Basel capital buffer framework comprises the capital conservation buffer (CCoB), the countercyclical capital buffer (CCyB), buffers for globally systemically important banks (G-SIBs) and domestic systemically important banks (D-SIBs), and Pillar 2 buffers. These buffers take the form of an additional layer of capital above the regulatory minimums, and must be met with Common Equity Tier 1 (CET1) capital. Banks operating at levels below the buffers are subject to automatic restrictions on capital distributions, such as dividends, Additional Tier 1 (AT1) coupons and certain discretionary bonus payments. These restrictions are intended to become more severe as a bank's capital ratio approaches the minimum capital requirement.[7]

23. The CCoB is fixed at 2.5% of RWAs. It has two objectives. The first is to provide greater resilience, enabling banks to absorb losses in times of stress, while remaining capable of providing key services to the real economy.[8] The second is that capital distribution restrictions associated with the CCoB will help ensure that capital remains available to support the ongoing business operations of banks through the period of stress. The buffer for G-SIBs aims to provide additional resilience to institutions given the greater potential negative impact of their stress or failure on the financial system and the economy.[9]

24. In contrast to these buffers, the CCyB is time-varying: it can be increased by authorities when they judge that system-wide risk is building up due to excessive credit growth,[10] to ensure the banking

[7] In addition to the maximum distributable amount (MDA) thresholds, banks may be mindful of the CET1 trigger threshold set at 5.125% of RWA for conversion of convertible contingent debt, an AT1 instrument.

[8] See RBC30.1 and RBC30.2. The Committee clarified its view on buffer usability in 2019 (Newsletter on buffer usability (bis.org)) that capital buffers are intended to be used by banks to: (a) "absorb losses in times of stress by having an additional overlay of capital that is above minimum requirements and that can be drawn down; and (b) help maintain the provision of key financial services to the real economy in a downturn by reducing incentives for banks to deleverage abruptly and excessively".

[9] There is a global framework for determining G-SIB status and their buffers. See Global systemically important banks: assessment methodology and the additional loss absorbency requirement (bis.org), Basel Committee on Banking Supervision.

[10] Approaches of the respective jurisdictions may differ. Some jurisdictions activate the CCyB against a range of quantitative and qualitative indicators, even if the credit growth is not necessarily excessive. Furthermore, some jurisdictions use a positive neutral CCyB rate (see Section 2).

system has an additional layer of capital to protect it against future potential losses that may exceed the size of the CCoB and any systemic buffers. The CCyB and other forms of countercyclical capital regulation are evaluated in Section 2.

1.2 Implementation of the buffer framework

25 The capital buffer framework was phased in between 2016 and 2019. Based on the results of the Regulatory Consistency Assessment Programme, most BCBS members have a capital buffer framework that is aligned with the Basel standards.[11] That said, there are differences across jurisdictions: with many having additional buffers (eg the Stress Capital Buffer in the United States for large banks, the PRA buffer in the United Kingdom, or the EU's Systemic Risk buffer).

26. Jurisdictions have adopted different methods of calculating distribution constraints. Based on a survey of BCBS member jurisdictions, eight out of 13 participating jurisdictions have opted for a gradual method of calculation of the distributable amount, meaning that banks are subject to increasing restrictions on capital distributions as their capital level gets closer to the minimum requirements. Five jurisdictions explicitly chose a sharp change, applying a total ban on distributions whenever a bank falls below the combined buffer requirements. Additionally, some jurisdictions use supervisory discretion either to address specific circumstances or to supplement automatic measures.

1.3 Lessons learnt from studies of the Covid-19 pandemic

The July 2021 BCBS report findings

27. The July 2021 BCBS report looked into the effectiveness of capital buffers during the Covid-19 pandemic. Most banks maintained capital ratios well above their minimum requirements and buffers, subsequently referred to as "capital headroom", during the pandemic, partly due to the extensive fiscal and monetary support provided to borrowers, as well as official decisions to reduce capital requirements and buffers and impose restrictions on capital distributions. As such, the report highlighted that it was difficult to draw firm conclusions from the pandemic experience regarding banks' willingness to use capital buffers.

28. The report presented quantitative analyses indicating that banks with lower capital headroom tended to lend less during the pandemic than banks with more headroom, controlling for other sources of variability. Additionally, analysis provided some evidence that greater capital headroom exerted a positive impact on lending behaviour over and above the effect of capital levels.

29. These findings suggested that banks might be reluctant, if the need arose, to dip into their capital buffers. Moreover, a range of supervisors and industry representatives have also expressed a similar sentiment. The July 2021 BCBS report identified several potential sources of impediment to buffer usability, such as adverse market reactions, uncertainty about the global macroeconomic outlook, and potential supervisory responses to the use of buffers, though it was unclear which might be the main driver.

Insights gained from other studies

30. A number of other studies have assessed whether capital headroom is related to lending. Using data on 16 US bank holding companies and about 54,000 firms, Berróspide et al (2021) find that, during the pandemic, banks with below-median capital headroom constrained their lending to small and medium-sized enterprises (SMEs) by 1.4 percentage points, and were 4.6 percentage points more likely to terminate lending relationships, relative to their peers. Couaillier et al (2022) find similar results with data on euro area banks and firms during the pandemic (Annex 1). In their baseline specification, banks in the

[11] Out of 19 jurisdictions, 18 are considered "compliant" and one is considered "largely compliant".

bottom quartile of capital headroom prior to the pandemic reduced their credit supply to non-financial corporates by about 3.5 percentage points compared with their peers. They also find evidence that this affected overall levels of lending: firms exposed to banks with low capital headroom had lower borrowing during the pandemic than firms borrowing mostly from banks with larger capital headroom. By contrast, Duncan et al (2022) find no statistically significant relationship between end-2019 capital buffers and lending during 2020 across a broad data set of US banks.

31. These papers discuss potential reasons for their findings. Berróspide et al (2021) use event studies to show that dividend cuts (which might arise were a bank to use its buffers) were associated with negative abnormal stock returns during the GFC. Couaillier et al (2022) point out that banks closer to their maximum distributable amount (MDA) trigger points saw larger falls in the prices of their contingent convertible bonds, suggesting investor concern about the potential for AT1 coupon payments to be missed. Duncan et al (2022) argue that the lack of a relationship between capital buffers and lending is consistent with the absence of a credit crunch during the pandemic.

32. Chiarotti et al (2022) study the effect of automatic distribution restrictions on banks' reactions to the buffer regime during the pandemic. Using data on 70 large internationally active banks, they find that banks with a history of more stable dividends and low initial capital headroom increased their CET1 ratios by more than their peers after the regime was introduced. They also find that banks with a high reliance on AT1 instruments and low capital headroom before the pandemic increased their CET1 ratios by more than their peers during the pandemic. Both findings suggest that these banks were more concerned about dipping into their buffers.

33. Abad and García Pascual (2022) assess the usability of banks' management buffers (ie their capital headroom). They find that use of these buffers would reduce shareholder value for most banks, suggesting that market reactions may make banks reluctant to use even their management buffers to lend.

34. Another line of study considers how regulatory capital buffers affect the way that banks set their capital targets. If banks consider regulatory capital buffers to be softer ("more usable") than minimum requirements, target capital ratios should be more responsive to changes in minimum requirements than to changes in capital buffers. In a study of 39 large euro area banks, Andreeva et al (2020) find that banks' combined buffer requirements (CBR)[12] and other CET1 requirements[13] are both positively and statistically significantly associated with higher target CET1 ratios, with a stronger impact for buffer requirements.

35. Similarly, using a sample of 70 euro area banks, Couaillier (2021) finds that banks' target CET1 ratios are no more responsive to minimum requirements than they are to the CBR. In addition, Pillar 2 capital guidance has a positive and statistically significant association with capital targets. Given that Pillar 2 capital guidance is intended to be even "softer" than the CBR – breaching it does not trigger automatic distribution restrictions – these results suggest that banks are sensitive to even "soft" regulatory capital thresholds.

1.4 New analyses of buffer usability

36. As noted by the studies above, banks may have various reasons to avoid dipping into their buffers. In a survey conducted as part of this evaluation, supervisors noted market stigma effects (potentially related to perceived non-compliance, ratings downgrades, or distribution restrictions) and uncertainty regarding potential supervisory consequences. To provide a better understanding of the factors that may influence banks' willingness to dip into buffers, this section builds on the previous findings

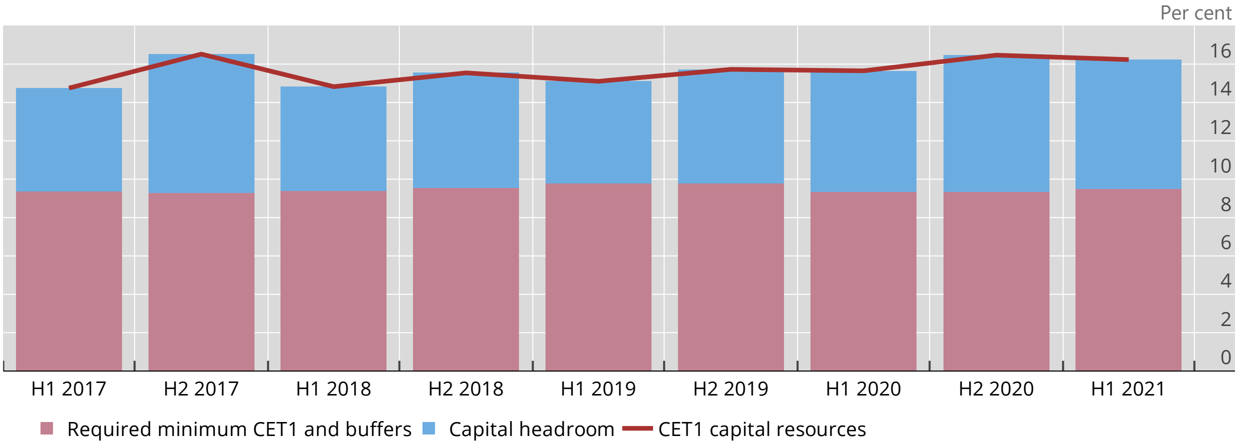
[12] Combined buffer requirements (CBR) include all the applicable capital buffer requirements.

[13] Other CET1 capital requirements include Pillar 1 requirements, Pillar 2 requirements and Pillar 2 guidance, plus potential constraints from the leverage ratio, if more binding than risk-weighted capital requirements.

with new quantitative analyses of the impact of capital headroom on banks' lending; insights from the US PCA framework (which is similar in nature to the Basel III buffer approach); and case studies of buffer use.

37. Graph 2 shows the evolution of capital headroom for the sample of banks considered for the regression analysis.[14]

CET1 capital requirements and buffers, capital headroom and capital resources — Graph 2



Required minimum CET1 and buffers include all Pillar 1 and 2 minimum and buffer requirements. Capital headroom refers to the surplus of a bank's capital resources above minimum CET1 and buffers requirements. Amounts shown are average across sample.

Source: BCBS.

Method

38. To complement the analysis in the July 2021 BCBS report on the relationship of capital headroom and lending during the pandemic, new quantitative analyses were run, using the Committee's global panel data set over the period H1 2017–H1 2021. The dependent variable for this analysis is corporate and retail lending.[15] Depending on whether bank controls are added, the sample includes 126 to 152 banks in 20 jurisdictions. The baseline regression model is:

$$\Delta Log(Lending)_{i,t} = \alpha + \alpha_t + \alpha_c + \alpha_s + \beta_1 Distance\_CBR_{i,t-1} + \beta_2 Distance\_CBR_{i,t-1} * Covid_t + X_{i,t-1} + Z_{c,t} + \varepsilon_{i,c,t}$$

where i denotes the individual bank, *c* the country, and *t* the time period. $\Delta Log(Lending)_{i,t}$ denotes credit growth while $Distance\_CBR_{i,t-1}$ is a continuous measure of bank *i*'s capital headroom. $Distance\_CBR_{i,t-1}$ is lagged to evaluate whether a change in capital headroom at *t-1* would impact lending decisions at t_0. $Covid_t$ is a time dummy equal to 0 for the period preceding the pandemic (H1 2017–H2 2019) and 1 for the period after that (H1 2020–H1 2021). $X_{i,t-1}$ denotes bank-specific controls, which are ROA, total assets, deposits ratio, LCR, and whether banks are constrained by the leverage ratio. $Z_{c,t}$ denotes macroeconomic controls,[16] namely inflation, GDP growth and 10-year bond yields. α_t, α_c and α_s denote time, country and

[14] Total CET1 requirements, including Pillar 2 and combined buffer requirements, have been calculated using information for each jurisdiction based on BCBS member jurisdictions' answers to a dedicated survey. Most but not all BCBS member jurisdictions are included in the sample.

[15] The lending variable includes all retail and corporate loans (source: SRS). This measure contains on- and off-balance sheet items, which differs from the lending variable used in the previous report that only included on-balance sheet items. Bank-to-bank exposures and bank-to-sovereign exposures are excluded.

[16] Macroeconomic controls aim to catch the effect of the macroeconomic environment on lending, which affects all banks at the same time. It is less likely that macro controls suffer from simultaneity than bank controls – see footnote 61 which provides further details on this argument.

bank business model fixed effects respectively, while $\varepsilon_{i,c,t}$ represents an idiosyncratic error term. The model is estimated with panel OLS and robust standard errors are clustered at the bank level.[17]

39. To allow for a non-linear effect of capital headroom on lending, the same model is estimated, but using a dummy $Distance\_CBR_{i,t-1}$ for banks in cohorts with high levels of capital headroom, relative to a percentile of the distribution at the time. Results are shown for the 25th and 50th percentiles.[18]

40. The baseline regression model is checking whether there is a general significant relationship between capital headroom on lending over the whole period and whether this effect is stronger during the pandemic.

Results

41. Table 1 presents the baseline results. Columns (1) and (2) provide results when using a continuous measure of capital headroom, without and with bank-specific controls, respectively. Columns (3)–(6) provide results for the different specifications using a dummy measure. When using the continuous measure of capital headroom, the regressions indicate a positive and significant correlation between banks' capital headroom and lending, with no significant difference in this relationship during the pandemic (column 1). This could point to concerns about the use of buffers affecting lending. However, when adding bank controls (column 2), the sample size diminishes and the relationship between credit growth and headroom is not significant.[19]

42. A positive relationship between capital headroom and lending is also found when using a dummy measure of capital headroom. Column (3) presents results for banks in the upper 50th percentile of the distribution and column (5) for banks above the 25th percentile of the distribution. The coefficient is positive and significant in both specifications, albeit somewhat smaller and less significant for the 25th percentile specification, indicating significantly higher credit growth among banks with larger headroom. When adding bank-specific controls (columns 4 and 6), the sample size is again diminished and the coefficient on lending turns insignificant. However, contrary to the other specifications, column (4) displays a weakly significant and negative additional effect of low capital headroom during the pandemic.[20]

[17] Focusing on the Covid-19 pandemic period, alternative specifications, mimicking those presented in para. 94 et seq. of the July 2021 BCBS report, were also conducted (see results in Annex 2).

[18] Over the period 2015–21, capital headroom has been around 3–3.5% (with the exception of the pandemic period, where it was around 5–6%) for banks within the 50th percentile and around 1.5–2% (around 3–4% during the pandemic) for banks within the 25th percentile.

[19] Sample consistency checks confirm that the majority of the coefficients are robust. In particular, all the significant coefficients are robust when total lending is used as an alternative dependent variables.

[20] The negative coefficient is larger in magnitude than the positive coefficient on the low capital headroom dummy, implying an overall negative effect on banks with high capital headroom during the pandemic.

Table 1

	Private (corporate + retail) lending					
	Continuous distance		50th percentile dummy		25th percentile dummy	
	(1)	(2)	(3)	(4)	(5)	(6)
Dist_CBR t-1	0.20**	0.15	1.85***	1.08	1.30*	0.47
	(0.10)	(0.12)	(0.66)	(0.70)	(0.77)	(0.77)
*Dist_CBR t-1 * Covid*	0.13	-0.08	0.35	-2.36*	1.81	1.45
	(0.18)	(0.17)	(1.34)	(1.27)	(1.64)	(1.85)
Lagged bank controls	NO	YES	NO	YES	NO	YES
Observations	1,349	913	1,349	913	1,349	913
R-squared	0.10	0.17	0.10	0.18	0.10	0.18
N banks	152	126	152	126	152	126
N countries	20	20	20	20	20	20

Macroeconomic controls and country, time and bank business model fixed effects are applied.

Source: BCBS.

43. Overall, these results and additional robustness exercises presented in Annex 2, mimicking the July 2021 BCBS report analysis and confirming its main result, are broadly consistent with the jurisdictional studies such as Berróspide et al (2021) and Couaillier et al (2022), which find that banks' lending behaviour is positively related to capital headroom. Such results may need to be interpreted with some caution, as the results in Table 1 are not significant when applying bank controls, and also Duncan et al (2022) does not find a significant relationship.

44. There are several possible reasons why these results are somewhat less clear cut than those obtained in the July 2021 BCBS report and in jurisdictional studies such as Berróspide et al (2021) and Couaillier et al (2022). First, the previous work was based on a commercial data set rather than the Committee's data, so that the sample of banks covered differs significantly, with the Committee's data having a certain bias towards internationally active banks. Second, the Committee's data are only reported semiannually, rather than quarterly as in previous work, so that changes in lending growth can be assessed only on a semiannually basis. There are some indications this may be a key factor – analysis of the quarterly data from the previous report finds that the semiannual data may be removing relevant quarterly variation in lending data. Third, the regressions use a measure of capital headroom that includes additional capital requirements (such as Pillar 2) as reported by supervisory authorities.

Bank responses to tripping regulatory thresholds – the US Prompt Corrective Action (PCA) framework

45. As an additional source of insight on the potential behaviour of banks with respect to regulatory thresholds, it is instructive to investigate how banks behaved under a pre-existing framework that bears similarities to the Basel buffers approach.

46. The US PCA framework classifies banks as well capitalised, adequately capitalised, undercapitalised, and significantly undercapitalised, based on the capital ratio thresholds shown in the

table below.[21] If a bank falls below the well capitalised category, federal banking agencies require increasingly severe, corrective supervisory actions to address the capital shortfalls of the bank.[22]

PCA framework thresholds

Table 2

In percent	Well capitalised	Adequately capitalised	Undercapitalised	Significantly undercapitalised
Total Capital	≥10.0	8.0–10.0	6.0–8.0	<6.0
Tier 1 Capital	≥8.0	6.0–8.0	4.0–6.0	<4.0
CET1 Capital	≥6.5	4.5–6.5	3.0–4.5	<3.0
Tier 1 Leverage	≥5.0	4.0–5.0	3.0–4.0	<3.0

Source: FDIC.

47. While differing in detail, there are important similarities between the PCA and the Basel III buffer frameworks. Both frameworks constitute a system of staggered thresholds above regulatory minimum requirements that are associated with increasingly severe restrictions on banks. Furthermore, there may be stigma associated both with dipping into Basel buffers or with banks being classified as less than well capitalised.

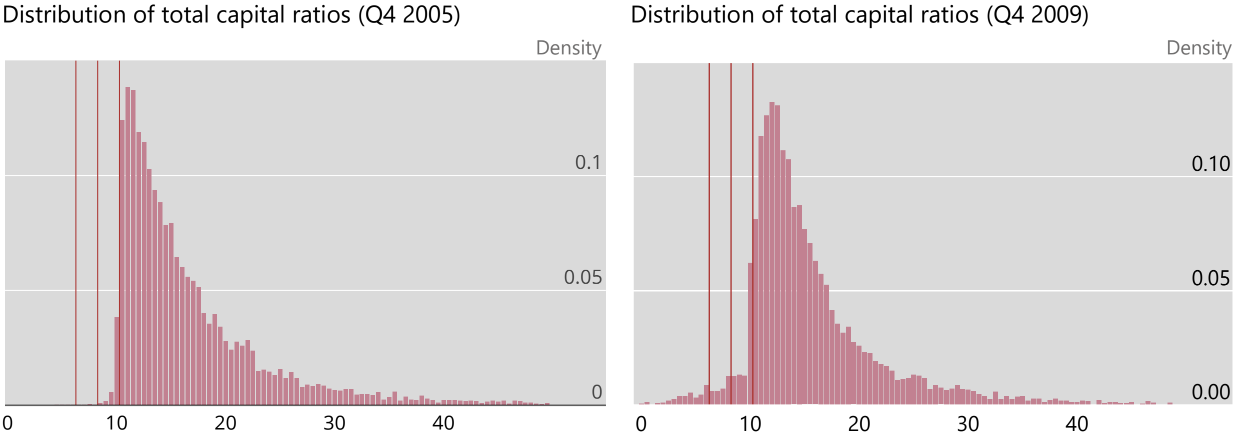
48. The analysis focuses on the well capitalised 10% threshold for banks' total capital ratios.[23] Graph 3 shows the distribution of total capital ratios (TCR) for banks in the United States in Q4 2005 left-hand panel and Q4 2009 right-hand panel. The three red vertical lines at 10%, 8%, and 6% mark the threshold values for banks to be deemed to be well capitalised, adequately capitalised and undercapitalised, respectively. In Q4 2005, before the GFC, there was bunching just above the 10% well capitalised threshold suggesting that banks were reluctant to fall below the threshold. In Q4 2009, during the GFC, a substantial number of banks had in fact dropped below the threshold, mainly due to losses suffered during the crisis.

21 See Chapter 5 of the FDIC Formal and Informal Enforcement Actions Manual. The thresholds presented in Table 2 have been applicable since 2013. While some thresholds were different during the GFC, the analysis focuses on the 10% well capitalised threshold with regard to total capital, which has remained unchanged over the time window of the analysis.

22 Well capitalised banks are subject to no restrictions. Adequately capitalised banks are restricted in their brokered deposit activities and cannot offer high deposit rates. Undercapitalised banks, inter alia, cannot approve capital distributions or pay management fees, must submit a capital restoration plan, are subject to asset growth restrictions, and are restricted from engaging in acquisitions, branching, or new lines of business without prior approval from the FDIC. Significantly under-capitalised banks face additional restrictions on, inter alia, senior executive officer bonuses and compensations and are required to recapitalise through the sale of voting shares or other obligations.

23 For most banks in the sample, total capital largely consists of Tier 1 capital. The 10% well capitalised threshold for banks' total capital ratios is more stringent than the 8% well capitalised threshold for banks' Tier 1 capital ratios. For example, 391 banks had a total capital ratio below 10% in Q4 2009, but only 327 banks had a Tier 1 capital ratio below 8% during the same period.

Distribution of total capital ratios (TCR) in US banks in Q4 2005 and Q4 2009 — Graph 3



This figure shows the distribution of total capital ratios for all call report-filing banks in the United States in Q4 2005 (left-hand panel) and Q4 2009 (right-hand panel).

Source: Call Reports; BCBS calculations.

49. The analysis compares the lending of two groups of banks – those which remained just above and banks which fell just below the 10% threshold during the period from Q4 2008 to Q4 2010, but always remained above 8%. The former group are defined as banks for which the TCR fell at least once below 10.5% during the period, but always remained above 10%.[24] This approach enables a sharp identification.

50. Graph 4, left-hand panel shows the mean annual growth rates of domestic loans from Q1 2005 to Q4 2019 for the two groups of banks. Banks falling below the 10% threshold had higher loan growth before the GFC, but substantially lower (and negative) loan growth in the period during and after the GFC relative to banks which remained close to but above the threshold. That suggests that banks falling below the 10% threshold during the GFC maintained weaker lending, perhaps indicating a desire to rebuild their capital ratios to move back and stay above a regulatory capital threshold. The higher loan growth rates for treatment banks prior to the GFC suggest a "credit boom gone bust" mechanism at the individual bank level.[25]

51. These descriptive results could however be driven by other bank characteristics that might affect lending. The following regression model is used to estimate the differences in lending between the groups of banks, controlling for various bank characteristics:[26]

$$\Delta Log(Total\ Loans)_{i,t} = \sum_{t=2005q1}^{2019q4} \delta^t \times (Treatment_i \times D_t) + \sum_k \gamma^k X_{i,t-4}^k + \varepsilon_{i,t}$$

52. Graph 4, right-hand panel, plots the estimated coefficients δ^t from the above regression specification. The results confirm the unconditional descriptive evidence in Graph 4, left-hand panel. Banks which fell below the 10% well capitalised PCA threshold during the GFC maintained weaker lending for an

[24] A placebo test based on a fictitious 12% PCA threshold confirms the importance of the 10% threshold with regard to the lending behaviour of banks (Annex 3).

[25] Akin to Fahlenbrach et al (2018).

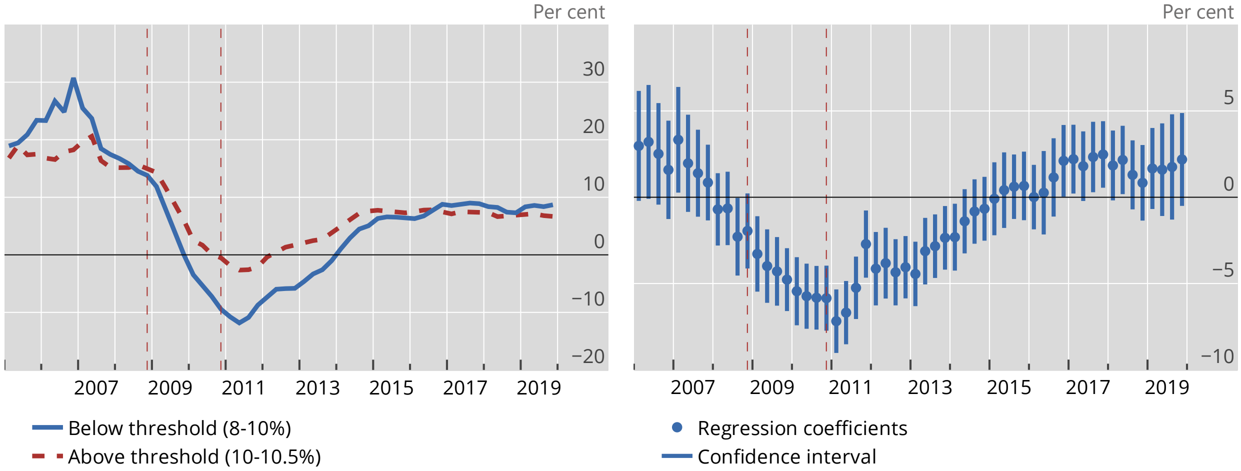
[26] The outcome variable is the mean domestic loan annual growth rate of bank i in quarter t. Treatment is a dummy variable which takes on the value of 1 for treatment banks, and 0 for control banks, as described above. D is a battery of quarterly indicator variables for each quarter from Q1 2005 to Q4 2019. The vector X contains the following bank characteristics: the logarithm of total assets, the total capital ratio, risk-weighted assets over total assets, deposits over total assets, loans over total assets, net income over total assets, and loan loss provisions over loans.

extended period, perhaps indicating a desire to rebuild their capital ratios to move back above the regulatory capital threshold.

Mean domestic loan growth rates Q1 2005–Q4 2019

Graph 4

Descriptive results: delta log total domestic loans (YoY) | Regression analysis: delta log total domestic loans (YoY)



This figure shows the mean domestic loan annual growth rates for 325 banks in the treatment group and 596 banks in the control group over the period from Q1 2005 to Q4 2019. The solid blue line represents the mean growth rates of treatment banks, for which the TCR fell at least once below 10% during the period from Q4 2008 to Q4 2010, but always remained above 8%. The dashed dark red line represents the mean growth rates of control banks, for which the TCR fell at least once below 10.5% during the period from Q4 2008 to Q4 2010, but always remained above 10%. The two dashed vertical lines marks Q4 2008 and Q4 2010.

The figure illustrates the following descriptive facts: treatment banks (= below-threshold banks) exhibited lower loan growth rates in the period during and after the GFC relative to control banks (= above-threshold banks).

Source: Call Reports; BCBS calculations.

Qualitative analysis and case studies

53. A survey of BCBS supervisory authorities sought insights on banks that have dipped into their buffers since the introduction of the capital buffer framework. Of 20 responding jurisdictions, eight reported cases of banks that have used their buffers since 2017, in total 26 banks, reflecting the infrequency with which banks dip into buffers.[27] Most of these banks were in two geographically distant jurisdictions (16 cases out of 26), and based on their size, appear to mostly be small domestic entities. On average, banks operated within their buffers for 11 months, with a median of 8.5 months. The average use of buffers was 200 bp of CET1 ratio, with a median of 100 bp.

54. The survey suggests that most banks that have dipped into their buffers did so due to idiosyncratic circumstances, rather than as an active choice. The responses highlighted operational events, weak net income and losses, RWA increases and higher provisions. Of the 26 reported cases, four banks were resolved (or currently are under a resolution process) and two other banks have been acquired or are involved in a sale process. In the case of 10 entities, compliance was restored through the implementation of recovery plans, capital conservation plans or other governmental actions, while for the remaining 10 cases, compliance was restored without implementing specific measures. In none of these idiosyncratic cases were there reports of negative effects on system-wide lending.

55. In total, 17 banks were subject to a prohibition of distributions, either directly imposed by regulation, or specifically imposed by a supervisory authority. Three other banks did not distribute capital during the period of buffer use, either because they were unprofitable, subject to a sale or liquidation

[27] Annex 4 provides a selection of case studies.

process, or for other reasons that appear unrelated to specific restrictions. In six cases (three being in the same jurisdiction), no distribution restrictions were imposed. Most jurisdictions that have reported cases indicate that it is not possible to assess market reactions to banks dipping into their buffers.

1.5 Factors influencing reluctance to use buffers

56. This section analyses factors that could potentially explain why banks might be cautious about dipping into their buffers. It considers two possible sources of reluctance to use buffers.[28] The first can be termed as stigma effects: firms are concerned about how the market (eg ratings agencies, equity markets, bank investors) might respond if they use their capital buffers and become subject to capital distribution restrictions and potential supervisory responses. The second is a concern about potentially hitting parallel leverage ratio requirements, which may limit the availability of risk-weighted capital buffers for some banks.

Concern about facing restrictions on capital distributions if buffers are used

57. Respondents to a survey, undertaken as part of the July 2021 BCBS report, and market participants at an outreach session, have mentioned both general non-compliance stigma and stigma related to distribution restrictions for banks that use buffers. These effects are, however, difficult to disentangle. Annex 2 examines whether market reactions to banks getting closer to using capital buffers are related to the intensity of the restrictions and finds no statistically significant result.[29] This analysis does not rule out stigma related to distribution restrictions for firms that use buffers. In particular, Chiarotti et al (2022) find that the more banks have a history of stable dividends, the more they increased their CET1 ratios during the pandemic, suggesting that these banks were more averse to dipping into their buffers.

Concerns about market reaction to potential buffer use

58. Previous studies suggest negative market reaction as a potential source of banks' reluctance to use capital buffers. While it is quite challenging empirically to determine the specific causes of potential stigma, market reactions to varying levels of capital headroom can be analysed to assess its potential materiality. The specification is similar to the one used in Section 1.4, with the dependent variable $Y_{i,t}$ replaced by market data such as price-to-book ratio, cost of equity, expected default frequency (EDF) at a one-year horizon, five-year USD CDS spread and average stock price.

59. Capital headroom has some association with market indicators: results show that the higher the capital headroom the lower the cost of equity, one-year EDF, five-year CDS spread and average stock price, and the higher the price-to-book ratio. The estimated coefficients do not change significantly during the pandemic (Table 3).[30]

Table 3

	(1)	(2)	(3)	(4)	(5)
	Price to book ratio	Cost of equity	1-year EDF	5-year CDS spread	Average stock price
Dist CBR	0.03*	-0.14**	-0.01	-5.68***	-0.06**
	(0.01)	(0.07)	(0.01)	(1.91)	(0.03)
*Dist CBR * Covid*	-0.02	-0.16	0.00	0.27	-0.03

28 For example, another factor not analysed in this report which could explain banks' reluctance to use buffers is banks' uncertainty regarding potential future losses.

29 The intensity of restrictions is determined based on whether they apply as soon as buffers are used or on a more gradual basis.

30 The interacted term represents an additional component of the effect which appears only during the Covid-19 pandemic.

	(0.02)	(0.20)	(0.03)	(1.18)	(0.03)
Observations	570	568	601	311	570
R-squared	0.77	0.61	0.58	0.68	0.89
N banks	63	63	66	40	63
N countries	18	18	18	10	18

Lagged bank controls, macroeconomic controls and country, time and bank fixed effects are applied.

Sources: BCBS, Bloomberg and Markit, Moody's, and BCBS calculations.

60. Relatively similar results are obtained regarding the relationship with distance to minimum requirements (Annex 2).

61. Overall, it appears that capital headroom and distance to minimum requirements are related to market-based indicators. While this may indicate evidence of a market stigma effect, which might be a reason for banks' reluctance to use their buffers, it may also simply capture market perceptions of less well capitalised banks.

Possibility of breaching parallel minimum requirements

62. Parallel minimum requirements may also limit the effective availability of buffers and potentially banks' ability to dip into their buffers. The Basel III regulatory framework allows the "multiple use" of capital to meet parallel regulatory minimum requirements, such as risk-based capital and leverage ratios. As a result, buffer usability could be constrained when, in nominal terms, risk-based minimum requirements are lower than requirements from the minimum leverage ratio.[31] In other words, banks would not be able to fully use their CBR without also breaching the minimum leverage ratio requirements[32] in the process. The European Systemic Risk Board has published empirical analysis that suggests buffer usability could be limited in some EU Member States by the leverage ratio and requirements from the resolution framework (TLAC, MREL).[33]

63. New analysis, using data as of H1 2021 for a global sample of 144 banks, investigates the interaction between risk-based capital and the minimum leverage ratio requirement globally. Graph 5, left-hand panel, below shows the cumulative distribution of CBR usability for this sample of banks. Around 10% of the banks in the sample would not be able to dip into their regulatory capital buffers without breaching the leverage ratio. For around half of the banks, a portion of the CBR is constrained, but the level of the constraint varies by geography. For example, a smaller percentage of banks in the Americas (39%) and the rest of the world (30%) have part of the CBR-constrained by the leverage ratio compared with banks in Europe (74%). On a global basis, on average 73% of the CBR can be used before the minimum leverage ratio requirement would be breached. These numbers reflect national regulations, not only implementation of the Basel III standard. When taking only Basel standards into account (for instance, disregarding risk-weighted minimum requirements that go beyond the Basel standard) average CBR usability drops to 56%. Graph 5 below (right-hand panel) shows a strong indication that the overlap between the leverage ratio and risk-weighted buffers, and therefore buffer usability, may also be driven by RWA density. The leverage ratio would indeed naturally tend to be more binding for banks with lower average risk weights and would fulfill its intended function as a backstop in doing so. Furthermore, the

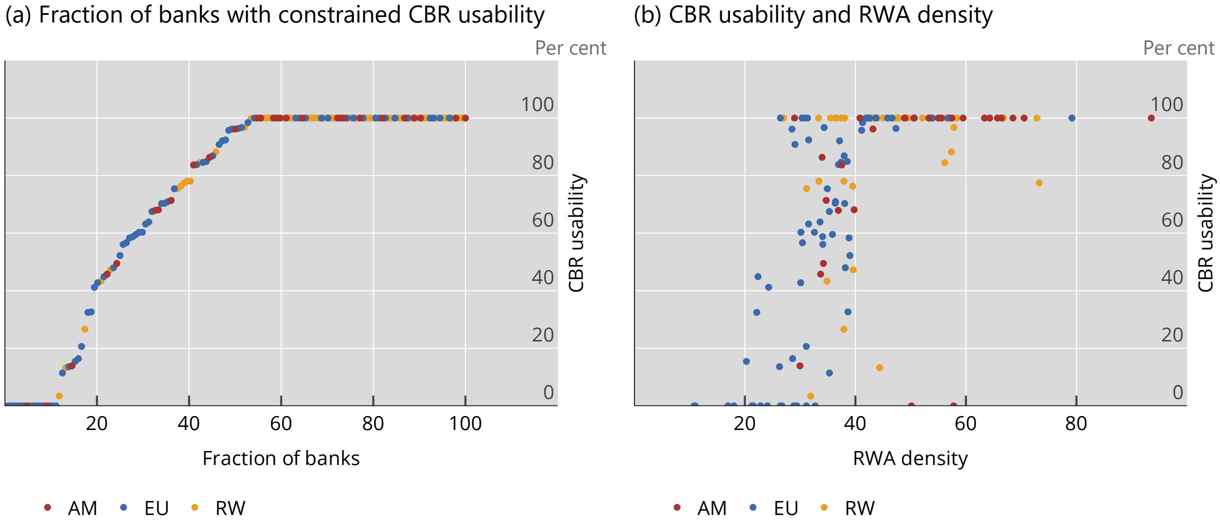
[31] The Basel leverage ratio requires a minimum level of 3%. Beginning in 2023, for GSIBs, a buffer of half a firm's GSIB surcharge level will be added as a buffer on top of the minimum leverage ratio requirement.

[32] Only CET1 components of both requirements are considered. For the Tier 1-leverage ratio, the CET1 component is the amount a bank needs to fulfil with CET1 due to a shortfall of AT1. When the leverage ratio is met entirely with AT1, the CET1 component is therefore zero. For risk-weighted minimum requirements the CET1 component is the sum of CET1 minimum requirements and possible AT1 and T2 shortfalls.

[33] Report of the Analytical Task Force on the overlap between capital buffers and minimum requirements (europa.eu).

introduction of leverage ratio buffers for GSIBs may increase the estimated size of total usable regulatory buffers (Annex 5).

CBR usability across 144 banks in H1 2021 (leverage ratio interaction) Graph 5



The sample includes 144 banks from the following regions: AM = America, EU = Europe, RW = Rest of the world. CBR usability of European banks might be slightly underestimated as AT1 and T2 shortfalls of pillar 2 minimum requirements are not taken into account.

Source: BCBS.

1.6 Conclusions

64. In accordance with existing academic literature and jurisdictional analyses, new empirical work finds some evidence of a positive relationship between capital headroom and lending. This could be an indication that banks tend to manage their capital positions to avoid falling within their buffers. The analysis of the PCA framework also suggests that banks might be concerned about crossing, or remaining below, regulatory thresholds. Survey findings indicate that there have been a few cases of banks using their capital buffers to absorb large losses. This report has looked into several possible causes for banks' reluctance to dip into their buffers: a regression analysis indicates that financial markets perceive banks that have lower headroom over buffers less favourably than better capitalised peers, while parallel requirements, such as the leverage ratio, in fulfilling its intended function as a backstop, may limit the availability of buffers for some banks with lower average risk weights or excessive leverage.

2. Countercyclical capital policy

65. Prior to the GFC, capital regulation generally focused on ensuring banks had sufficient capital to meet the microprudential risks they faced. As regulatory frameworks have advanced, macroprudential objectives in regulation have grown in importance, including ensuring that capital requirements are sensitive to broad economic conditions. In recent years, jurisdictions have adopted various forms of countercyclical capital regulation, including the CCyB (see examples in Annex 6).

66. The CCyB is a time-varying capital buffer, which is set based on the relevant national authority's judgment of system-wide risks.[34] It is the only designated releasable buffer in the Basel framework. A key purpose of the CCyB is to achieve the broader macroprudential goal of protecting the banking sector from periods of excess credit growth. A bank's required CCyB is a weighted average of jurisdictional CCyB rates, where weights reflect the geographic location of the bank's credit exposures to the non-financial private sector. National authorities can implement a range of additional macroprudential tools, including a CCyB in excess of 2.5% of RWA for exposures in their jurisdictions. However, the international reciprocity provision is capped at 2.5%.

67. The July 2021 BCBS report provided some empirical evidence that releases of capital requirements during the pandemic had a positive effect on lending, although the analysis had some limitations. In addition, two thirds of the jurisdictions surveyed for that report held the view that releasing buffers was or would have been valuable in the face of the pandemic.

68. This section provides a range of analyses on countercyclical regulatory capital policies. It documents the experience with the CCyB and other forms of countercyclical capital regulation, studies the relationship between changes in capital requirements and bank lending, and analyses the range of capital buffers that may be needed to absorb losses when risks are elevated.

2.1 International use of the CCyB and other forms of countercyclical capital regulation

69. The CCyB standard was phased in (in parallel with the CCoB) beginning in 2016 and became fully effective in 2019. Ahead of the phase-in period, three BCBS member countries made active use of the CCyB (one of them used a sectoral version), raising CCyB rates to 2% (see Graph 6, left-hand panel). During the phase-in period, three other countries activated the CCyB.

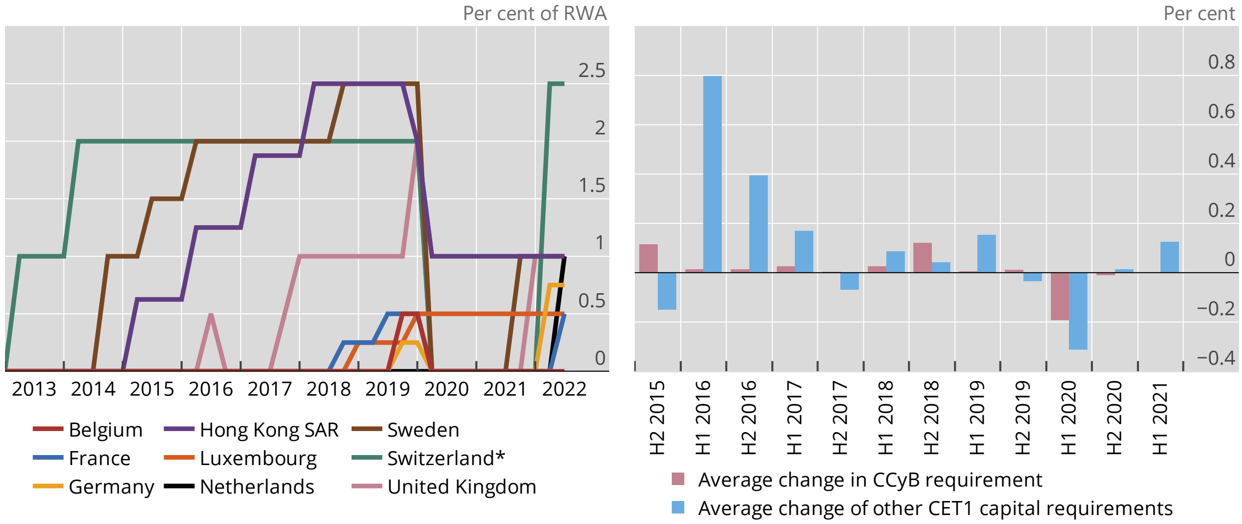
[34] See RBC30.7: "*The countercyclical buffer aims to ensure that banking sector capital requirements take account of the macro-financial environment in which banks operate. It will be deployed by national jurisdictions when excess aggregate credit growth is judged to be associated with a build-up of system-wide risk to ensure the banking system has a buffer of capital to protect it against future potential losses*".

Countercyclical capital buffer

Graph 6

Overview of announced CCyB rates by BCBS members

Average bank-level percent changes in CCyB requirements and other non-CCyB CET1 requirements, % of RWA, H2 2015–H1 2021



*SCCyB for Switzerland

Source: For left-hand panel, webpages of relevant jurisdictional authorities, data until end of May 2022. For right-hand panel, BCBS, bank-level Committee data covering up to 162 banks for the periods of focus, H1 2015 to H1 2021.

70. Prior to the Covid-19 pandemic, eight out of 27 BCBS member jurisdictions either had a positive CCyB[35] (six countries) or had announced an intent to activate the CCyB (two countries, see Graph 6, left-hand panel). Effective jurisdictional CCyB rates at this point were generally low, varying between 0.25% and 2.5%, reflecting light use of this countercyclical tool. Furthermore, as shown in Graph 6, right-hand panel, the average changes in CCyB requirements between 2015 and 2021 have been lower than the average changes in other, non-CCyB CET1 requirements.

71. While CCyB use was originally envisaged for shocks resulting from prior excess aggregate credit growth, in practice all the CCyB releases thus far have been motivated by shocks of another nature. Prior to the pandemic, the only two releases followed political economy events. Then in Q1 2020, in response to the Covid-19 pandemic, seven out of eight countries with an (announced) CCyB greater than zero released their CCyB (fully or partially; Graph 6, left-hand panel).

72. The main motivation cited by these countries for releasing the CCyB was to support banks in their key role as lenders to the real economy. As noted above, the releases occurred despite the pandemic shock being unrelated to any preceding excessive credit growth and only a few jurisdictions referred to the future expected development of the credit market. Since 2021, five of the seven countries which had released or reduced their (announced) CCyB at the onset of the pandemic and one additional country (re)activated the CCyB, reflecting an increase of cyclical systemic risks.

73. Jurisdictions have also employed a range of other regulatory capital tools to vary capital requirements countercyclically, particularly during the pandemic. A few measures are standing instruments which have been used either as a substitute or a complement to the CCyB. Annex 6 sets out examples, which include countercyclical measures affecting capital ratio requirements, risk-weights and buffers, and adjustments affecting the level of capital.

[35] This includes the Basel III CCyB requirement as well as national variants that apply to all banks and may target sector-specific cycles (eg a sectoral CCyB).

2.2 Lessons learnt on the use of countercyclical capital regulation

Survey evidence on experience with the CCyB

74. In 2019, the BCBS conducted a survey of national authorities' experience in their use of the CCyB. This survey found that in setting the CCyB around half of the jurisdictions considered a wider range of metrics of risk than the standard Basel III credit-to-GDP gap, and relied on expert judgment rather than a mechanistic approach. Jurisdictions that had not activated the CCyB at the time of the survey appeared to have done so either because they felt that credit developments did not justify such action or because they preferred to use other capital tools.

75. The July 2021 BCBS report included lessons from a follow-up survey of supervisors about the release of capital buffers. The survey found, for example, that lowering certain capital requirements and/or buffers was perceived as being valuable by many jurisdictions.[36]

Insights from jurisdictional implementation of countercyclical capital regulation

76. Several jurisdictions have adopted variations of the original design of the CCyB (see Annex 7). One innovation is the adoption of a "positive neutral rate CCyB framework". The original CCyB design implied a baseline CCyB rate of zero, but an increasing number of jurisdictions are now operating under a positive baseline rate framework or are in the process of doing so (Australia, Netherlands, Sweden and the United Kingdom[37]).[38] For these jurisdictions, the baseline CCyB rate ranges between 1 and 2% of RWA (Annex 7). Germany announced in February 2021 that it would examine whether the CCyB can be deployed more flexibly and whether larger buffers should be built up in periods of economic prosperity.[39]

77. One of the driving factors for the positive neutral rate approach is the perceived value of having in place releasable buffers for shocks unrelated to any preceding excessive credit growth. Moreover, a positive neutral rate mitigates the problems in building up sufficient buffers in advance from lags in data availability and other challenges to measuring and responding to a rise in cyclical risks.[40] In the Netherlands and the United Kingdom, there was a (partial) offsetting reduction in other buffers or requirements while in Australia and Sweden there was no offset.

78. Another variation is a capital buffer with a more targeted application than is possible with the standard Basel III CCyB. Switzerland has adopted a sectoral CCyB on credit exposures secured by domestic residential properties,[41] while Germany[42] and Belgium[43] implemented a sectoral systemic risk buffer (SyRB) focusing on credit exposures secured by residential properties (Annex 7).[44]

[36] See July 2021 BCBS report, paragraphs 117–121.

[37] The Netherlands does not have a complete positive neutral framework but aims for a positive buffer in a standard risk environment since this takes fuller account of the inherent uncertainty in measuring cyclical systemic risk.

[38] This trend is also visible for non-member jurisdictions of the BCBS, such as Czechia and Estonia.

[39] German Financial Stability Committee: In light of the pandemic, countercyclical capital buffer of 0% until end-2021 appropriate, Deutsche Bundesbank.

[40] For a detailed discussion of the positive neutral rate see, for example, Annex 2 of the ECB response to the European Commission's call for advice on the review of the EU macroprudential framework: Annex 2: Enhancing macroprudential space in the banking union (europa.eu).

[41] Swiss National Bank proposes reactivation of sectoral countercyclical capital buffer at 2.5% (snb.ch).

[42] BaFin - Administrative Acts - General Administrative Act ordering a capital buffer for systemic risks.

[43] The Belgian sectoral SyRB applies to IRB banks only: Real Estate, nbb.be.

[44] The BCBS has stated that the sectoral CCyB (SCCyB) is a useful complement to the Basel III CCyB and has published "Guiding Principles" (Guiding principles for the operationalisation of a sectoral countercyclical capital buffer (bis.org)). One advantage of the SCCyB is its effectiveness in the face of specific (sectoral) risks as only "affected" sectors are targeted and resilience can be built-up early.

79. Finally, in Canada, the Office of the Superintendent of Financial Institutions (OSFI) has implemented a Domestic Stability Buffer (DSB), which shares some similarities with the CCyB.[45] The DSB applies only to Canada's six largest banks. Adjustments to the DSB (increases or releases) are based on the evolution of vulnerabilities and risks in the Canadian financial system. One notable difference of the DSB vis-à-vis the CCyB is that it is a Pillar 2 (instead of Pillar 1) buffer. Hence, if large Canadian banks dip into the DSB, they are not necessarily subject to automatic constraints on capital distributions, as would occur with the CCyB.

Insights from academic studies on the role of the CCyB

80. Academic studies are generally supportive of the potential benefits of time-varying capital requirements such as the CCyB. One rationale offered is to mitigate the procyclicality of non-time-varying capital requirements.[46] A constant capital requirement could result in a reduction in the aggregate supply of bank loans following a large negative shock to the economy if banks cannot replenish capital fast enough to satisfy the capital requirement. This problem may be exacerbated by rises in risk weights during downturns. Another rationale is based on externalities of lending and risk-taking, and fire sales.[47] Individual banks fail to internalise the impacts of their individual actions on aggregate outcomes. In this environment, there is a role for time-varying, countercyclical macroprudential policies to mitigate the ensuing inefficiencies.

81. There is also support for countercyclical capital buffers in the empirical literature.[48] Behncke (2022) found that Swiss banks that were constrained by the CCyB reduced their mortgage lending growth and their loan-to-value ratios. Chen and Friedrich (2022) studied the foreign activity of large Canadian banks and found that a tightening of the CCyB by a foreign jurisdiction reduced the growth rate of lending by Canadian banks in the CCyB-tightening jurisdiction (via the reciprocity in the CCyB standard). Avezum et al (2021) found that capital buffer releases in Europe during the pandemic helped to mitigate the procyclicality of credit, notably to households. Analysis using EU credit registry data has similar findings (Annex 8). Saporta (2021) finds that firms with higher exposure to the UK CCyB release increased CET1 ratios by less than other banks during the pandemic. However, Andreeva et al (2020) studied banks' reactions to buffer releases during the pandemic and found that only a few banks reduced their capital targets.

82. The empirical literature has caveats. The micro-econometric literature tends to focus on loan supply of banks taken individually, but does not typically allow for conclusions regarding the effects of buffer releases on aggregate loan supply or on GDP. Few studies look at the potential drawbacks of capital releases vis-à-vis fixed buffers in terms of impacts on bank funding costs,[49] resilience, market confidence, and the distribution of released capital to shareholders. One study notes the CCyB could exacerbate a moral hazard problem by providing insurance against bad outcomes, causing banks to increase risk-taking during normal times.[50]

83. Heterogeneous-agent banking models measure impacts of the CCyB on banks whose capital ratios are close to the regulatory requirements. Ríos-Rull et al (2020) compare the effects of time-varying capital regulation with a static capital requirement of the same size, using a model of the Canadian banking sector. They find that, on average, releasing buffers during a crisis period has but a limited impact on total loan supply because it has a meaningful effect only on banks with small headroom. They also find that the

45 Domestic Stability Buffer – Information Sheet (osfi-bsif.gc.ca).

46 Kashyap and Stein (2004), Repullo (2013) and Repullo and Suarez (2013), Benes and Kumhof (2015), Davydiuk (2019), Darracq Pariès et al (2020).

47 Lorenzoni (2008), Bianchi and Mendoza (2018), Schroth (2021), Van der Ghote (2021).

48 Gilchrist and Zakrajšek (2012), Jiménez et al (2017), Chen et al (2019).

49 Schmitz et al (2019).

50 Martinez-Miera and Suarez (2014).

implementation of time-varying capital regulation with buffers well above 2.5% would have a larger average impact on loan supply when released during a crisis.

84. The literature suggests that the CCyB could be combined with other tools for more potency, for example to deter banks from distributing significant shares of released capital.[51] A CCyB release could be accompanied by disincentives to distribute capital and by incentives to employ it for the intended objectives (eg supply of credit during stress and/or timely write-downs of non-performing loans). System-wide dividends and other pay-out restrictions can complement the CCyB by increasing bank resilience and loan supply.[52]

85. On the appropriate degree of cyclicality of capital requirements, the literature suggests that proactive use of the CCyB could address the inherent uncertainty around whether and when to activate the CCyB given implementation lags. For example, Garcia and Schroth (2021) find welfare gains from a time-varying capital requirement in a DSGE model of the Canadian economy. Using a DSGE model Elenev et al (2020) conclude that financial recessions are shallower with countercyclical requirements, and finds welfare gains from enhanced countercyclicality in the capital framework.

86. Van Oordt (2022) estimates the time-varying magnitudes of the cyclical capital add-on that is required to safeguard the resilience of banks from system-wide shocks. Based on the market value of stocks of large banks in Australia, Canada, the euro area, Japan, the United Kingdom and the United States, the optimal range of the CCyB is estimated to be 1.4% to 1.7% of total assets, which is typically larger than a CCyB of 2.5% of RWA.[53]

87. To investigate the effects of the CCyB on business cycle amplitudes, some papers simulate the aggregate impacts of CCyB through counterfactual analyses. Using a DSGE model, Gertler et al (forthcoming) find that the optimal policy reduces the quarterly probability of a bank run by more than half (0.9% to 0.4%), and reduces quarterly output during normal states by 0.6% but increases average output by 0.1%. Faria-e-Castro (2021) finds that raising capital buffers during leverage expansions can reduce the frequency of crises by more than half, with large gains in aggregate consumption. Section 2.4 below provides further analysis on this issue.

2.3 Analysis of the relationship between countercyclical capital requirements and lending

88. The July 2021 BCBS report analysed the relationship between CCyB and other capital releases and bank lending. It found that banks benefiting from CCyB and other capital releases tended to see stronger loan growth than other banks. As the report noted, there may have been a lack of statistical power in the findings as only a few jurisdictions had activated and then released the CCyB during the pandemic, and generally only by a modest amount. Additionally, contemporaneous support measures influenced banks' lending behaviour and borrower creditworthiness, further complicating the identification of the effects of regulatory capital releases.

89. This section reports further work investigating the relationship between changes in CCyB and in other CET1 capital requirements and bank lending.[54] It uses semiannual data from H1 2015 to H1 2021. This new study is based on Committee's global panel data set, as well as on a supervisory survey. The

[51] Andreeva et al (2020) and Couaillier (2021).

[52] Muñoz (2020), Dell'Arriccia et al (2017); Gambacorta and Shin (2018); Kapan and Miniou (2018); Kim and Sohn (2017).

[53] Assuming an average risk density of assets of 37.4% (the value used in Section 2.4 based on UK bank levels), this would be equivalent to 3.7–4.5% of RWA.

[54] This analysis differs from the July 2021 BCBS report in several aspects, including a different sample of banks; a longer time horizon considered; a different lending variable; a different definition of changes in capital requirements; and a different data frequency since the July 2021 BCBS report used quarterly data. More details are provided in footnotes 57, 58 and Annex 9.

analysis examines whether there is a significant relationship between the changes of different types of capital requirement (CCyB and others such as Pillar 2 requirements or the CCoB)[55] and lending to the private sector, including retail and corporate exposures.[56]

Method

90. The baseline econometric approach is based on the panel data model used in the July 2021 BCBS report.

$$\begin{aligned}\Delta Log(Lending)_{i,t} &= \alpha_i + \alpha_t + \alpha_c + \beta_1 \Delta CCyB_{i,t} + \delta_1 \Delta Other\ CET1\ Req_{i,t} + \beta_2 \Delta CCyB_{i,t} \times Covid_t \\ &+ \delta_2\ \Delta Other\ CET1\ Req_{i,t} \times Covid_t + \gamma\ BusinessModel_{i,t-1} + zX_{i,t-1} + wZ_{c,t} + \varepsilon_{i,t}\end{aligned}$$

91. In this regression, i denotes individual banks, c denotes the bank's home country, and t denotes time, X and Z denote bank and macro controls respectively as in section 1. Observations have a semiannual frequency. The dependent variable is the rate of change in lending volumes period-on-period.[57] The variable of interest is $\Delta CCyB_{i,t}$, which measures the changes in each bank's specific CCyB rate in a given half-year period relative to the previous period.[58] A negative value of $\Delta CCyB_{i,t}$ indicates a decrease in the bank-specific CCyB rate in a given period relative to the previous period. Therefore, a negative coefficient β_1 would indicate that banks for which the CCyB was partially or fully released (increased) raised their lending relatively more (less) when compared with banks for which there were no CCyB releases (increases). It is important to stress that $\Delta CCyB_{i,t}$ treats increases and releases symmetrically.[59]

92. $\Delta CCyB_{i,t}$ is analysed on a standalone basis and interacted with a pandemic dummy $Covid_t$, which takes the value of 1 in periods from H1 2020 to H1 2021 and 0 otherwise. When $\Delta CCyB_{i,t}$ is interacted with the Covid dummy, a negative coefficient β_2 indicates that CCyB releases had a more positive effect on lending growth during Covid times.

93. A second variable of interest, $\Delta Other\ CET1\ Req_{i,t}$, is the period-on-period change in CET1 requirements other than the changes from the CCyB. The inclusion of this variable has two goals: first, investigating the relationship between lending and changes in CET1 requirements other than CCyB, and second, disentangling this relationship from lending dynamics associated with changes in the CCyB requirement. $\Delta Other\ CET1\ Req_{i,t}$ is included as a standalone regressor and interacted with $Covid_t$.

55 The total CET1 capital requirement is measured on a fully loaded basis (ie fully phased in) during the phase-in period of Basel III (ie between 1 January 2016 and 31 December 2018).

56 ECB analysis reported in Annex 8 indicates that capital relief measures were generally successful in supporting credit supply during the pandemic.

57 The lending variable includes all retail and corporate loans (source: SRS). This measure contains on- and off-balance sheet items, which differs from the lending variable used in the July 2021 BCBS report that only included on-balance sheet items. Bank-to-bank exposures and bank-to-sovereign exposures are excluded.

58 *ΔCCyB* is defined for each bank at each point in time as the difference in percentage points between its current bank-specific CCyB rate and its bank-specific CCyB rate in the previous period (ie $CCyB_t - CCyB_{t-1}$). If negative, *ΔCCyB* indicates a CCyB release; if positive, *ΔCCyB* indicates a CCyB activation/increase. To note, this definition differs from the approach in the July 2021 BCBS report, which measured CCyB releases as a one-off, cumulative bank-level difference between Q1 2019 and Q3 2020 (other and total CET1 releases were defined in the same way).

59 It could be argued that the effect of releases on lending growth could be stronger than the effect of increases, for example because in upturns banks might be better able to generate capital internally (eg via retained earnings) and therefore continue to lend as before or similarly (see Behn et al (2022)). However, it could also be argued that the effects of releases could be more difficult to identify because other relief measures may be adopted simultaneously in a downturn. Robustness checks have been run testing releases and increases separately, both for CCyB and for other CET1 requirements, but the results were generally not significant.

94. The specification also includes variables controlling for business model and other bank-specific characteristics, as well as macroeconomic controls.[60] Bank controls are lagged one period. Changes in capital requirements are not lagged. Given the semiannual frequency of data, introducing a lag to requirements could measure changes in capital requirements with a delay of six to 12 months. At the same time, some lag is in practice taken into account, as for example changes in February would be reflected in the June data.[61]

Results

95. Table 4, column (1) shows that there is no significant relationship between changes in bank-specific CCyB rates and changes in loans to firms and households over the period as a whole. However, as shown in column (3), this relationship has some significance during the pandemic period relative to non-Covid times[62] although this relationship does not hold in a smaller sample regression that controls for bank characteristics and business models (column 5). By contrast, other CET1 releases (*ΔOther CET1 Req$_{i,t}$*) are associated with a significant increase in bank lending during the pandemic relative to non-Covid times (column 3), and this relationship remains significant even controlling for bank characteristics and business model (column 5) and also for macroeconomic conditions (column 7).

96. In addition, the two forms of capital changes are combined to look at the relationship between *ΔTotal CET1 Req$_{i,t}$*, the total change in required CET1, and bank lending. The results indicate a significant additional effect during the pandemic period (column 4), but not when controlling for lagged bank characteristics and business model (column 6) and for macroeconomic conditions (column 8). However, when controlling for changes in the sample, the relationship remains significant also when including bank controls and macro controls (see Annex 9).[63]

97. An extended specification interacted the capital requirement variables (CCyB and other CET1) with an indicator for banks' headroom over buffers. It aimed to examine whether CCyB releases have been associated with greater lending growth for banks closer to their buffers. The estimation did not yield statistically significant results.

CCyB and other CET1 changes and semester-on-semester growth of bank lending — Table 4

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔCCyB$_{i,t}$	0.0151		0.0479		0.0018		-0.0016	
	(0.0173)		(0.0314)		(0.0181)		(0.0191)	
ΔOther							0.0033	
CET1 Req.$_{i,t}$	-0.0052		0.0012		0.0022			
	(0.0037)		(0.0031)		(0.0031)		(0.0032)	
ΔTotal								
CET1 Req.$_{i,t}$		-0.0051		-0.0003		0.0008		0.0016

60 For more detailed information on the model, see Annex 9.

61 Lags are also not applied to macroeconomic controls on grounds that, for example, GDP growth in each semester (or the other macroeconomic variables) is more likely to have a contemporaneous relationship with bank lending than GDP growth of the previous semester. The bank-specific characteristics are instead lagged by one semester because bank lending may be simultaneously determined. Although bank characteristics are highly persistent, using a lagged value obviates this concern.

62 To note, in this specification *ΔCCyB$_{i,t}$* is included both as standalone variable and interacted with the *Covid$_t$* given that both coefficients have to be combined to properly interpret results. When combined, the sign of the *ΔCCyB$_{i,t}$* coefficient remains negative across all specifications, but is not statistically significant.

63 The analysis in Table 4 uses all available data to estimate the regressions (labeled "*opportunity*" sample). As the number of observations, countries, and banks indicates, the sample varies from regression to regression. To ensure that changing the specification, and not simply changing the sample, is driving the differences in results across columns, Table A7 in Annex 9 repeats the analysis of Table 4 using three consistent data samples.

		(0.0032)		(0.0027)		(0.0027)		(0.0027)
$Covid_t$ * $\Delta CCyB_{i,t}$			-0.0594*		-0.0063		-0.0026	
			(0.0350)		(0.0258)		(0.0267)	
$Covid_t$ * ΔOther CET1 $Req._{i,t}$			-0.0308***		-0.0336*		-0.0157*	
			(0.0111)		(0.0179)		(0.0087)	
$Covid_t$ * ΔTotal CET1 $Req._{i,t}$				-0.0261**		-0.0251		-0.0078
				(0.0107)		(0.0173)		(0.0085)
Observations	1,360	1,647	1,360	1,647	899	1,072	871	1,041
R-squared	0.168	0.165	0.177	0.171	0.255	0.241	0.255	0.246
Bank Controls	NO	NO	NO	NO	YES	YES	YES	YES
Macro Controls	NO	NO	NO	NO	NO	NO	YES	YES
N banks	162	163	162	163	141	148	137	144
N countries	23	23	23	23	21	22	20	21
Sample	Opportunity	Opportunity	Opportunity	Opportunity	Opportunity	Opportunity	Opportunity	Opportunity

Firm clustered standard errors in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Source: BCBS, BIS and ESRB CCyB rates data, and BCBS calculations. Data period: H1 2015–H1 2021.

98. There are some limitations to the analysis. As noted in Section 1, the semiannual frequency of the data is likely to be less effective than quarterly data at picking up the effects of capital releases on lending. Capital releases, and also CCyB releases, were implemented at the start of the pandemic in spring 2020, and entailed significant releases both in March 2020 and in April 2020. The data used for this study, however, only include information as of the end of Q2 and Q4, implying that changes in requirements in Q1 2020 are only reflected in Q2 2020. Increasing the data frequency may have an impact on the results.

99. Also, regarding the limited significance for the CCyB term, it should be recalled that only a few jurisdictions activated and then released the CCyB, and generally by a modest amount prior to the Covid crisis. Depending on the jurisdiction, capital releases mostly took the form of other, non-CCyB CET1 releases.

100. Overall, subject to the caveats mentioned above, the results suggest that releases of other, non-CCyB CET1 capital requirements, as well as total CET1 releases, are associated with greater lending during the pandemic. The results provide weaker evidence for CCyB releases being associated with greater lending. This may be because other CET1 releases were generally larger and more prevalent than CCyB releases.

2.4 The range of variation of capital buffers across the cycle

101. This section looks at historical bank losses to augment the academic findings on the range within which capital buffers should vary with risks, discussed in Section 2.2. Authorities may bridge this difference in capital requirements using a variety of tools, including the CCyB. The analysis may help inform jurisdictional decisions on maximal CCyB rates.

Method

102. The approach focuses on the distribution of historical losses in normal times and periods of elevated risk.[64] Annex 10 provides a detailed explanation of the method and its caveats. The analysis constructs an empirical distribution of bank losses using data from Capital IQ on actual losses experienced over the period 1990 to 2019 by all banks over USD 50 billion in size before 2007.

103. A random draw from this distribution is attributed to each of the *current* major banks[65] in each country.[66] Next, aggregate country losses are calculated by weighting individual losses based on 2019 assets, and translated into RWA equivalents by assuming a representative constant average risk weight. This simulation is replicated 250,000 times to obtain a full distribution of potential system-wide losses for each country.

104. A simulation across the entire period informs the average level of capital buffers needed to absorb losses. Simulations for losses in periods of elevated risk inform the extent to which capital buffers may need to be higher in such periods. A year of elevated risk is defined as a year in which the predicted probability of a crisis – based on a simple model with credit-to-GDP and the CBOE Implied Volatility Index (VIX) as predictors – is greater than 3%. This occurs in approximately 30% of the years covered in the exercise.

Results: How much larger were losses in "elevated" risk times compared with the average?

105. Graph 8 below illustrates the distribution of aggregate simulated losses on average and in elevated risk times. These are total losses rather than credit losses to which the CCyB applies. However, it is potentially a reasonable assumption that most of the extra losses following a credit boom are attributable to credit losses rather than, for example, trading book losses, operational losses or conduct penalties; but there may be some positive correlation making other losses also more likely to be larger following a credit boom. The majority of losses observed are between 0 and 1% of RWAs. Losses greater than 5% of RWAs are rare but become somewhat more frequent in elevated risk times (Graph 7, right-hand panel).

Distribution of aggregate losses — Graph 7

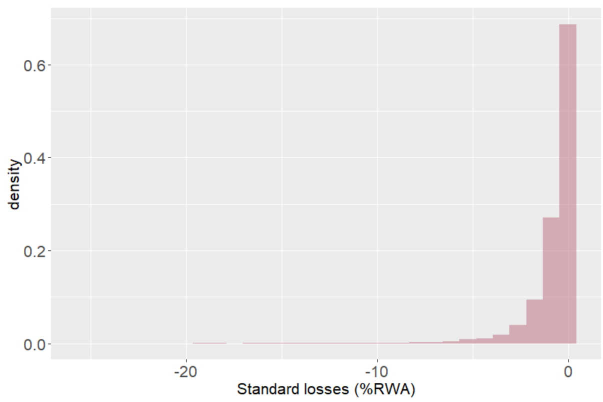
[64] The approach adapts the method in M Brooke, O Bush, R Edwards, J Ellis, B Francis, R Harimohan, K Neiss and C Siegert, Bank of England, Financial Stability Paper, no 35, December 2015. Calibrating the GSIB Surcharge, Board of Governors of the Federal Reserve System, July 2015 also use a similar methodology.

[65] Those over USD 50 billion in assets now. The data set of the July 2021 BCBS report was used to derive this sample.

[66] This ignores likely cross-correlation within a country. Highly concentrated banking systems, in this exercise, might need more capital to cover losses with a higher probability.

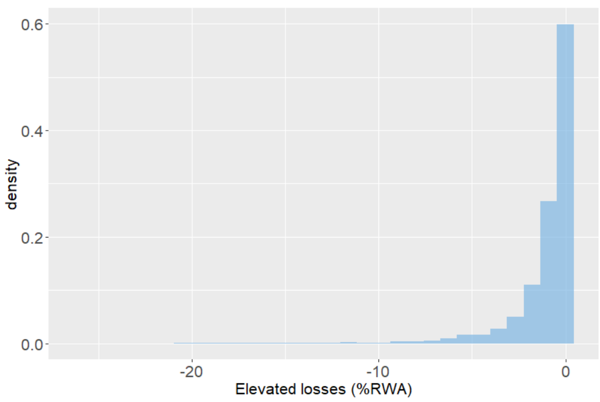
Distribution of aggregate losses in all times.

Density



Distribution of aggregate losses in elevated risk times.

Density



Source: Capital IQ and BCBS calculations

106. Table 5 shows the capital buffers in excess of minimum requirements needed for banks to absorb a loss outcome located at different percentiles in the left tail of the simulated distribution of P&L. The tables illustrate results both on average and when risks are elevated. The results in Table 5 are best viewed as capital buffers needed above and beyond minimum requirements, so that banks can absorb losses and carry on with their financial intermediation.

107. Naturally, as one gets further into the tails of the loss distribution, one would need additional capital buffers to absorb such losses. Focusing on the additional capital required to absorb losses in periods of elevated risk, Table 5 shows, for example, that an authority concerned with keeping loss absorbency at the 97th percentile would set capital buffers in excess of minimum requirements of about 4.7% of RWAs on average through the cycle and 7.2% of RWAs in elevated risk periods, which implies an additional capital buffer when risks are elevated of 2.5% of RWAs. The amount of additional capital buffers needed when risks are elevated relative to cycle average rises above 2.5% of RWAs further out in the tail of the distribution.

Capital buffer needed at different periods and tails of the loss distribution — Table 5

Tail of the loss distribution	Cycle average (incl. elevated times)	Elevated risk times
95	3.4	4.8
96	4.0	5.7
97	4.7	7.2
98	6.0	9.3
99	9.1	12.9
99.1	9.6	14.6
99.2	10.3	16.8
99.3	11.0	17.7
99.4	11.7	18.1
99.5	12.6	19.0

Source: Capital IQ and BCBS calculations.

108. There are a number of caveats to this work, which aims to provide a heuristic analysis of the extent to which one may wish to have higher capital requirements in elevated risk periods (see Annex 10). Notably, obtaining precise estimates of tail losses is challenging and the implicit assumption that future losses will reflect historical experience, itself drawn mainly from the GFC, sets aside many shifts in the

economic and regulatory environment. And, in practice, imperfect information as to when risks are elevated implies that authorities may prefer a smaller difference in capital requirements over the cycle than the ones obtained in this exercise. Nonetheless, the analysis suggests that one may wish to have higher loss absorbency for elevated risk periods to further increase the resilience of banking systems.

2.5 Conclusions

109. The Covid-19 pandemic has revealed a preference by jurisdictions to use capital requirements countercyclically in a stress event. Most countries with a positive CCyB rate entering the pandemic cut their CCyB at the onset of the pandemic. Jurisdictions also reduced non-CCyB capital requirements and took other countercyclical capital measures. While the originally anticipated use of the CCyB was to release capital requirements in downturns following credit-related booms, all the CCyB releases to date have been either due to the pandemic or to political economy events. That said, the original intention was nevertheless preserved: "to ensure that the banking sector in aggregate had the capital on hand to help maintain the flow of credit in the economy". The empirical analysis finds some evidence that, during the pandemic period, there has been a positive additional effect of capital releases on lending, although such effect was found mainly for other CET1 releases rather than for CCyB releases, perhaps reflecting the more limited use of the CCyB across jurisdictions. Finally, the examination of how banking system losses vary over time suggests that there could be value in higher loss absorbency for elevated risk periods.

3. Liquidity buffer usability

110. The Liquidity Coverage Ratio (LCR) was introduced following the GFC of 2007–09. It requires banks to hold a sufficient buffer of high-quality liquid assets (HQLAs) to support their ability to meet their obligations in a severe, short-term stress. This requirement aims to improve banks' individual and collective resilience to liquidity shocks to give supervisors time to take appropriate measures, reducing the risk of spillovers to other financial institutions and from the banking sector to the wider economy. That in turn should improve depositors' and creditors' confidence in banks, hence reducing the risk of a run in the first place.[67]

111. At the same time, required liquidity does not necessarily mean usable liquidity. Indeed, the potential tension between setting a requirement to hold a certain amount of liquidity and the usability of that liquidity has long been recognised.[68]

112. This section builds on findings from the July 2021 BCBS report. That report found that certain short-lived and moderate pressures on liquidity positions occurred early in the pandemic, and certain banks in some jurisdictions took defensive actions to bolster liquidity, reflecting in part their targeting of internal LCR levels well above 100%. There is no evidence that such actions had widespread adverse effects, but the episode raises questions regarding how banks might behave in a more severe liquidity stress scenario and whether bank actions could have macroeconomic impacts.

113. This section reviews the potential consequences on the economy if banks defend their liquidity buffers,[69] summarises evidence from the pandemic, presents furthers evidence on banks' management of liquidity buffers, and sets out the potential reasons for their behaviour.

[67] See for example, Diamond and Dybvig (1983) and Diamond and Kashyap (2016).

[68] See for example, the "last taxi" parable cited in Goodhart (2008).

[69] Liquidity buffers, in this section, include all liquid assets buffers, not just amounts above 100% LCR.

3.1 Potential consequences of reluctance to use buffers

114. The main concern relates to scenarios where the actions taken by a range of individual banks in response to unanticipated liquidity needs produce unexpected knock-on consequences for the wider financial sector and/or economy.[70] In a market-wide stress, there is a balance to be struck between banks retaining enough liquidity to retain confidence and using liquid assets to avoid procyclical effects or contagion.

115. There are multiple ways by which negative externalities to the broader economy could materialise as a result of liquidity hoarding in a market-wide stress. Fire sales can depress the values of financial assets for many market participants.[71] Coen et al (2019) show that fire sales can lead to more significant losses if banks are reluctant to allow their LCRs to fall.[72] De Haan and van den Ende (2011) find evidence of a link between liquidity-hoarding and fire sales in the GFC.[73] In addition, banks may restrict the availability of credit to conserve liquidity. Several studies identify a link between liquidity-hoarding in the GFC and reduced lending of various types.[74]

116. Regulatory stress tests provide additional evidence. In a liquidity stress test run by the Bank of England, banks' response was to take defensive actions, including cutting lending to households and businesses.[75] Analysis by the Bank of Canada suggests that, in a scenario of a severe liquidity stress affecting domestic systemically important banks, if those banks simultaneously do not allow their LCRs to fall below 100%, lending to the real economy can decline materially.[76] There is also some quantitative evidence that indicates that, if banks defend a high LCR, this can affect their market intermediation. In particular, Gerba and Katsoulis (2021) and Macchiavelli and Pettit (2021) find evidence of possible effects in the repo market.[77]

117. There were concerns amongst some supervisors about potential consequences of individual bank actions to maintain their resilience in the early part of the pandemic, particularly during the "dash for cash" in March 2020. As described in the July 2021 BCBS report, a number of jurisdictions took actions to temporarily reduce or amend their LCR standard to encourage banks to continue to support financial intermediation under stress. In addition, the BCBS and a number of jurisdictions issued statements encouraging banks to use their HQLAs.[78]

3.2 Lessons learnt during the pandemic period

118. Monthly data on LCR levels do not show a meaningful trend across the five jurisdictions considered until March 2020 (Graph 8). After March 2020, there is an increase in LCR levels, which is likely reflective of central banks providing large amounts of liquidity to financial systems, deposit inflows, and

[70] There is implicit support in the LCR standard for this view. The standard sets out that it would be entirely appropriate for banks to use their stock of HQLA, thereby falling below the minimum, during periods of stress – see LCR20 - Calculation (bis.org) 20.5. The standard also describes how supervisors should respond to LCRs falling below 100% - see LCR20 - Calculation (bis.org) 20.6.

[71] See Shleifer and Vishny (2011).

[72] See Coen and Schaaning (2019).

[73] See De Haan and van den Ende (2011).

[74] See Bernanke (2018), Berrospide (2013), Acharya and Merrouche (2013) and Cornett et al (2011).

[75] Financial Policy Summary and Record, Bank of England, March 2021.

[76] See Halaj and Priazhkina (2021).

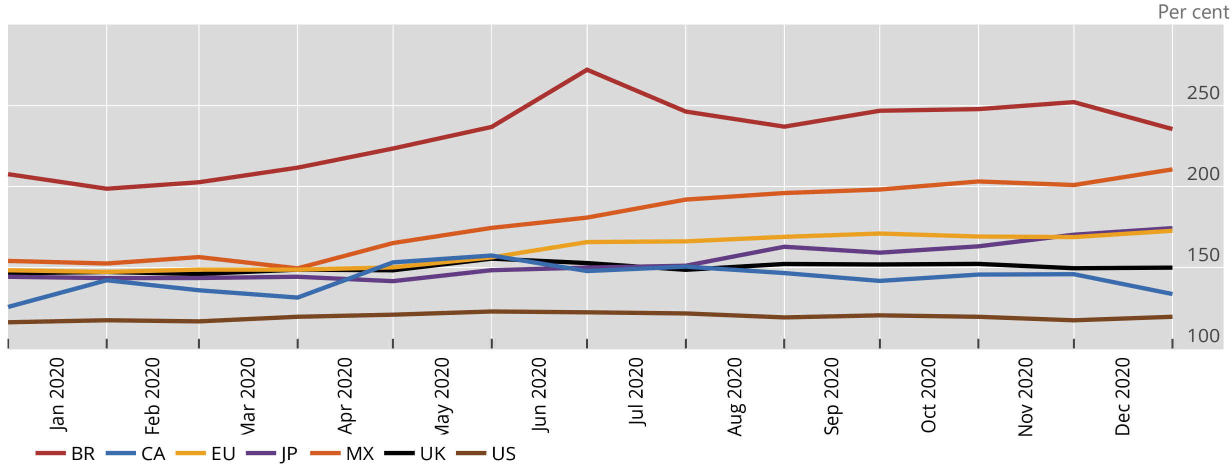
[77] See Gerba and Katsoulis (2021) and Macchiavelli and Pettit (2021).

[78] Press release: Basel Committee coordinates policy and supervisory response to Covid-19 (bis.org).

governments taking fiscal measures to support economies. Broadly speaking, the graph indicates that, for the most part, banks faced little sustained liquidity stress during the pandemic.

Evolution through 2020 of end-month LCR ratios

Graph 8



Series show average LCRs for largest banks in each jurisdiction.

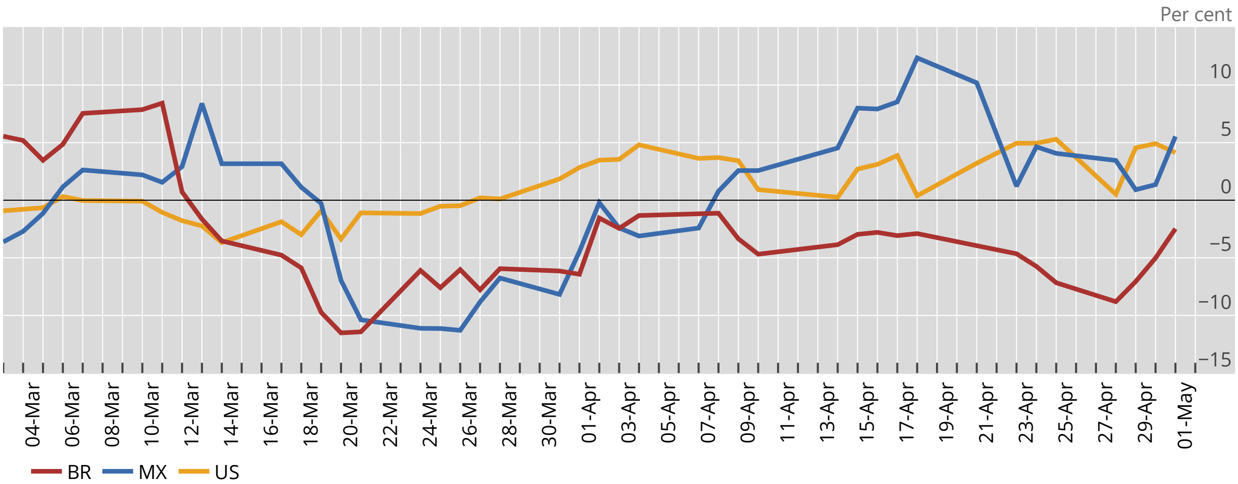
Source: Jurisdictional data and BCBS calculations

119. During the course of March 2020, there was a modest deterioration in LCRs in jurisdictions that were able to provide daily data, followed by a recovery that returned LCRs to previous levels (Graph 9). Relative to the end of February, the aggregate average LCR dropped 4 percentage points for US G-SIBs.[79] Similar patterns were observed for D-SIBs in Brazil (5 percentage point drop) and in Mexico (11 percentage point drop).[80] These data indicate that, while there was considerable market stress in this period, it mostly did not manifest as liquidity stress at banks. Indeed, in many cases, deposit levels increased (eg as the counterpart to drawdowns in committed facilities and investor withdrawals from money market funds (MMFs)).

[79] July 2021 BCBS report, Annex 3, Chart A1.

[80] These three jurisdictions are the only ones to collect LCR numbers systematically on a daily basis.

Cumulative change in the LCR since 28 February 2020 Graph 9



Series show average LCRs for largest banks in each jurisdiction.

Source: Jurisdictional data and BCBS calculations

120. Even so, some jurisdictions reported seeing a range of banks taking or planning to take management actions in March 2020 to bolster liquidity.[81] Examples of such actions include reducing certain types of lending and asset holding, constraining balance sheet growth by slowing the on-boarding of new clients and discouraging expansionary trading desk activities. Reflecting the short-lived and limited nature of pressure on banks' liquidity, there is no evidence that such actions had widespread adverse effects.

121. This behaviour is consistent with banks typically targeting LCRs above 100% (as reported by supervisors and documented for example in recovery plans studied for this report[82]). It may have been partly motivated by elevated uncertainty and caution around how the stress would unfold.

3.3 Other evidence on banks' management of LCRs

122. Banks typically have internal targets or other thresholds above 100% LCR for triggering actions to defend their liquidity positions.[83]

123. A study of large UK banks' monthly LCR ratios over the period 2016 to 2022 provides evidence that banks actively manage their LCRs by targeting a mean LCR level well above 100%. In addition, whenever a bank's LCR has fallen below that target, it has tended to increase its LCR in the following month, with larger increases observed when further away from the target. On the other hand, when above the target, banks will typically let their LCRs drop in the subsequent month. Annex 11 provides further information on this analysis.

124. Furthermore, UK data show a relationship between banks' average LCR levels and their volatility: banks that experience larger fluctuations in their LCR levels over time tend to maintain relatively higher average LCRs. This is consistent with banks wanting to be confident their LCR is always well above 100%.

[81] July 2021 BCBS report, para 156.

[82] July 2021 BCBS report, para 157 and p 81.

[83] Reported by supervisors in early 2021 (see July 2021 BCBS report, para 157). From a representative sample of UK banks (accounting for the majority of banking assets in the United Kingdom and a multiplicity of business models) in 2020, no bank calibrated its LCR recovery indicator below 100%. This suggests that banks consider urgent measures necessary to improve their liquidity positions at no lower than that level.

Finally, no bank dropped below the regulatory minimum of 100% throughout the entirety of the time series, with the low points all well above 100%. This indicates that UK banks were reluctant to allow their LCRs to drop below 100% even when the regulatory standard was set at a lower level during the phase in period (ie 2016 and 2017).[84]

125. Experience from supervisory stress-testing exercises also suggests that banks are reluctant to allow LCRs to fall below 100%. For example, banks' response in a stress exercise run by OSFI included disposing of level 2 HQLA not held for liquidity purposes and non-HQLA assets, and unwinding collateral downgrade trades and matched book repo, to maintain a high LCR.

126. A Bank of England liquidity stress test in 2019 produced similar findings.[85] In that exercise, banks were unwilling to allow their LCR to fall below 100% if they could avoid it. Due to the severity of the stress scenario, banks had little choice but to run down their liquidity buffers at the beginning of the stress. But almost all banks planned to take actions – including drawing on Bank of England liquidity facilities, and cutting lending and attracting deposits – to maintain LCRs at or above 100% by the end of the stress period, consistent with the standard.

127. This reluctance to allow the LCR to drop below the regulatory threshold is consistently reported by supervisors and bankers. In a 2019 survey of Basel Committee authorities, 13 of 23 jurisdictions reported seeing evidence that banks would be hesitant or unwilling to draw down their stock of HQLA during a period of stress, particularly if doing so would make the bank's LCR fall below 100%. This is broadly consistent with views of bankers (eg as reported by the Bank Policy Institute in October 2021).[86]

3.4 Why might banks be reluctant to allow LCRs to fall?

128. Banks' apparent reluctance to use their liquid assets during stressed situations is a behaviour that predates the Basel III liquidity standards, as demonstrated by banks´ actions during the GFC.[87] Uncertainty and caution around how a stress may continue to evolve or worsen may be one driver of such reluctance.

129. Banks' reluctance to draw on their HQLA is probably also motivated by the wish to avoid abrupt drops in their LCR, especially to below 100%. This is reflected in institutional incentives to maintain LCR levels above internal targets. One possible explanation for this reluctance is that banks may be concerned about how supervisors will respond to a sudden drop in LCR, especially to below 100%, for example through enhanced supervisory monitoring.[88] In a 2019 survey of Basel Committee authorities, 13 of 23 jurisdictions identified that the potential supervisory response to an LCR dropping below 100% was a reason for banks' reluctance to use their HQLA. Also, domestic regulations may require firms to set triggers for instigating recovery plan actions at levels well above 100%.[89]

[84] Data from the United States tell a similar story, as does the Committee's monitoring of LCR implementation (see eg Basel III Monitoring Report March 2018 (bis.org), chart 44 for the picture as of end-June 2017).

[85] Financial Policy Summary and Record - March 2021, Bank of England.

[86] Bank Treasurers' Views on Liquidity Requirements and the Discount Window - Bank Policy Institute (bpi.com).

[87] See Carlson et al (2015). The authors also mention banks´ uncertainly on how to meet unforeseen liquidity needs during financial panics.

[88] In some jurisdictions, enhanced monitoring begins at higher levels, eg in Japan internationally active banks are required to report approximated LCR on a daily basis once LCR drops below 110%.

[89] Eg EBA Final Report on Guidelines on recovery plan indicators.pdf (europa.eu).

130. Another possible explanation is banks' concern about how the market, counterparties and credit rating agencies[90] would react to falls in HQLA or the LCR. Banks may be concerned about a negative market reaction or stigma to disclosing an LCR below 100% or well below their peers – a view also reported by a significant number of jurisdictions in the 2019 survey.[91] To mitigate such risks, Basel Pillar 3 disclosures require banks to disclose relevant LCR figures as averages only. But, in some jurisdictions (EU and United Kingdom), many of the largest banks have adopted the voluntary practice of regularly disclosing point-in-time LCRs. Such spot disclosure practices may exacerbate banks' wariness about the market finding out if their LCR were to fall below 100%. Furthermore, two jurisdictions noted that bank behaviour during the pandemic was influenced by forthcoming (end-March 2020) public LCR disclosures. Additionally, banks may feel obliged to disclose drops in the LCR because of local capital market transparency regulations.

3.5 Conclusions

131. Banks' management of liquidity buffers – in particular, a reluctance to allow LCR to drop below buffer requirements – could have a macroeconomic impact in a severe liquidity stress scenario. Early on in the pandemic, certain banks in some jurisdictions planned or took defensive actions to bolster liquidity in response to short-lived pressures on liquidity positions. There is no evidence that such actions had widespread adverse effects. But banks typically a target LCR level above 100% and there is evidence that in the event of a more severe stress, they would take defensive action to maintain it.

4. Expected credit loss provisioning, capital and procyclicality

132. This section considers interactions between provisions and regulatory capital under the Expected Credit Loss (ECL) accounting regime, focusing particularly on potential procyclicality of the framework. It also compares ECL with the Incurred Loss (IL) accounting regime. For the purpose of the analysis, procyclicality is interpreted as described by the Financial Stability Forum (FSF (2009a)) as "*mutually reinforcing interactions between the financial and the real sectors of the economy that tend to amplify business cycle fluctuations and cause or exacerbate financial instability*".[92]

133. IL accounting allowed banks to recognise only loan losses that were probable of having been incurred. This backward-looking approach was criticised for delaying recognition of loan losses, potentially amplifying lending through the cycle. ECL accounting was introduced in response to weaknesses in IL accounting that were exposed during the GFC. ECL standards require banks to recognise not only historical and current losses but also expected losses corresponding to a reasonable and supportable view of future economic conditions. Under ECL standards, banks can also forecast improvements in the economy and thus release reserves earlier, which can benefit recovery in a downturn as well. In principle, a forward-looking approach should improve loss recognition and may help dampen procyclicality. This may not be the case in the face of a sudden exogenous shock such as a Covid-19 pandemic, which differed in many ways from previous economic downturns and made it more challenging to apply the forward-looking features of ECL framework.

90 The published global assessment methodologies for S&P, Moody's and Fitch all give a sizeable weighting to liquidity and funding, and within that, to metrics of liquidity adequacy. All give some consideration to the LCR as part of this. Sometimes the LCR itself features explicitly as one metric among others, sometimes it is not itself part of the core set, but the rating agency has discretion to take it into account. When the LCR does not feature explicitly but rather some other (typically simpler) measure of liquidity, then obviously that other measure would tend to be related to LCR.

91 Eighteen of 23 jurisdictions mentioned market reaction or stigma as a possible explanation at the 2019 survey of BCBS authorities.

92 Borio et al (2001) provide an overview of procyclicality, describing it as feedback from the financial system to the real economy.

134. This section focuses on links between provisions, regulatory capital and lending growth before and after the introduction of ECL accounting. First, it summarises academic findings on how IL and ECL approaches interact with capital and lending. Second, it assesses such interactions quantitatively. It is clearly challenging to assess procyclicality of ECL empirically given its recent implementation, not least given the extraordinary conditions of the pandemic. Finally, the section draws additional insights from jurisdictional case studies of ECL, as well as supervisory intelligence on the use of management overlays in loan loss provisioning.

4.1 Accounting provisions and regulatory capital

135. IL accounting was widely criticised following the GFC for having delayed the recognition of loan losses, as captured in the phrase, "too little too late". The IL approach included credit losses in provisions only after the event that would probably result in a loss occurred, generally supported by observable evidence. This delayed loss recognition was seen by policymakers as procyclical and also reduced the accuracy of regulatory capital measures.

136. In the wake of the GFC, the FSF noted a strong link between the cyclicality of IL provisioning and the economic downturn: "*Earlier recognition of loan losses could have dampened cyclical moves in the current crisis*" (FSF (2009a)). An FSF Working Group on provisioning made recommendations for changes in provisioning approaches with a goal of reducing procyclicality.[93]

137. To address the deficiency of the IL standards, the International Accounting Standards Board and the US Financial Accounting Standards Board published the ECL standards (IFRS 9) in July 2014 and Current Expected Credit Losses (CECL) in June 2016. These standards were adopted in 2018 and 2020, respectively. Both IFRS 9 and CECL require banks not only to use historical loss experiences and current economic conditions, but also to include reasonable and supportable economic forecasts in their ECL estimations. This change was intended to lead to earlier recognition of expected credit losses – and by recognising losses earlier, to provide a more accurate, forward-looking view of a bank's health.

138. Under the internal ratings-based approach, accounting provisions set aside for credit losses connect to regulatory capital through the prudential measure of expected loss (EL). For banks using the standardised approach for credit risk, provisions held against future, presently unidentified, losses qualify for inclusion within Tier 2 capital.[94]

4.2 Procyclicality of loan loss provisioning: IL and ECL

139. IL was criticised for being procyclical because provisions only covered losses that were incurred. Consequently, in benign periods of economic growth, bank capital positions were overstated, encouraging more lending. In a downswing, capital positions declined sharply when credit losses emerged. To keep capital from falling below regulatory requirements, at a time when raising capital may be especially challenging, banks may reduce lending, potentially amplifying a downturn. This behaviour was recognised in a number of official reports on the GFC.[95]

140 Both the IFRS 9 and CECL standards require an estimate of future credit losses in the loan book. These estimates are often based on internal models that require the bank to categorise exposures based on certain risk parameters (eg probability of default). In forming a view on ECL, banks use judgment in

93 The FSF (2009b) report based its conclusions and recommendations on the inputs from supervisory experts, surveys and illustrative examples of procyclicality for a sample of the US banks.

94 Basel III: A global regulatory framework for more resilient banks and banking systems - revised version June 2011 (bis.org), paragraphs 60–61.

95 For example, a Joint FSF-BCBS Working Group on Bank Capital issues (2009) provided detailed recommendations for reducing procyclicality arising from the bank capital framework which impact lending.

addition to outputs from models; these judgments (management adjustments) have been material during the pandemic, as discussed in Annex 12.

141. Industry experts have expressed some concerns that ECL may increase procyclicality if there is a rapid increase in allowances during stress. Despite these concerns, industry experts have noted the benefits of ECL in providing a more accurate measure of losses that can also support better risk management and controls (Hintze (2022)).

4.3 Evidence from academic literature

142. To the extent that provisioning expenses reduce capital and deter lending in a downturn, IL approaches could be procyclical. Several academic studies have found that IL provisions amplified reductions in lending during recessions. Laeven and Majnono (2003) find a negative relationship between provisions and growth in lending and GDP. Beatty and Liao (2011) show that banks with longer delays in loss recognition tended to reduce their lending more during recessions. Jiménez et al (2017) demonstrate that more forward-looking "dynamic provisioning" smooths lending across the credit cycle and mitigates procyclicality in credit supply.

143. A recent BCBS literature review (BCBS (2021)) summarises papers examining procyclicality under IL and ECL methods, and notes that the use of a range of concepts and approaches makes it hard to compare the findings of studies. Empirical studies on procyclicality of IFRS 9 or CECL have also been severely limited by lack of sufficient time series data, given the recent implementation of IFRS 9 and CECL. This nascent literature finds mixed evidence, with some studies (eg Covas and Nelson (2018); Abad and Suarez (2018)) arguing that the ECL framework contributes to procyclicality, while others (eg Chae et al (2019); DeRitis and Zandi (2018); Loudis and Ranish (2019)) suggest that it dampens procyclicality. Juselius and Tarashev (2020) argue that ECL provisions would reduce procyclicality if the underlying credit-loss forecasts employ standard indicators of financial stress such as the debt service ratio; they acknowledge that even the best forecast models could not predict downturns rooted in exogeneous shocks such as Covid-19 outbreak.

144. The IL approach may have also helped to weaken the information content of regulatory capital measures for market participants and other stakeholders.[96] Wheeler (2021) examines incentives to manage regulatory capital and earnings via provisioning under IL and ECL. He shows that IL-based provisions are more understated for banks with low regulatory capital relative to estimated ECL provisions, consistent with capital management incentives. This aligns with findings by Beatty and Liao (2021), who show that analysts included unrecognised expected losses beyond the IL provisions in their forecasts of stock prices. Bischof et al (2021) demonstrate that loan loss recognition under IL came late relative to prevailing market expectations, and market estimates far exceeded banks' loss recognition.

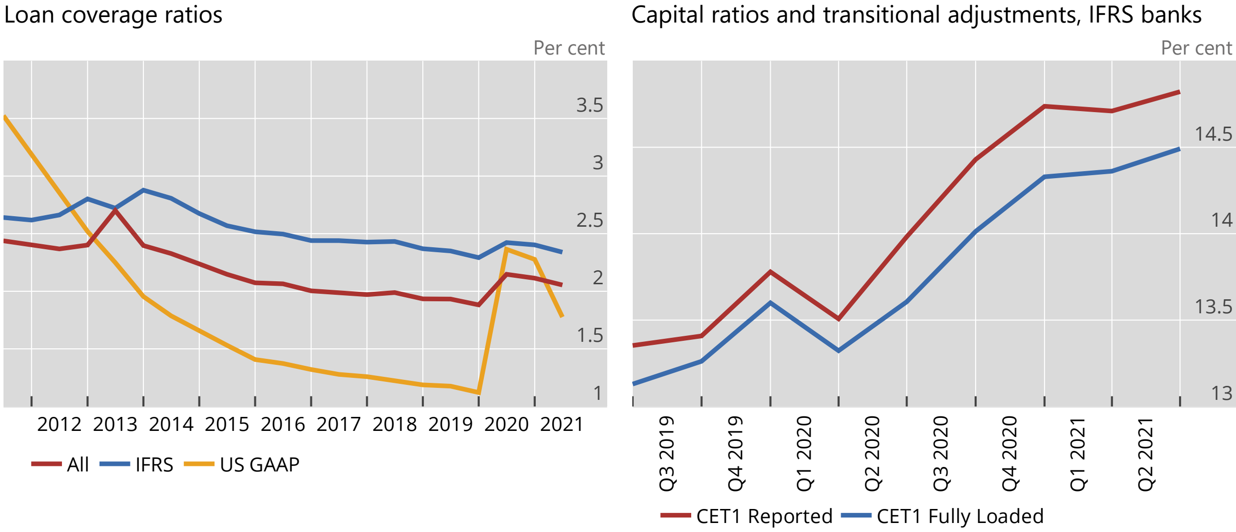
4.4 Trends in provisions and capital during the Covid-19 crisis and the use of management adjustments

145. As seen in Graph 10, left-hand panel, until Q4 2019 the loan coverage ratio (provisions relative to gross loans) was on a downward trend, but rose sharply in Q2 2020, particularly for US GAAP banks:

[96] Several studies noted that the declines of banks' market-to-book ratios after the GFC may be due to the delayed recognition of losses (eg Plantin et al (2008); Calomiris and Herring (2013)). Calomiris and Nissim (2014) provide an alternative explanation related to declines in the values of intangibles such as customer relationships, business opportunities and unrecognised contingent obligations.

IFRS9 bank coverage ratios rose by 6% in H2 2020, while US GAAP banks coverage ratios increased by 111%.[97]

Loan coverage ratios, capital ratios and transitional adjustments | Graph 10



Sources: S&P Market Intelligence data; BCBS calculations.

146. Provisions had a relatively muted impact on capital ratios, which tended to rise throughout the pandemic period. That partly reflects actions by governments, central banks and regulatory agencies to support economies during the pandemic, as well as restrictions on payouts, which may also have encouraged banks to divert surplus resources to allowances. The BCBS also announced amendments to rules on how capital is affected by provisions, including expanding the transition period from three years to five for add backs of provisions to capital.[98] Graph 10, right-hand panel above suggests that the impact of transitional arrangements for banks using IFRS9 was around 30–45 bp, and Loudis et al (2021) have a similar estimate for CECL banks. Additional insights on transitional arrangements are presented in a case study of EU banks (Annex 12).

Management adjustments

147. Firms have significant discretion in assessing loan loss provisions. The EBA Monitoring Report on IFRS 9 (2021) observed that the pandemic pushed ECL models outside of their boundaries resulting in the increasing reliance on judgment ("management adjustments") in the EU.

148. Judgment is an essential part of measuring loan losses under both IL and ECL, due to inherent limitations in banks' credit models and data. As neither standard prescribes a particular method or technique to calculate credit losses, both standards allow flexibility to use a combination of models and judgment. But a key driver for adjustments being more prevalent under ECL than IL is the requirement to use a broader range of (forward-looking) credit information to recognise credit losses on a timely basis.

149. While management adjustment practices have been different across jurisdictions, they were used extensively during the pandemic period to better reflect unprecedented levels of government support and uncertainty over the economic outlook in the ECL estimation. The application of management adjustments under the ECL approach, particularly during the pandemic, appears to have contributed to limiting

[97] For public banks in the US GAAP segment, CECL adoption was effective on 1 January 2020, while most banks in IFRS segment implemented IFRS9 effective for annual periods beginning on or after 1 January 2018.

[98] Measures to reflect the impact of Covid-19 (bis.org).

excessive earnings volatility. The approaches to managerial adjustments in provisioning for loan losses are described further in Annex 12.

4.5 Empirical analysis of provisions, capital and lending

Insights from the July 2021 BCBS report on the Covid-19 pandemic

150. The July 2021 BCBS report noted that ECL accounting had helped banks recognise loan losses earlier than the IL approach during the economic downturn. Preliminary analysis based on data to 2020 Q2 showed that IFRS 9 provisions correlated negatively with CET1 capital ratios in the absence of transitional offsets. However, this negative relationship did not exist when applying the capital transition arrangements. Government support and economic stimulus programmes mitigated the impact of the economic contraction on ECL provisions and thus on bank capital. The report concluded that it was too early to draw clear lessons regarding cyclicality of capital requirements arising from provisioning.

New analysis on provisions, capital and lending

151. This subsection reports new analysis on the link between provisions, capital and lending before and during the pandemic. It uses both quarterly S&P Market Intelligence vendor data and semiannual global panel data collected by the Committee. For the vendor data, there is a baseline sample of 418 banks.[99] Analysis using vendor data looks at Q1 2017–Q2 2021 to mitigate quality concerns about earlier data. Analysis using Committee's global panel data covers H1 2011 to H1 2021. Two definitions of lending are used in this analysis: a narrow definition which measures lending to the private sector, and total lending which also includes sovereign and bank lending.[100]

152. For both data sources, banks are segmented by the type of accounting standards in use: IFRS, US GAAP and Other National Accounting Standards (ONAS). ONAS banks did not implement ECL but use a variety of approaches, some of which can be seen as a hybrid between IL and ECL (eg see Annex 12 "Bank loan loss allowance under Japanese GAAP"). Analysis in this section is undertaken separately for IFRS and ONAS banks, with results for the IFRS segment presented below.

153. There are data limitations in both the Committee's data and vendor data sets. The limited availability of some key variables, such as the non-performing loan ratio, restricts the number of banks in the analysis. The vendor data do not include information on government stimulus, forbearance extended by banks, and capital transitional effects.

154. The empirical work first examines whether the relationship between lending growth and capital ratios is affected following IFRS9 implementation, and then whether there are any further changes in behaviour during the pandemic-related economic shock. The analysis uses a regression specification similar to that in Bernanke and Lown (1991).[101]

155. The focus of this analysis is the impact of changes in loan loss provisioning approaches (from IL to ECL) on the relationship between regulatory capital (CET1 ratio) and subsequent growth in lending. During a downturn, a stronger relationship between lagged capital and lending growth may indicate procyclicality.

156. A panel regression approach looks at behaviour before and after IFRS9 implementation ($IFRS9_t$) and after the Covid-19 shock ($Covid_t$), including interactions with the CET1 ratio or, alternatively, capital

[99] Banks are identified using the approach in the July 2021 BCBS report based on both quantitative criteria (total bank assets are larger than 0.25% of national annual GDPs or $50 billion as of Q4 2019) and qualitative judgment.

[100] The lending definition in the Committee's data includes securities and some off-balance sheet items, whereas the total lending in vendor data does not include securities and off-balance sheet data, and does not include sovereign lending.

[101] Bernanke and Lown (1991) studies the depletion of bank capital during the early 1990s downturn, and banks' efforts to meet regulatory capital standards via a reduction in lending, which in turn contributed to the severity of recession.

headroom. The NPL ratio and Total Assets (log) are included as bank-specific control variables, and national real GDP growth (HP filtered) as a control for time-variant macroeconomic factors. All control variables are lagged by one period. In all specifications, bank fixed effects are applied and robust standard errors clustered at bank and country-time levels, or at a bank level in alternate specifications.

$$\begin{aligned}\Delta Log(Lending)_{i,t} \\ &= \alpha_t + \alpha_i \\ &+ ß_1 CET1Ratio_{i,t-1} + ß_2 IFRS9_t + ß_3 IFRS9_t * CET1Ratio_{i,t-1} + ß_4 Covid_t + ß_5 Covid_t \\ &* CET1Ratio_{i,t-1} + ß_6 Controls_{i,t-1} + \varepsilon_{i,t}\end{aligned}$$

i-individual bank, t-time: semiannual for BCBS data (or quarter for vendor data)

157. If $ß_3 > \mathbf{0}$ (significant and positive), it could indicate that the link between lagged CET1 ratios and lending growth is strengthened following IFRS9 implementation.[102] Further, looking at the interaction with the Covid-19 pandemic shock, $ß_5 > \mathbf{0}$ (significant and positive) could indicate that the relationship between lagged capital levels and lending growth was further strengthened during the Covid-19 shock for those institutions that had adopted IFRS9.

Results

Table 6

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.910**	-0.465	1.510	-0.454	2.224***	1.748**
	(0.931)	(2.154)	(1.121)	(2.055)	(0.689)	(0.746)
CET1 Ratio$_{t-1}$	–0.003	0.006	–0.003	0.007	0.002	0.001
	(0.007)	(0.007)	(0.007)	(0.007)	(0.002)	(0.003)
IFRS9$_t$	–0.113**	–0.027	–0.132**	–0.042	–0.044	–0.054
	(0.049)	(0.045)	(0.062)	(0.049)	(0.032)	(0.035)
CET1Ratio $_{t-1}$ * IFRS9$_t$	0.007**	0.002	0.007**	0.002	0.003*	0.003*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.002)
Covid$_t$	–0.184	–0.145	–0.220	–0.181	0.005	–0.017
	(0.131)	(0.097)	(0.140)	(0.110)	(0.030)	(0.029)
CET1Ratio $_{t-1}$ * Covid$_t$	0.013	0.010	0.014	0.011	0.000	0.001
	(0.010)	(0.007)	(0.010)	(0.007)	(0.002)	(0.002)
NPLRatio $_{t-1}$	–0.003	–0.001	–0.003	–0.001		
	(0.007)	(0.002)	(0.006)	(0.002)		
Ln (Total Assets) $_{t-1}$	–0.068**	0.014	–0.052	0.015	–0.086***	–0.067**
	(0.031)	(0.079)	(0.040)	(0.075)	(0.027)	(0.029)
RealGDP(HPFiltered) growth $_{t-1}$			–4.280	–4.060*	–0.288	–4.465
			(4.173)	(2.123)	(2.671)	(2.887)

102 1 January 2018 is used as IFRS9 adoption date for all countries in the IFRS segment, with the exception of the following: Singapore (December 2018), and Mexico (1 January 2021). Brazil made changes in loan loss accounting in 2020 (Caruzo et al 2021)). However, IFRS 9 is planned to be implemented in 2025. In India, IFRS9 has been introduced for non-bank financial companies in 2018 but it has not yet been made applicable to banks. Since the implementation date for Brazil is outside the time period for this study, it is excluded from the sample. Inclusion of Brazil, or, alternatively, exclusion of all countries that adopted IFRS 9 after January 2018, does not materially change the results in robustness tests.

Observations	274	236	274	236	1,121	847
R-squared	0.151	0.241	0.160	0.253	0.173	0.199
# of Banks	33	33	33	33	108	103
Sample	All	Post 2015	All	Post 2015	All	Post 2015

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

IFRS banks, Retail and Corporate Lending Growth as a dependent variable.

Source: BCBS, with semiannual frequency, H1 2011–H1 2021, standard errors are clustered at bank and country-time levels. Subsample H1 2016–H1 2021.

158. Regression analysis indicates that higher (lower) loan growth was statistically significantly associated with higher (lower) regulatory capital ratios in the time period immediately after implementation of IFRS9 in specifications (1), (3), (5) and (6). However, there was no discernible amplification effect following the pandemic shock in any of the specifications. Similar effects are not observed in ONAS segment.[103] Robustness checks including alternate lending definitions and use of capital headroom in place of CET1 ratios do not alter the main conclusions.

159. The analysis of the impact of CECL implementation on lending growth for the US GAAP segment is presented in US GAAP (CECL) case study (Box 1). It uses a different identification approach that compares banks that adopted CECL versus those that did not. It concludes that loan growth did not decline significantly for CECL adopters compared with IL firms following the Covid-19 related economic downturn.

Box 1

US GAAP (CECL) case study

While IFRS9 was implemented in most IFRS banks in the beginning of 2018, the US version of ECL (CECL) was implemented by the majority of large banks in the first quarter of 2020, which coincided with the Covid-19 shock. Many medium-sized and small banks using US GAAP continued to use the IL method throughout the economic downturn. The effective dates for CECL implementation range from 2020 to 2023 for different types of financial institution. The varying implementation dates of CECL allows us to conduct a comparative analysis of CECL and IL banks in relation to the interaction of provisions, regulatory capital and lending.[104]

Data

The sample banks include consolidated US banking holding companies of between $2.3 billion–$100 billion in total assets, with an even split between firms that adopted CECL on 1 January 2020 (CECL firms) and those that remained on IL (IL firms).[105] This study uses the sample period Q1 2016–Q2 2021. The CET1 ratio is shown both as reported and with CECL transitional arrangements added back. The dependent variable, Loan Growth, excludes Paycheck Protection Program (PPP) loans.

[103] The number of banks in the US GAAP segment with non-missing variables in the Committee's data set is too small (11 in most specifications) to make statistical inferences. Therefore, for the US GAAP segment, a case study is conducted with an alternative source of data.

[104] This case study generally follows Loudis et al (2021), which does not support the view that CECL affected loan growth for CECL adopters relative to non-adopters.

[105] Late CECL adopters (those firms that adopted CECL after Q1 2020) are removed from the sample used in CECL case study. Cooperative banks and savings and loan associations (S&Ls) are also excluded from the sample. Firms with assets greater than $100 billion as of Q4 2019 are removed from the main sample but added back in robustness tests. Firms with loans to total assets ratio less than 25% as of Q4 2019 are removed as they do not have lending as their primary business focus. Firms with Tier 1 leverage ratios greater than 30% or CET1 ratios greater than 50% in Q4 2019 are removed as it is not likely that the firms with such high CET1 ratios would face capital constraints that affect lending growth decision-making.

Method

A difference-in-difference approach is applied, with banks that adopted CECL (CECL adopters) as a treatment group, and banks that remained on IL as a control group, before and after CECL implementation date 2020 Q1 ($CECL_t$ =1 for quarters after 2019 Q4, 0 otherwise). NPL ratios and Total Assets (log) are used as control variables, all lagged by one quarter, and bank fixed effects with robust standard errors clustered by bank are applied:

$$\Delta Log(Lending)_{i,t} = a_t + ß_1 CECLAdopter_i * CECL_t * CET1Ratio_{i,t-1} + ß_2 CECLAdopter_i * CECL_t + ß_3 CECLAdopter_i * CET1Ratio_{i,t-1} + ß_4 CECLAdopter_i + ß_5 CET1Ratio_{i,t-1} + Controls_{i,t-1} + \varepsilon_{i,t}$$

Controls include non-performing loan ratios (or alternatively, delinquency ratios), net interest margin (NIM), and total assets (log). A positive and significant coefficient $ß_1$ could be an indication of "procyclicality" related to CECL implementation at the onset of the pandemic shock: this could mean that a low CET1 ratio in a preceding quarter for CECL adopters is associated with low lending growth relative to non-CECL adopters (IL firm), following CECL implementation.

Results

	As Reported (Including Transitional Add-Backs)				Excluding Transitional Add-Backs			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CECL_Adopter * $CECL_t$ * $CET1Ratio_{t-1}$				–0.150				–0.146
				(0.091)				(0.091)
CECL_Adopter * $CECL_t$	–0.137	–0.140	–0.137	–0.285	–0.129	–0.133	-0.129	–0.286
	(0.227)	(0.228)	(0.228)	(0.241)	(0.227)	(0.228)	(0.228)	(0.245)
CECL_Adopter * $CET1Ratio_{t-1}$				0.061				0.062
				(0.071)				(0.071)
$CECL_t$ * $CET1Ratio_{t-1}$				–0.096**				–0.094**
				(0.045)				(0.046)
CECL_Adopter	0.115	0.120	0.123	0.147	0.117	0.122	0.125	0.142
	(0.234)	(0.235)	(0.233)	(0.244)	(0.234)	(0.235)	(0.234)	(0.243)
$CET1Ratio_{t-1}$	0.028*	0.026	0.028*	0.055	0.028*	0.026	0.028*	0.056
	(0.017)	(0.017)	(0.017)	(0.036)	(0.017)	(0.017)	(0.017)	(0.036)
$Delinq\_Ratio_{t-1}$	–0.175***		–0.163***	–0.206***	–0.175***		–0.163***	–0.206***
	(0.067)		(0.063)	(0.079)	(0.067)		(0.063)	(0.079)
NPL_Ratio_{t-1}		–0.217**				–0.217**		
		(0.092)				(0.092)		
Ln (Total Assets) $_{t-1}$	–0.321**	–0.320**	–0.324**	–0.309**	–0.320**	–0.320**	–0.323**	–0.309**
	(0.126)	(0.126)	(0.125)	(0.120)	(0.126)	(0.126)	(0.125)	(0.121)
NIM_{t-1}	0.024	0.005		0.029	0.024	0.005		0.029
	(0.051)	(0.049)		(0.051)	(0.051)	(0.049)		(0.051)
Observations	5,368	5,368	5,368	5,368	5,368	5,368	5,368	5,368
R-squared	0.126	0.125	0.126	0.129	0.126	0.125	0.126	0.129

Cluster (bank) robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: FR Y-9C and FFIEC Call Reports.

Regression analysis indicates that there is no significant decline in lending growth for CECL adopters compared with IL firms. In other words, there was no evidence of CECL contributing to procyclicality.[106] Robustness tests, including different measures of lending lead to similar conclusions.

Provisioning and regulatory capital after ECL implementation

Methodology

160. Next, this study examines whether the Cost of Risk (defined as the ratio of Provision (Expense) for Loan and Lease Losses to Total (Gross) Loans) is associated with capital ratio levels, and whether this relationship changes due to ECL implementation, and during the pandemic. Prior studies show that the discretionary use of provisioning can be associated with the practice of earnings management. The regression specification is similar to that used above for IFRS banks, with Cost of Risk as the new dependent variable. This analysis uses S&P Market Intelligence vendor data (at a quarterly frequency) since the provision expense data are not available in the Committee's data for the entire sample period.

Results

Table 7

	(1)	(2)	(3)	(4)

[106] A recent study by Chen et al (2022) finds that the CECL approach increased lending procyclicality following CECL implementation. The authors find that CECL adopters reduced loan growth more than other banks, and this effect is stronger for CECL adopters with low regulatory capital. They also find that CECL adopters increased their loan loss provisions following the Covid-19 downturn more than other banks.

Constant	−0.01380	−0.00108	0.01190	0.00382
	(0.02890)	(0.03110)	(0.03110)	(0.03060)
CET1 Ratio $_{t-1}$	0.00009	0.00007	0.00008	0.00008
	(0.000096)	(0.000091)	(0.000109)	(0.000111)
IFRS9$_t$	0.00190	0.00155	0.00092	0.00154
	(0.001180)	(0.001060)	(0.001150)	(0.001150)
CET1Ratio $_{t-1}$ * IFRS9$_t$	−0.00008	−0.00009	−0.00004	−0.00009
	(0.000058)	(0.000056)	(0.000058)	(0.000060)
Covid$_t$				−0.00282***
				(0.000703)
CET1Ratio $_{t-1}$ * Covid$_t$				0.000148***
				(0.000056)
NPLRatio $_{t-1}$			0.01470	0.01640
			(0.015900)	(0.015900)
Ln (Total Assets) $_{t-1}$	0.00081	0.00019	−0.00055	−0.00007
	(0.001590)	(0.001710)	(0.001710)	(0.001700)
RealGDP(HPFiltered) growth $_{t-1}$		−0.197**	−0.185*	−0.294*
		(0.096200)	(0.094200)	(0.154000)
Observations	1862	1862	1263	1263
R-squared	0.605	0.606	0.467	0.473
# of Banks	137	137	109	109

Cost of Risk (ratio of provision (expense) for loan and lease losses to total (gross) loans) as dependent variable.

IFRS banks (Q1 2017– Q2 2021). Source: S&P Market Intelligence data and BCBS calculations.

Bank fixed effects, Standard errors are clustered by bank and country-time, all explanatory variables (with exception of date indicator variables) are lagged by one quarter.

161. The results indicate that for IFRS adopters, provisioning and capital ratios were not significantly related following ECL implementation.[107] Incremental change is observed after the Covid-19 shock when banks with higher (lower) capital ratios have significantly higher (lower) provisioning. This effect is not observed for banks in ONAS segment.

162. The statistically significant coefficient on the interaction term with the Covid-19 shock suggests that less well capitalised banks may have been relatively more cautious in recognising losses, potentially reflecting concerns about impacts on regulatory capital ratios. This points to the need for close monitoring of provisioning by banks during a downturn, especially those that are less well capitalised.

4.6 Conclusions

163. Taken together, the empirical findings – including case studies – show little sign of procyclicality related to ECL provisioning during the Covid-19 economic shock. Several caveats and limitations of this empirical study should be acknowledged: data gaps in the Committee and vendor data, and a limited ability to control for the impact of government stimulus and capital transitional arrangements during the Covid-19 shock. Also, the nature of the Covid-19 economic downturn – a sudden exogeneous shock – makes it difficult to draw general conclusions. The forward-looking approach of forecasting future losses conditional on anticipated states of the economy, one of the essential parts of ECL framework, was more difficult to apply due to the sudden and unusual nature of the pandemic, and banks' increased reliance on managerial judgment and adjustments. Additional data on ECL implementation through a full business

[107] Weak statistical significance (at 10% level) is noted when using alternate specifications for clustering of standard errors.

cycle would be required to evaluate the full effect of the new accounting ECL standards and to draw conclusions about the potential procyclical effects.

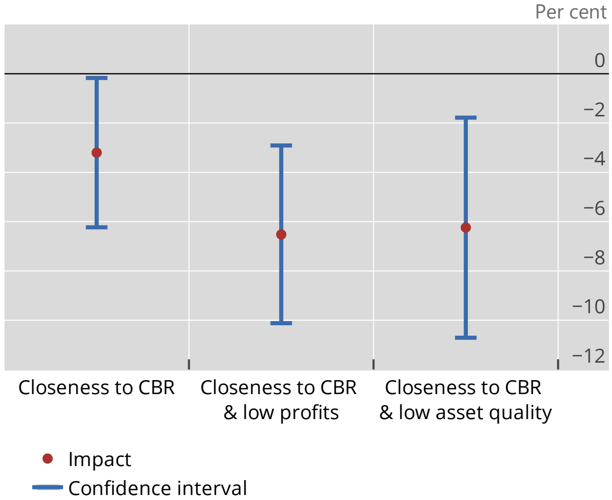
Annexes

Annex 1: ECB study on impact of distance to CBR on lending

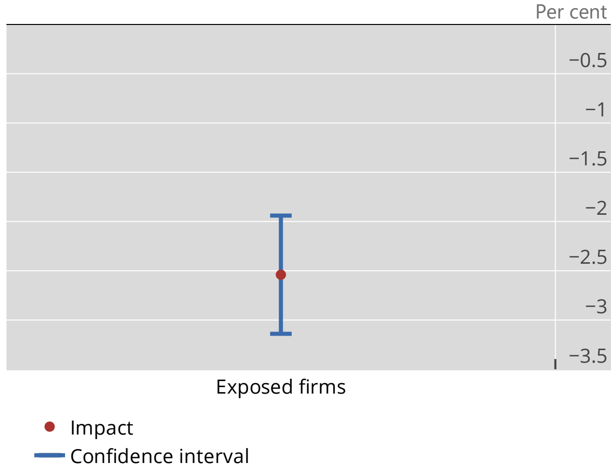
This jurisdictional study on the European banking union uses granular credit register data to explore whether banks closer to their CBR take adjustment actions to preserve their capital ratios (ie whether they curtail their lending).[108] Results show that proximity to the CBR leads to a weakening in credit provision to non-financial corporates after controlling for credit demand, bank asset quality and solvency and a broad range of public support measures. Specifically, banks with a distance to CBR below the first quartile of the distance to CBR distribution reduced lending by about 3.2 percentage points in comparison with banks further away from their CBR (Graph A1, left-hand panel). This effect is amplified for banks with pre-pandemic profitability and asset quality below the median level (Graph A1, right-hand panel). Specifically, banks with a pre-pandemic below-median level of return-on-assets (provisions-to-total assets) face an additional contraction in lending supply of about 3.3 percentage points.[109]

Impact of distance to CBR on lending — Graph A1

Impact of the distance to CBR on credit provision and interaction with bank profitability/asset quality



Estimated reduction in borrowing capacity for firms exposed to CBR-constrained banks



Notes: In the left-hand panel, the displayed coefficients are the bank-firm level difference-in-differences regression coefficients (left) and the triple difference-in-differences coefficients (middle and right). The blue line represents confidence interval at the 95% level. Closeness to CBR refers to a dummy variable equal to 1 for those banks that prior to the pandemic had a below first quartile distance to CBR, 0 otherwise. Low profits refer to a dummy variable equal to 1 for those banks that prior to the pandemic had a below-median level of return on assets (0.39%). Low asset quality refers to a dummy variable equal to 1 for those banks that prior to the pandemic had an above-median level of provisions-to-total assets ratio (0.43%). In the right-hand panel, the displayed coefficient comes from firm-level difference-in-differences estimation. Exposed firms refer to a dummy variable equal to 1 for those firms that prior to the pandemic had at least 25% of their borrowing coming from banks closer to the CBR.

Source: ECB.

In principle, the effect on individual firms of a reduction in credit supply from banks in the proximity of the CBR could be offset if other banks picked up the slack. However, firm-level analysis provides evidence of impediments to credit substitution. Firms exposed to banks in the proximity of the

[108] The analysis builds on the findings in C Couaillier et al (2022).

[109] Average credit growth at the bank-firm level in the sample stood at 12.5% over the course of the pandemic. Thus, the relative reduction in lending for banks close to the CBR is economically meaningful, representing about a quarter of average credit growth (3.2 percentage points) for the average bank close to the CBR, and more than half of average credit growth (6.5 percentage points) for banks close to the CBR that are also characterised by low pre-pandemic profits or asset quality.

CBR exhibited 2.5% lower aggregate borrowing after the onset of the pandemic than firms borrowing mostly from banks with larger capital buffers (Graph A1, right-hand panel).

Annex 2: Additional insights on impact of capital headroom

This annex includes supplementary analysis, following similar methodologies to those set out in Section 1 of the report.

Impact of capital headroom over minimum requirements

As well as concerns about proximity to breaching buffers, banks' willingness to use their buffers could also be affected by concerns about breaching minimum requirements. As such, the relationship between lending and capital headroom over minimum requirements (including Pillar 2) has also been assessed (Table A1). Proximity to minimum requirements seem to be more significantly related to lending to the private sector: in normal times, the loan growth of banks is positively and significantly associated with a higher distance to minimum requirements.

Table A1

	Private (corporate + retail) lending					
	Continuous		50th percentile dummy		25th percentile dummy	
	(1)	(2)	(3)	(4)	(5)	(6)
DistMinReq t-1	0.17*	0.09	1.99***	1.30**	0.71	-0.66
	(0.09)	(0.10)	(0.61)	(0.64)	(0.89)	(0.72)
*DistMinReq t-1 * Covid*	0.06	-0.03	0.81	-1.49	1.22	1.67
	(0.17)	(0.14)	(1.33)	(1.21)	(1.65)	(1.84)
Lagged bank controls	NO	YES	NO	YES	NO	YES
Observations	1,306	910	1,306	910	1,306	910
R-squared	0.11	0.17	0.11	0.18	0.10	0.17
N banks	152	126	152	126	152	126
N countries	20	20	20	20	20	20

Macroeconomic controls and country, time and bank business model fixed effects are applied.

Source: BCBS.

Empirical analysis of distribution restrictions

The starting point is an analysis of the nature of MDA restrictions – for example, are they automatic and do they quickly restrict distributions as banks fall into buffers, or are they more discretionary and/or more gradual? This is then used to create a simple metric of MDA stringency. Automatic restrictions with no graduation are considered more stringent than gradual restrictions or those based on supervisory discretion. The metric is equal to zero when distribution restrictions are less severe and 1 when they are more stringent. The analysis explores whether the stringency of MDAs affects the relationship between capital headroom and lending, with the hypothesis being that banks facing more stringent restrictions on entering buffers will be more concerned about proximity to buffers (Table A2) shows that there is no statistically significant relationship for the term which interacts distance to buffers and the MDA stringency indicator.

Table A2

	(1) Total lending	(2) Private lending	(3) Total lending	(4) Private lending
DistCBR	0.38	0.78***	0.94	0.61
	(0.58)	(0.27)	(0.72)	(0.46)
*DistCBR * Severe restrictions*	-0.04	-0.35	-0.90	0.06
	(0.61)	(0.36)	(0.77)	(0.63)
Lagged bank controls	NO	NO	YES	YES
Observations	401	395	333	327
R-squared	0.20	0.19	0.39	0.36
N banks	56	56	52	52
N countries	11	11	11	11

Macroeconomic controls and country, time and bank business model fixed effects are applied.

Source: BCBS.

Market reactions to potential buffer use

There are some indications that market indicators are related to distance to minimum requirements: results in Table A3 below show that the higher the distance to minimum requirements the lower the cost of equity and 1 year EDF, and the higher the five-year CDS spread and the price-to-book ratio. However, distance to minimum requirements does not seem to be related to average stock price, either in normal times or when the variable is interacted with Covid-19.

Table A3

	(1) Price to book ratio	(2) Cost of equity	(3) 1-year EDF	(4) 5-year CDS spread	(5) Average stock price
DistMinReq	0.04***	–0.24***	–0.01	0.04***	0.00
	(0.01)	(0.04)	(0.01)	(0.01)	(0.00)
DistMinReq Covid*	0.00	0.08	0.02	0.00	0.00
	(0.02)	(0.16)	(0.02)	(0.02)	(0.01)
Observations	621	620	654	621	619
R-squared	0.77	0.61	0.56	0.77	0.57
N banks	64	64	67	64	64
N countries	19	19	19	19	19

Bank controls, macroeconomic controls and country, time and bank business model fixed effects are applied.

Source: BCBS.

Lending in relation to capital headroom during the Covid-19 pandemic

Additional analysis was conducted mimicking the specifications used in Table 5 of the July 2021 BCBS report. These specifications include a model with lagged capital headroom and one which fixes capital headroom at levels at the end of the first semester of 2019. The latter specification studies whether banks with dissimilar capital headroom prior to the pandemic showed different lending patterns during the pandemic. The new specifications differ from the baseline regression model presented in Section 1.4 in the choice of fixed effects and control variables.

Table A4 presents the results of these alternative specifications. The regressions cover the period H1 2019 –H1 2021. Columns (1) and (2) present the new specification's results over this shorter period of time without fixing the capital headroom, while Columns (3) and (4) present the new specification's results with fixed capital headroom for the same period. This setting reduces the number of observations, which might dampen the results' significance.

Results suggest a positive relationship between capital headroom and lending during the pandemic. The results in Columns (3) and (4) suggest that banks with a higher capital headroom pre-Covid experienced higher loan growth during the pandemic. This result is consistent regardless of whether bank controls are considered in the estimation and points in the same direction as the July 2021 BCBS report, while noting that the number of observations drops by more than half when bank controls are included.

Table A4

	Private (corporate + retail) lending			
	(1)	(2)	(3)	(4)
Distance to CBR	–0.29	–1.22		
	(0.37)	(0.99)		
*Distance to CBR * Covid*	0.68*	1.33		
	(0.34)	(1.17)		
*Distance to CBR 19H1 * Covid*			0.68*	1.49**
			(0.36)	(0.71)
Lagged bank controls	NO	YES	NO	YES
Observations	202	105	223	100
R-squared	0.62	0.73	0.70	0.79
N banks	47	26	48	25
N countries	11	9	12	9

Country-time, pandemic-bank business model and bank fixed effects are applied. Macroeconomic controls are not applied.

Source: BCBS.

Annex 3: Further results for the PCA analysis

This annex includes supplementary analysis on the behaviour of banks subject to the US PCA framework, discussed in Section 1 of the report.

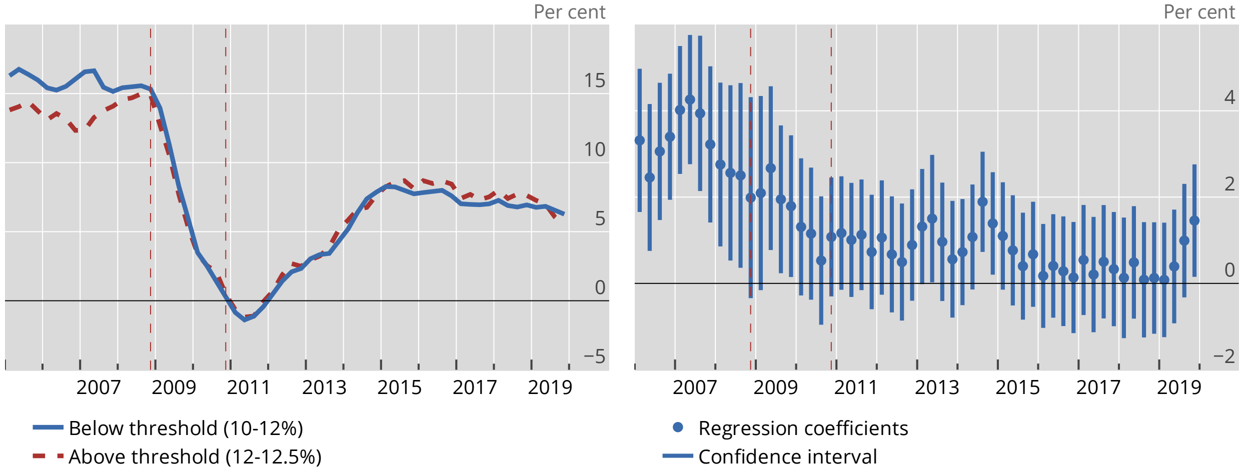
Placebo test around the 12% threshold

Graph A2 shows results of a placebo test for the lending growth analysis of banks subject to the PCA framework. The analysis classifies banks into treatment and control groups based on a fictitious 12% PCA threshold. Placebo treatment banks are defined as banks for which the TCR fell at least once below 12% during the period from Q4 2008 to Q4 2010, but always remained above 10%. Similarly, placebo control banks are defined as banks for which the TCR fell at least once below 12.5% during the period from Q4 2008 to Q4 2010, but always remained above 12%.

The left-hand panel illustrates the mean annual growth rates of loans from Q1 2005 to Q4 2019 between placebo treatment and placebo control banks. The right-hand panel plots the estimated coefficients δ^t from the regression specification in equation (1) using the placebo threshold. While banks above the 12% threshold exhibited somewhat higher growth rates in the period before the GFC, there was no significant difference in the reduction of loan growth rates during and after the GFC. This placebo test therefore confirms the importance of the 10% threshold with regard to the lending behaviour of banks.

Placebo test: mean domestic loan growth rates Q1 2005–Q4 2019 Graph A2

Placebo Groups: Delta Log Total Domestic Loans (yoy) | Placebo Groups: Delta Log Total Domestic Loans (yoy)



The left-hand panel shows the mean domestic loan annual growth rates for 2,221 banks in the placebo treatment group and 460 banks in the placebo control group over the period from Q1 2005 to Q4 2019. The solid blue line represents the mean growth rates of placebo treatment banks, for which the TCR fell at least once below 12% during the period from Q4 2008 to Q4 2010, but always remained above 10%. The dashed dark red line represents the mean growth rates of placebo control banks, for which the TCR fell at least once below 12.5% during the period from Q4 2008 to Q4 2010, but always remained above 12%. The two dashed vertical lines marks Q4 2008 and Q4 2010. The right-hand panel shows the estimated coefficients δ^t from the regression specification in equation (1) using the 12% placebo threshold.

Source: Call Reports and BCBS calculations.

Annex 4: Case studies of banks dipping into buffers

A survey of BCBS member jurisdictions identified cases of banks dipping into their capital buffers. This annex focuses on three specific cases, which are selected as they concern banks of different size and business models, and from different geographical areas:

- A large bank with a universal bank business model reported that it had crossed its MDA threshold in early 2017. This was due to negative one-offs in the bank's previous year P&L, related mainly to loan loss provisions and restructuring costs. The bank was able to restore its capital position before the due date of AT1 coupon payments, so that no distribution restrictions were imposed. To restore capital, the bank provided its supervisor with a capital conservation plan entailing a capital increase and the disposal of a subsidiary and of the bank's asset management business. The size of the buffer use in terms of weighted average CET1 ratio amounted to 0.91% of RWAs and the largest drop in CET1 ratio was 1.86% of RWAs.
- A medium-sized bank with a diversified lending business model reported in 2020 that it had used its capital buffers as a result of larger than expected unrealised losses on securities. In this case, no distribution restrictions were imposed by the supervisor. The bank issued Tier 2 bonds to restore its capital position. There was no dipping into buffers for the CET1 ratio but a four months' breach in the total capital ratio. In the quarter preceding the use of buffer, the total capital ratio was 10.3%, compared with a requirement of 10.5%. The bank's equity price dropped for a week after the breach, but recovered to the original level within two weeks from the announcement. Rating agencies did not change their external ratings.
- A smaller bank focused on retail lending, faced challenges from 2013 through 2017, principally involving legacy issues. The bank was recapitalised in 2013, but progress in rebuilding capital to meet its capital and additional buffer requirements was constrained by low interest rates and by higher than anticipated transformation and conduct redress and remediation costs. This led to the bank using its capital buffers in Q2 2016. As a result, the bank was subject to restrictions on distributions and variable remuneration and it engaged in a process of restructuring and recapitalisation. Several ratings of the bank were downgraded during February 2017.

Annex 5: Interaction between buffers and minimum requirements

This annex includes analysis on the role of parallel minimum requirements, which is supplementary to that set out in Section 1 of the report.

The risk-weighted asset (RWA) density of a bank is likely to affect the extent to which buffers can be used before breaching minimum requirements. The lower the RWA density, the more likely it is that in nominal terms risk-weighted minimum capital requirements fall to the level required by the minimum leverage ratio. There are many factors that can drive a bank's RWA density, including its regulatory approach for calculating credit RWA and the business strategies of a bank. Typically, banks using the Internal Ratings-Based (IRB) approach have a lower CBR usability than those using the Standardised Approach (SA) for credit risk. Furthermore, RWA densities vary over time in a manner that can have a large impact on banks' CBR usability. Table A5 shows results for a regression of CBR usability on some potential driving factors. CBR usability is positively related to RWA density, AT1 instruments and the level of risk-weighted minimum requirements.

Factors influencing CBR usability — Table A5

VARIABLES	CBR usability (%)			
	(1)	(2)	(3)	(4)
RWA density	1.74***	2.23***	1.70***	2.46***
	(0.18)	(0.45)	(0.07)	(0.16)
AT1 (% RWA)	5.19**	5.36	5.84***	5.27***
	(1.99)	(3.39)	(0.89)	(1.35)
Risk-weighted min req. (% RWA)	2.18***	3.24	1.63***	3.15***
	(0.83)	(2.53)	(0.40)	(0.97)
Observations	144	77	702	374
R-squared	0.41	0.30	0.46	0.45
Time FE	NO	NO	YES	YES
N banks	144	77	144	94

Columns (1) and (2): cross-section regressions (H1 2021) with (1) full sample and (2) CBR-constrained banks; (3 and 4): panel regression (H1 2019– H1 2021) with (3) full sample and (4) CBR-constrained banks. Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Source: BCBS.

Low CBR usability also means that, when dipping into the CBR, the risk of breaching the parallel minimum leverage ratio requirement is higher than for banks with unconstrained regulatory buffers. Thus, banks with low CBR usability might prefer a higher management buffer. To examine the effect that limited CBR usability has on banks' management buffer, the following regression model is used:

(1) $MB_{i,t} = \alpha_i + \beta_1 Usab\_CBR_{i,t} + controls_{i,t} + \alpha_{c,t} + \alpha_i + \varepsilon_{i,c,t}$,

where i indicates an individual bank, t time and c the country of the bank's domicile. $MB_{i,t}$ is the bank's management buffer as a percentage of its risk-weighted assets, $Usab\_CBR_{i,t}$ denotes the usable part of CBR relative to total CBR. Bank controls ($controls_{i,t}$) include potential driver of banks' target capital ratios such as the log of total assets, provisions over total assets, RoA and its standard deviation.[110] Table A6 depicts results for different variants of specification (1).

Impact of CBR usability on management buffer

Table A6

VARIABLES	Management buffer (% RWA)			
	(1)	(2)	(3)	(4)
CBR usability (%)	–0.06***	–0.04***	–0.04***	–0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
RoA	3.15***	3.19***	–1.81	1.12
	(0.99)	(0.98)	(2.13)	(0.83)
Sd RoA	0.55*	0.72**	–1.70	–0.06
	(0.31)	(0.36)	(3.01)	(0.10)
Provisions (% assets)	–0.86	0.06	0.53	0.11
	(0.61)	(0.70)	(2.12)	(0.43)
Log total assets	–0.50***	–0.90***	–0.91***	–1.12***
	(0.19)	(0.23)	(0.34)	(0.24)
Observations	122	122	65	608
R-squared	0.45	0.73	0.66	0.66
Region FE	YES	NO	NO	NO
Country FE	NO	YES	YES	NO
Country-time FE	NO	NO	NO	YES
N-banks	122	122	65	139

Columns (1), (2) and (3): cross section regressions (H1 2021) with (1) full sample and region fixed effects (2) full sample with country fixed effects and (3) CBR-constrained banks. Column (4): panel regression (H1 2019–H1 2021). RoA and provisions to assets are winsorised at the 1st and 99th percentile values. In the panel regression (column 4) RoA, provisions and log total assets are lagged by one period. Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Source: BCBS.

A cross section regression for H1 2021 (column 1) shows a statistically significant negative relationship between the size of the management buffer and CBR usability. In column 2, country fixed effects rather than region fixed effects are used. In column 3 the sample is restricted to banks with limited CBR usability and column 4 shows results of a panel regression using data from H1 2019 to H1 2021.

The estimated size of usable regulatory buffers can increase if one considers the leverage ratio buffers already implemented in some jurisdictions. Normalised to the size of the CBR, for those banks subject to a leverage ratio buffer, the total amount of useable buffer is estimated to increase by 17 percentage points (from 67% to 84%).

[110] Larger banks typically have lower management buffers. Too-big-to-fail externalities or a higher capacity to diversify asset risk may rationalise this. RoA reflects banks' internal capital generation capacity, provisions, and the volatility of returns account for asset quality and risk-preferences. See Couaillier (2021) for an analysis of determinants of European banks' target capital ratios.

Annex 6: Examples of countercyclical capital regulation

This annex details examples of countercyclical capital measures taken by authorities. The measures can be grouped as:

- Measures affecting the capital ratio requirements, risk-weights and buffers, which include, among others, changes to Pillar 2 capital buffer requirements or guidance, the use of releasable systemic buffers, and the release of the capital conservation buffer;
- Measures affecting the level of capital, which include provisioning rules ("dynamic provisioning"), provisioning "add-backs", and restrictions on capital distributions (that accelerate capital accumulation).

Standing instruments of countercyclical capital regulation (mostly pre-pandemic):

Domestic Stability Buffer (Canada): In Canada, the Office of the Superintendent of Financial Institutions (OSFI) has implemented a Domestic Stability Buffer (DSB), which shares some similarities with the CCyB.[111] Implemented in 2018, the DSB currently ranges between 0 and 2.5% of banks' total RWAs. The DSB applies only to Canada's six largest banks, which qualify as domestically systemically important banks. Adjustments to the DSB buffer are based on monitoring of a set of indicators to track the evolution of vulnerabilities and risks in the Canadian financial system. The DSB is set twice a year by the OSFI. One notable difference of the DSB vis-à-vis the CCyB is that it is a Pillar 2 (instead of Pillar 1) buffer. Hence, if large Canadian banks use the buffer they are not subject to automatic constraints on capital distributions. The DSB also differs from the Basel III CCyB as it is set relative to the banks' total RWAs, calculated from both domestic and international exposures (instead of domestic-only exposures for the CCyB).

Systemic Risk Buffer (EU): The 2019 Capital Requirements Directive V (CRD-V) clarified that the SyRB can be used to prevent and mitigate systemic and macroprudential risks not addressed by the CCyB, D-SIB/G-SIB buffers or other macroprudential measures coming earlier in the pecking order. In December 2020, the scope of the SyRB was modified so that it became possible to impose the SyRB not only on all exposures but also on domestic sectors, or subsets within those sectors.[112] The CRD-V entered into force in December 2020.

Dynamic provisioning (ES) was adopted countercyclically in Spain between 2000 and 2016. Under the rule, provisions are built up in good times. In case of stress, part of these provisions is reversed, adding to CET1 capital, thereby improving capital ratios and strengthening banks capacity to keep lending. It was considered to be an effective tool by the authorities.[113]

Changes to RWA (BR)**:** In late 2010, the risk-weight factor (RWF) for certain new auto-loans in Brazil[114] was doubled to 150% after excessive risk-taking was detected in the auto credit segment. Loan-to-value ratios were increasing while loan maturities were being extended and interest margins narrowed. That combination exposed banks to rising risks given rapid collateral depreciation (motor vehicles). The doubled RWF was imposed on loans with high LTV and long maturity and was in effect for about one year.

Distribution restrictions are a form of countercyclical capital regulation. Restricting capital distributions at the beginning of a stress event and releasing them once stress conditions have abated mitigates capital depletion pressures, thus helping banks to keep credit channels open. In response to the Covid-19

[111] Domestic Stability Buffer – Information Sheet.

[112] Final guidelines on the appropriate subsets of sectoral exposures to which competent or designated authorities may apply a systemic risk buffer in accordance with Article 133(5)(f) of Directive 2013/36/EU.

[113] See eg Jiménez et al (2017).

[114] Afanasieff et al (2015).

pandemic, an overwhelming majority of BCBS jurisdictions publicly announced dividend restrictions (18 out of 21) and repurchase restrictions (14 out of 21) during 2020.

Measures on real estate risk weights (EU): European Union regulation allows modification of risk weights on real estate exposures to mitigate risks to financial stability. CRR Article 458 allows authorities to adjust risk weights on domestic residential property and commercial real estate, for instance by supplementing internal risk rating models with add-ons, multiplication factors or floors to risk weights. A number of EU authorities have employed it countercyclically arguing that, in the upswing of the cycle, microprudential risk weights decreased while from a macroprudential perspective risks increased. In line with this, from 1 January 2022 the Netherlands introduced a previously announced floor for mortgage risk weights. This measure was initially postponed at the onset of the pandemic to provide banks with additional room to support the real economy.[115]

Countercyclical capital regulation (other than CCyB) during the Covid-19 pandemic:

Several BCBS members made changes to capital requirements other than the CCyB or used other countercyclical capital measures to dampen potential pandemic effects.

Capital Conservation Buffer (BR)**:** Brazil's capital conservation buffer (CCoB) was halved at the onset of the pandemic for the duration of one year. The rule that released the CCoB already scheduled the gradual phase-out of the release starting in Q2 2021 and ending in Q2 2022. The value of the CCoB has returned to 2.5% in Q2 2022, as scheduled.[116]

Systemic Risk Buffer (NL)**:** In March 2020, the Netherlands lowered the SyRB from 3% of global risk-weighted exposures to 2.5%, 2% and 1.5% respectively for the three largest systemically important Dutch banks. In addition, for one of these three banks, the O-SII buffer was lowered from 2% to 1.5%. The authorities plan to compensate for this reduction in the capital requirement by gradually building up a 2% CCyB for exposures in the Netherlands.[117]

Pillar 2 capital add-on and guidance (United Kingdom and ECB)**:** the United Kingdom held the pre-pandemic monetary value of the Pillar 2 capital add-on constant to offset the effect of cyclical RWA increases on Pillar 2 requirements during the pandemic. This measure was withdrawn in 2022. In March 2020, the ECB announced that banks may use their full capital buffers and temporarily operate below Pillar 2 Guidance. The ECB noted that banks should continue to use their capital and liquidity buffers for lending purposes and loss absorption, and that it will not require banks to begin replenishing their capital buffers before reaching peak capital depletion. In February 2022, the ECB communicated that banks are once again expected to operate above Pillar 2 Guidance from 1 January 2023.

Provision add-back: the transitional arrangements for the regulatory capital treatment of Expected Credit Losses were amended countercyclically by the BCBS during the pandemic.[118]

Changes to market risk RWAs: Sources of cyclicality in the current (Basel 2.5) market risk framework prompted supervisors to take relief measures in several jurisdictions (eg the EU, the United Kingdom and the United States).[119] However, revisions to this framework,[120] agreed upon in January 2019, are expected to mitigate these sources of cyclicality.

[115] Overzicht Financiele Stabiliteit - Najaar 2021 ENG (dnb.nl).

[116] The CCoB was also adjusted in Indonesia during the pandemic.

[117] DNB lowers bank buffer requirements to support lending.

[118] Measures to reflect the impact of Covid-19 (bis.org)

[119] The Fed – Banks' Backtesting Exceptions during the COVID-19 Crash: Causes and Consequences (federalreserve.gov).

[120] Minimum capital requirements for market risk (bis.org).

Annex 7: Jurisdictional implementation of countercyclical capital regulation

Adoption of positive neutral rate for the CCyB

United Kingdom: In 2016 ,the United Kingdom's Financial Policy Committee (FPC) announced its intention to set a positive "neutral" rate of 1% and in 2019 increased this rate to 2%. This was motivated by considerations about the difficulty in assessing systemic risks and the speed at which the FPC would have to build the CCyB to reach a level considered to be sufficient.[121]

Netherlands: The Netherlands Bank (DNB) noted that recent experience during the Covid-19 pandemic underlined the desirability of bank capital being available for immediate release, giving banks additional scope to absorb losses and maintain lending in times of economic adversity. Against that background, the DNB revised its framework for setting the CCyB. While the Basel credit-to-GDP gap remains a key indicator in the determination of the CCyB, it was also acknowledged that reliance on this sole indicator could have potentially contributed to the limited build-up of capital in the euro area prior to the Covid-19 pandemic. Therefore, the new framework also recognises the importance of other variables related to the macroeconomic environment, financial sector, non-financial sectors and financial markets. In addition, the revised framework aims for a CCyB of 2% in a standard risk environment to take fuller account of the inherent uncertainty in measuring cyclical systemic risk. This has the additional advantage that banks can build up the buffer in a gradual and timely manner (ie by reducing the risk that the buffer is built up too late due to lags in data availability or the phase-in period). The CCyB can be raised above 2% if risks become elevated, and a CCyB above 2.5% is considered if multiple dimensions pose a high or very high cyclical risk.[122]

Australia: The new capital framework provides for a CCyB with a new default level of 1% of RWAs from January 2023, which may be varied by APRA in the range of 0–350 bp. This higher default setting is intended to improve the flexibility of APRA's capital framework and macroprudential responses.[123]

Sweden: To ensure the possibility of freeing up capital for Swedish banks during a crisis, Finansinspektionen will apply a positive neutral rate of 2%. This reflects lessons learned from the 2020 downturn in the economy and the turbulence on the financial markets, which showed the importance of usable capital buffers that can be lowered to lighten the requirements on the banks. Sweden entered the crisis with a high countercyclical buffer, which Finansinspektionen was able to lower, freeing up capital for the banks. Not all countries had built up the buffer and were thus not able to free up capital for banks to maintain the supply of credit. The CCyB can be increased above 2.5% if systemic risks are high or growing significantly faster than sustainable in the long run.[124]

Countercyclical capital regulation with sectoral focus

Switzerland: In January 2022, the Swiss authorities set the sectoral CCyB at 2.5% of risk-weighted exposures secured by residential property in Switzerland.[125] The Swiss authorities chose to activate a sectoral CCyB targeted at domestic residential mortgage loans, instead of the standard Basel III CCyB. They considered a sectoral application of the CCyB to be the most cost-effective approach as observed imbalances have been confined to the residential mortgage and real estate markets. It temporarily increases the capital requirements associated with residential mortgage loans while leaving those for other

121 The Financial Policy Committee's approach to setting the countercyclical capital buffer (bankofengland.co.uk).

122 New countercyclical capital buffer framework (dnb.nl).

123 Information paper – An Unquestionably Strong Framework for Bank Capital (apra.gov.au).

124 Memorandum: Finansinspektionen's approach to setting the countercyclical capital buffer.

125 Swiss National Bank proposes reactivation of sectoral countercyclical capital buffer at 2.5% (snb.ch)

exposures unchanged. This mitigates any unintended effects on other credit segments. The fact that mortgage loans make up the bulk of bank loans ensures that an activation of the sectoral CCyB leads to an increase in resilience at the system level.

Germany: The German authorities reactivated the CCyB in January 2022 (at 0.75%, effective February 2023) and increased the systemic risk buffer to a level of 2% of domestic residential mortgages in March 2022 (sectoral SyRB) as a complementary instrument. The specific advantages which were mentioned by the authorities are that "the SyRB can be used to address the specific additional dynamics and build-up of risk in the area of residential real estate financing in a more targeted way; these would otherwise have to be covered by higher calibration of the CCyB". Further, "Targeted use of the SyRB also serves to avoid undesirable side effects which could arise in other, less dynamic sectors."[126]

Belgium: The Belgian authorities introduced a macroprudential measure targeting exposures to the Belgian residential real estate market of credit institutions applying the Internal Ratings-Based (IRB) approach. The measure was introduced on 1 May 2022 and replaces an earlier measure introduced in 2018 that expired on 30 April 2022. This measure imposes additional capital requirements for targeted residential real estate exposures, in order to increase the banking sector's resilience.[127]

[126] Financial Stability Committee – German Financial Stability Committee welcomes the Federal Financial Supervisory Authority's announced package of macroprudential measures (afs-bund.de).

[127] Real Estate, nbb.be.

Annex 8: ECB study on the impact of capital requirement releases on lending during the pandemic

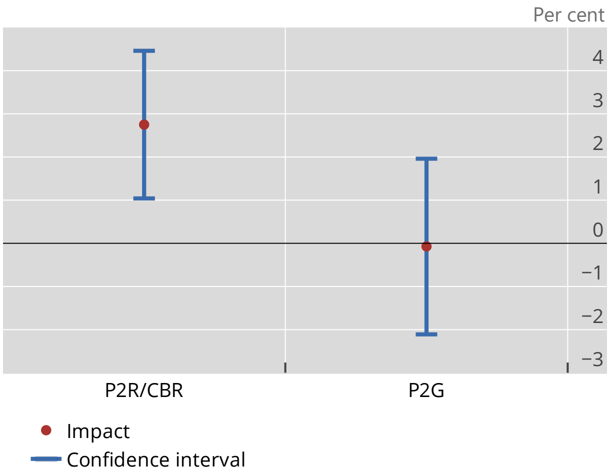
This annex investigates the effects of prudential capital release measures on bank credit supply in the European Banking Union during the pandemic.

Soon after the pandemic outbreak, prudential authorities released capital requirements to support banks' capacity to accommodate possible increases in risk weights and losses without curtailing the supply of lending. First, authorities reduced Common Equity Tier 1 (CET1) capital requirements, either on a permanent or temporary basis, including via (i) frontloading of new rules on the composition of the Pillar 2 Requirement (P2R), allowing banks to partly use Additional Tier 1 and Tier 2 (instead of CET1) instruments to meet these requirements, and (ii) a reduction of the Combined Buffer Requirement (CBR). Second, prudential authorities clarified that supervisory capital expectations are available for use, explicitly allowing banks to operate below the level of Pillar 2 Guidance (P2G).

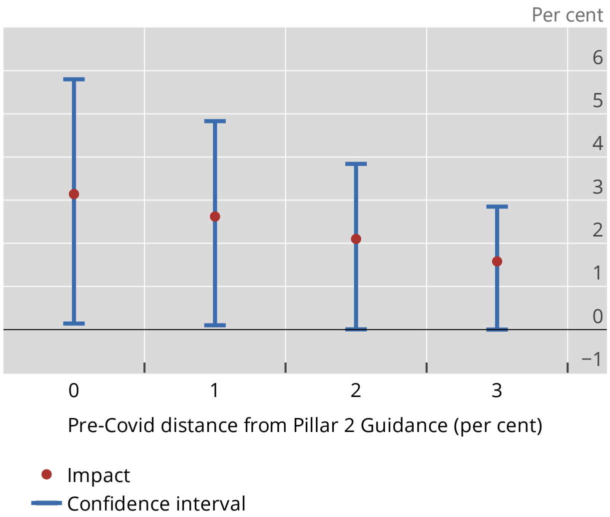
Using credit register and supervisory data and controlling for credit demand as well as for a range of other support measures adopted at the outbreak of the pandemic (monetary, fiscal and prudential), the analysis suggests that capital relief measures were generally successful in supporting credit supply. These findings are driven in particular by the actual reductions in capital requirement, while allowing banks to operate below the P2G had no significant additional impact on banks' lending behaviour during the pandemic. Specifically, bank-firm level regressions show that a 1 percentage point release of the P2R and the CBR increased lending by about 2.7% while the permission to operate below the level of P2G does not show any effect on bank lending supply as the coefficient is negative (although small) and statistically insignificant (Graph A3, left-hand panel).

Impact of capital requirement releases on lending during the pandemic — Graphs A3

Impact of capital requirement releases on bank lending supply



Impact of P2R and CBR releases on lending by pre-pandemic distance to P2G (x-axis, in percentage points)



Notes: In the left-hand panel, the displayed coefficients are the bank-firm level regression coefficients. Firm*time fixed effects are included to control for credit demand. Several bank-specific controls as well as fiscal and monetary policy measures are included. The blue line represents confidence interval at the 95% level. P2R/CBR refers to the front-loaded change in the composition of the P2R and the reduction of the CBR. P2G refers to supervisory measures which allowed banks to operate below their assigned level of P2G. In the right-hand panel, the displayed coefficients come from an interaction between the capital release measure (P2R and CBR release) with the pre-Covid (Q4 2019) distance to the P2G.

Source: ECB.

The capital requirement releases were more effective for banks with little capital above the P2G, suggesting that the policies were also successful in mitigating buffer usability constraints. Interaction terms between capital requirement release variables (CBR and P2R release) and pre-Covid distance to P2G are negative and statistically significant, suggesting that the higher the pre-Covid distance to P2G the lower the effect of capital requirement releases on bank lending supply. Specifically, a 1 percentage point increase in the pre-pandemic distance to the P2G reduces the effect of capital requirements releases by 0.5% (Graph A3, right-hand panel). In line with intuition, banks with less capital headroom benefited relatively more from the easing of regulatory constraints due to the capital relief measures.

Annex 9: The relationship between countercyclical capital requirements and lending – methodology

This annex provides additional details on the econometric approach used in Section 2.3 to investigate the relationship between countercyclical capital requirements and lending. Furthermore, an additional table with regression results is shown as robustness check, controlling for changes in the sample of banks across different specifications. The results confirm those found in Table 4 (Section 2.3).

Econometric approach

$$\begin{aligned}\Delta Log(Lending)_{i,t} &= \alpha_i + \alpha_t + \alpha_c + \beta_1 \Delta CCyB_{i,t} + \delta_1\, \Delta Other\ CET1\ Req_{i,t} + \beta_2 \Delta CCyB_{i,t} \times Covid_t \\ &+ \delta_2\, \Delta Other\ CET1\ Req_{i,t} \times Covid_t + \gamma\, BusinessModel_{i,t-1} + zX_{i,t-1} + wZ_{c,t} + \varepsilon_{i,t}\end{aligned}$$

$\Delta CCyB_{i,t}$ is analysed on a standalone basis and interacted with a pandemic dummy $Covid_t$, which takes the value of 1 in periods from H1 2020 to H1 2021 and 0 otherwise. When $\Delta CCyB_{i,t}$ is interacted with the Covid dummy, a negative coefficient β_2 indicates that CCyB releases had a more positive effect on lending growth during Covid times.

A second variable of interest, $\Delta Other\ CET1\ Req_{i,t}$, is the period-on-period change in CET1 requirements other than the changes from the CCyB.[128] The inclusion of this variable has two goals: first, investigating the relationship between lending and changes in CET1 requirements other than CCyB, and second, disentangling this relationship from lending dynamics associated with changes in the CCyB requirement. $\Delta Other\ CET1\ Req_{i,t}$ is included as a standalone regressor and interacted with $Covid_t$.

The specification also includes $BusinessModel_{i,t-1}$, a bank business model dummy (set equal to 1 if lending is higher than 50% of a bank's total exposure) and $X_{i,t-1}$, a vector of bank-level control variables on capital and profitability (total capital ratio, RWA density, ROA and ROE), in order to control for the possibility that different types of bank and banks with different characteristics may have reacted differently. Both the bank-level controls and the bank business model dummy are lagged by one period. All specifications additionally include bank, country, and time fixed effects.[129]

Finally, contemporaneous macroeconomic controls are included with the vector $Z_{c,t}$ to catch additional variability related to macroeconomic conditions, notably HP-filtered real GDP growth, inflation, and the yield on 10-year government bonds of the headquarter country of the bank.

Robustness tests

Table A7 in this Annex repeats the analysis of Table 4 in the main text using three consistent data samples. The first four columns use the sample where changes in the CCyB and other requirements are available ("*requirement*" sample); columns (5) and (6) use the sample where both requirements and the bank controls are available ("*control*" sample); columns (7) and (8) use the sample where requirements, bank

[128] Both for CCyB and other CET1 requirements, the definition differs from the approach in the July 2021 BCBS report, which measured the changes in these variables as one-off: the cumulative adjustment between Q1 2019 and Q3 2020, at the bank level.

[129] Time country fixed effects ($\alpha_{t,c}$) absorb all variation that is constant in a single country in a single period (half-year). Regrettably, the CCyB is also fixed at the country-time level. Within a country and period, the variation in the CCyB requirement across banks comes from differences in international exposures to countries with different levels of CCyB. Unfortunately, internationally active banks differ from domestic ones in many ways: sophistication, size, and other features that are unobserved or difficult to control for. Using the $\alpha_t + \alpha_c$ controls reduce the bias induced by comparing domestic and internationally active banks by using variation across countries and time to identify the effects of changes in capital requirements. The introduction of macroeconomic controls provides an additional robustness check.

controls and also macroeconomic controls are available (*"macro"* sample). The results are in line with the results shown in Table 4, and in addition the changes in total CET1 requirements remain significant when bank controls and macro controls are added.

Table A7

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta CCyB_{i,t}$	0.0151		0.0480		0.0019		–0.0015	
	(0.0173)		(0.0315)		(0.0182)		(0.0191)	
ΔOther CET1 $Req._{i,t}$	–0.0052		0.0013		0.0023		0.0033	
	(0.0038)		(0.0032)		(0.0032)		(0.0032)	
ΔTotal CET1 $Req._{i,t}$		–0.0052		–0.0010		0.0022		0.0033
		(0.0038)		(0.0032)		(0.0032)		(0.0032)
$Covid_t$ * $\Delta CCyB_{i,t}$			–0.0595*		–0.0064		–0.0026	
			(0.0350)		(0.0258)		(0.0268)	
$Covid_t$ * ΔOther CET1 $Req._{i,t}$			–0.0308***		–0.0337*		–0.0157*	
			(0.0111)		(0.0180)		(0.0087)	
$Covid_t$ * ΔTotal CET1 $Req._{i,t}$				–0.0296***		–0.0318*		–0.0150*
				(0.0110)		(0.0178)		(0.0090)
Observations	1,360	1,360	1,360	1,360	899	899	871	871
R-squared	0.168	0.168	0.177	0.176	0.255	0.254	0.256	0.255
Bank Controls	NO	NO	NO	NO	YES	YES	YES	YES
Macro Controls	NO	NO	NO	NO	NO	NO	YES	YES
N banks	162	162	162	162	141	141	137	137
N countries	23	23	23	23	21	21	20	20
Sample	Requirement	Requirement	Requirement	Requirement	Control	Control	Macro	Macro

Robustness checks. CCyB and other CET1 changes and semester-on-semester growth of bank lending (H1 2015–H1 2021).

Source: BCBS.

Annex 10: Analysis of capital needs in an elevated risk environment

This annex provides additional detail on the approach used in the exercise in Section 2.4 on capital needs in elevated risk environments. This exercise uses information from the past experiences of bank losses to establish how much capital would be needed to cover the losses of the banking system with a given probability, both on average through the cycle and also at times of peak credit losses.

Data

- Source: Capital IQ (Standard & Poors)
- Data series: IQ_NI, IQ_INC_TAX, IQ_TOTAL_ASSETS
- Time span: from 1991 to 2019
- Filter criterion: banks with assets above $50 billion in 2007

Defining peak loss periods

To categorise the peak periods, a logit regression is run on a crisis indicator with two independent variables: three-period lagged bank credit-to-GDP and three-period lagged VIX. It effectively uses bank credit to GDP and VIX as measures of the financial cycle. The regression gives a relationship between measures of the financial cycle and the probability of a crisis. Then it is used to see what the regression predicted probability of a crisis is in each country/year, given the values of cycle indicators. Where the predicted probability of a crisis is greater than 3% – corresponding to around the top 30% of the distribution – this year is labelled as a "peak". The years identified as peaks vary across countries. Losses from periods one, two and three after a peak are identified, as this covers 75% of the peak loss periods.

Sample of banks

The analysis uses all banks over $50 billion in size pre-2006 or over $50 billion now in line with the cut-off in the July 2021 BCBS report. Greek banks (due to large losses in the sovereign crisis, which did not seem representative) and US GSEs are excluded.

The loss series start in 1991 but data going back that far are available only for 29 banks.

Calculating losses

Pre-tax net income (IQ_INC_TAX + IQ_NI) is used for the data series for losses. The original half-yearly net income data are translated into percentage of a bank's total assets (Table A8).[130]

Net income (% assets) — Table A8

Bank	1990.1	1990.2	1991.1	1991.2	1992.1	1992.2	1993.1
Bank A	0.62	0.67	–0.17	–0.52	–1.07	–1.26	–6.76
Bank B	–0.90	–1.27	0.00	–1.99	0.00	0.45	0.25

Next the semiannually net income (% total assets) is translated into cumulative net losses (% total assets), assuming conservatively that any positive cumulated profits are paid out as dividends (Table A9).

130 Data in GBP were used so that data from Brooke et al (2015) could be used and to make it easier to match the series in Capital IQ. The loss data are normalised by assets so that the use of GBP rather than another currency should not make any difference to the results.

In 1990.1, for instance, Bank A makes a positive income (Table A8), so that this is recorded as 0 cumulative net loss in Table A9. Between 1991.1 and 1993.1, Bank A registers five consecutive semiannual losses (Table A8), and so this is cumulated in Table A9.

Cumulative net losses (% assets)

Table A9

Bank	1990.1	1990.2	1991.1	1991.2	1992.1	1992.2	1993.1
Bank A	0	0	–0.17	–0.69	–1.76	–3.02	–9.77
Bank B	–0.90	–2.17	–2.17	–4.16	–4.16	–3.71	–3.46

Then these loss data are combined with the classification of periods into peak/elevated to generate losses following "peak" periods so that they can be compared with the average for the whole period.[131]

Getting system-wide losses

Losses for the "elevated/peak" and "average" distributions are calculated by attributing a random pick from the distribution to each of the major banks in a country. Aggregate losses for each country are calculated by weighting individual losses based on 2019 assets. These values are translated into RWA space using a constant average risk weight of 37.4%.[132] This simulation is replicated 250,000 times to obtain a full distribution of potential system-wide losses for each country.

This means that each country gets its own distribution of losses. They are averaged over advanced economies (AEs) and emerging market economies (EMEs) to get an average level of capital required, both for the average across the cycle and also for elevated periods.

Table A10

	AEs		EMEs	
	Whole distribution	Elevated only	Whole distribution	Elevated only
95	3.4	4.8	3.5	5.1
96	4.0	5.7	4.1	5.8
97	4.6	7.2	4.9	7.3
98	6.0	9.3	6.2	9.1
99	9.1	12.9	9.1	13.0
99.1	9.6	14.7	9.5	14.4
99.2	10.3	16.6	10.1	17.4
99.3	11.0	17.5	10.9	18.5
99.4	11.7	18.0	11.8	18.9
99.5	12.6	18.8	12.9	20.0

Caveats

There are several caveats to this work:

131 We also separate into "peak" and "other" but these are not reported here.

132 This is an average risk weight for UK banks.

- It is difficult to estimate tails of distributions. Even more so, periods of "elevated" risk corresponds to only a third of the time periods and so results should be treated with extra caution.
- The additional losses in elevated times reflect a combination of losses that are relevant for the CCyB (for instance on domestic mortgages) and losses that are not (for instance, on foreign exposures or trading book). The data set from Capital IQ is not able to separate these losses. It can be reasonably assumed that most of the losses associated with a credit boom are credit losses and therefore relevant for the CCyB – or at the very least that the CCyB would target those losses.
- The time series only goes back to the early 1990s, is sparse in the 1990s and covers mainly banks in advanced economies – meaning that the GFC is behind most of the negative draws. But while this crisis was a motivation for designing a CCyB, it is not the only shock a CCyB might be used for. On the other hand, a cost of using historical losses is that they may not necessarily be representative of future credit cycle downturns. For example, the reforms since the GFC may have changed banks' risk-taking incentives, and the use of macroprudential instruments may have limited the size of downturns.
- The methodology discards the correlation structure of the original data. This is because the time series of losses for each bank is simulated by drawing random observations from the original data. Therefore, for instance, one data point in the simulated losses time series of Bank A could correspond to the losses of Bank B in 1997, whereas the next data point could reflect those of Bank C in 2005 in three different jurisdictions. Therefore, the simulated time series does not reflect the potential correlation between successive loss outcomes of a same bank, or between different banks in the same jurisdiction and period. That said, the fact that *all* banks are more likely to face large losses in elevated risk environments is captured in the peak-losses analysis; this is because the simulation only draws from elevated-risks periods for this exercise.
- Only data for banks over $50 billion are used. If a banking system has one or two large banks but many small banks it will appear much more concentrated in the data set than it actually is. This will lead to an overly large capital requirement in both standard and elevated risk times.
- A constant risk weight is assumed.

Annex 11: UK empirical evidence on LCR management

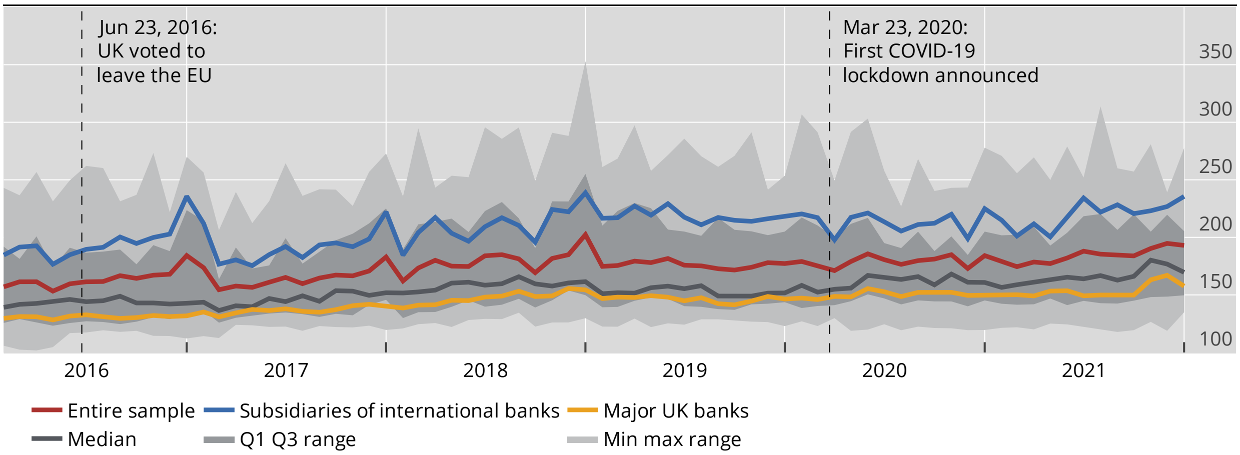
The observed volatility of LCR levels can provide insights into the liquidity management practices of banks during both normal times and times of stress. The following quantitative assessment of UK banks' patterns of changes in LCR levels – including their size and direction – and their dependence on the existing LCR levels aims to shed light on how banks in the United Kingdom manage their regulatory liquidity buffers.

In particular, analysis suggests that UK banks actively manage their LCRs by targeting a specific mean LCR level – set well above the regulatory 100% mark – which is related to the experienced volatility of that metric (and thus a bank's business model). In a sign of possible reluctance to dip into their liquidity buffers, those banks always stayed above the regulatory minimum of 100% LCR throughout the entire time series, which spanned 2016–21.

Evolution of LCR levels and volatility

The analysis examines monthly regulatory returns for the United Kingdom's largest banks, between January 2016 and December 2021. Graph A4 shows the monthly evolution of average LCR levels.

Evolution of LCR levels and volatility — Graph A4



Temporal evolution of LCRs indicates increase in levels over time. Average LCR values represented by the solid lines: black – the entire sample, blue – subsidiaries of international banks, orange – major UK banks at a group level. Monthly distribution of LCRs for the entire sample represented by individual boxplots: box edges represent the first and third quartile, while whiskers extend to extreme points (truncated at 1.5 interquartile range from the first and third quartile). Points within truncated part of the distribution are considered to be outliers and are omitted from the chart. K-means analysis suggests clustering of outliers approximately seven months after two key events – UK vote to leave the EU and first Covid-19 lockdown in the United Kingdom.

Source: UK PRA.

A positive skew in the LCR levels is observed for all time periods, with the higher LCR levels typically driven by subsidiaries of international banks (blue line). At no point in time in the sample do LCR levels fall below the 100% regulatory threshold, even in times of market stress and increased volatility. Irrespective of the business model, UK banks follow a common trend of steadily increasing their liquidity buffers – with an average pace of approximately 40 bp per month. In particular, the observed build-up of LCRs when faced with a stress is consistent with banks seeking to maintain buffers on top of regulatory thresholds at all times – even when hit by a severe adverse shock.

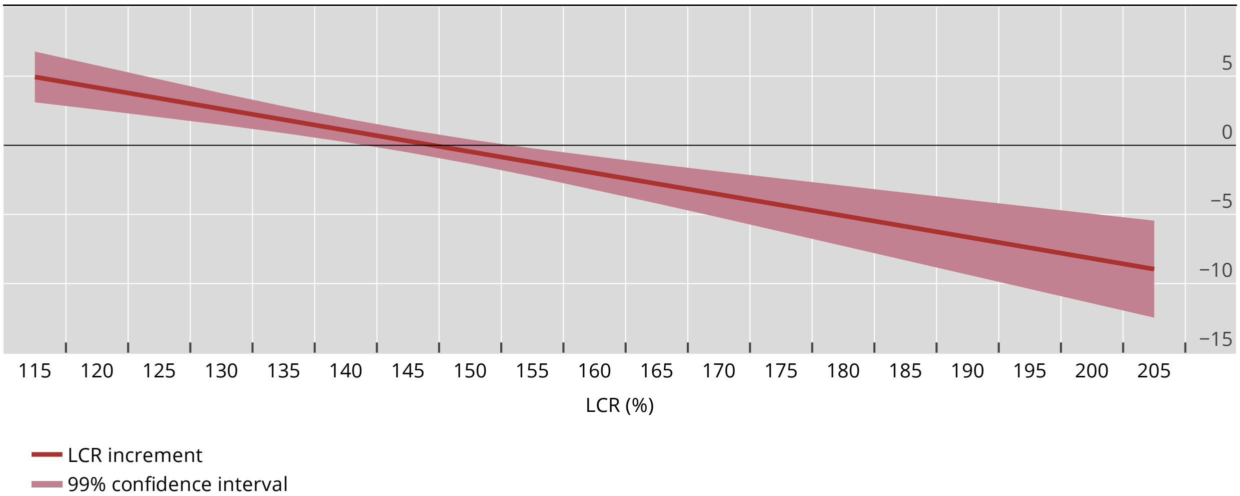
Indeed, although the two periods of market uncertainty and liquidity pressures – the Brexit referendum and pandemic periods – see a subsequent increase in the volatility of LCR, this increase in volatility is largely driven by certain firms (mostly subsidiaries of international banks) increasing their LCRs significantly above the 100% mark. Results from a K-means cluster analysis applied to the outliers (that is, banks with unusually high LCR levels) suggest that there is a gradual subsequent build up in banks' liquidity buffers following an adverse market event.[133]

LCR increment analysis

To gain further insights, the relationship between LCR levels and changes in LCR in the following month (that is, monthly "LCR increments") is analysed. Specifically, *increment* at time t represents the difference between LCR levels at time ($t + 1$ month) and t. If banks actively pursue self-imposed targets, set in excess of regulatory thresholds, then one would expect changes in LCR levels to reflect banks' targets and their response to changes in market conditions.

The data are consistent with this. Graph A5 shows a negative relationship between LCR levels and subsequent increments for major UK banks. Firms with relatively low LCRs tend to increase their levels in the next month, while those significantly further away from the regulatory minimum tend to experience LCR reductions afterwards.

LCR levels and LCR increments — Graph A5



Linear regression between LCR levels and their subsequent increments suggests a presence of a negative relationship. Shaded area represents the 99% confidence interval. Residual analysis reveals the presence of a non-linear relationship in the data.

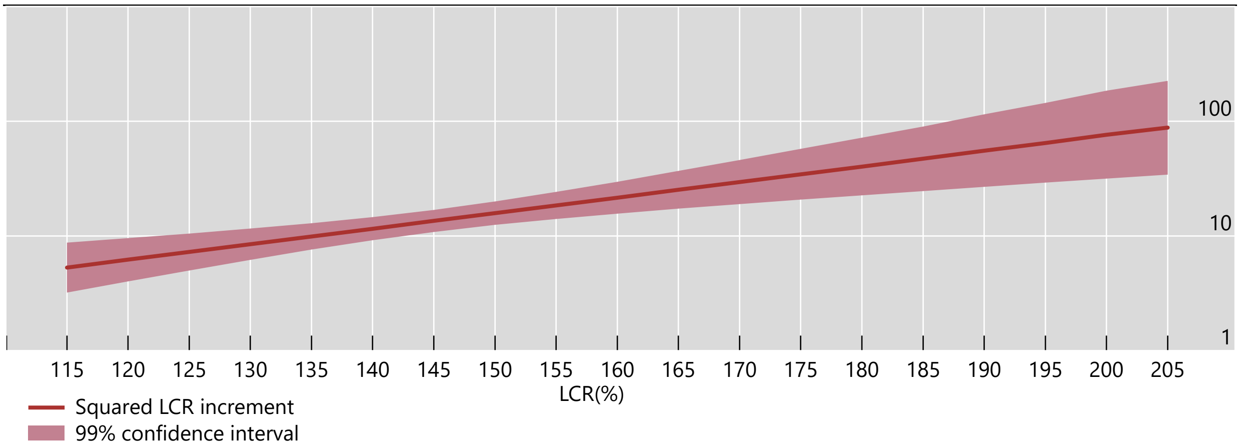
Source: UK PRA.

The analysis also finds that UK banks with higher LCR volatility (proxied by the square of the increments between *t* and *t-1*) tend to have subsequent higher LCR levels, and vice versa (Graph A6).

[133] However, the identification of factors – such as banks' internal risk appetites and liquidity support from central banks – that could explain the observed build-up in LCRs during times of stress is beyond the scope of this analysis.

LCR levels and squared LCR increments

Graph A6



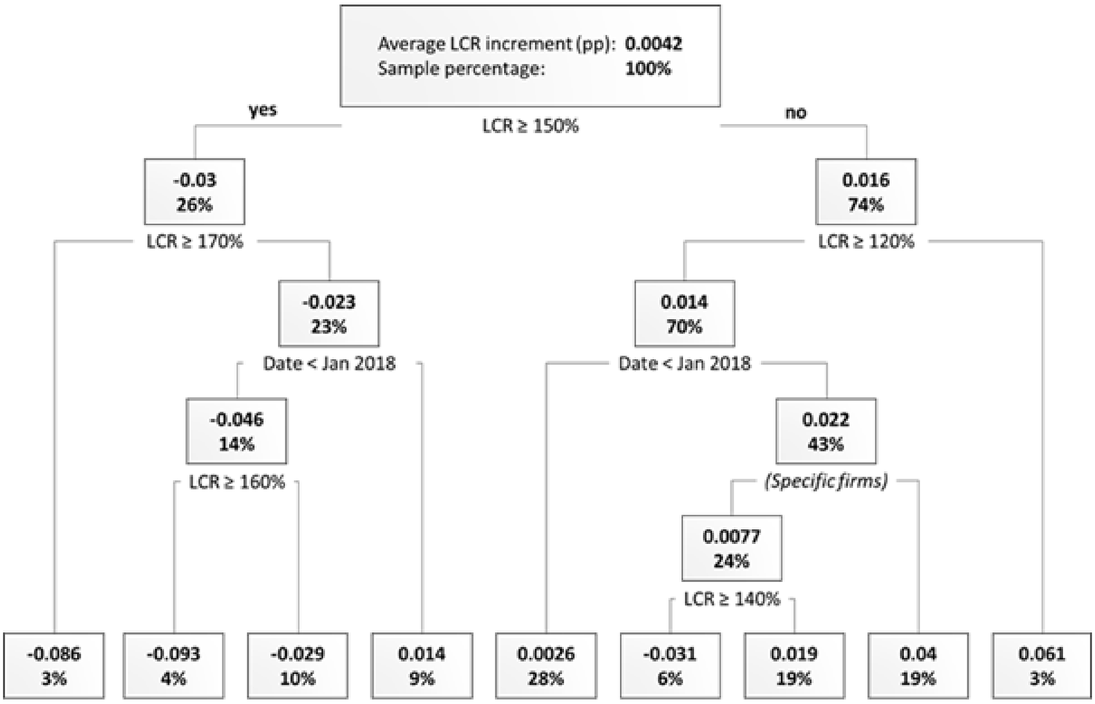
Linear regression between LCR levels and their prior squared increments (on a log2-scale) suggests that banks which experience higher volatility typically have larger LCRs afterwards. Shaded area indicates the 99% confidence interval. Residual analysis reveals the presence of a non-linear relationship in the data.

Source: UK PRA.

However, the residual analysis also shows that the inverse relationship between LCR levels and their subsequent changes seen in Graph A6 have a non-linear nature. To capture these non-linearities adequately and to incorporate time- and firm-specific effects, a regression tree analysis[134] is adopted with LCR increments as the response variable, and LCR levels, date and firm name as predictor variables. The results are summarised in Graph A7.

[134] Regression tree analysis is a machine learning model that predicts a continuous outcome variable by recursively partitioning the predictor variables into a series of smaller groups, called nodes, in a way that minimises the prediction error for the outcome variable.

Graph A7



Regression tree analysis. The LCR level has the highest importance score, with the primary decision rule defined by the LCR threshold of 150%: firms above this level experience on average subsequent LCR reduction of 0.03%, while firms below see an increase of 0.016% – a sign of mean-reversion.

Source: Bank of England.

Out of the three predictor variables considered in the model, the LCR level is the key determinant of the increment size, with a relative importance score of 68 (out of 100) compared with 22 for date and 10 for firm variables. This points towards UK banks exhibiting a common and systematic approach to LCR management, where the LCR level is the main factor considered.

The primary split in the regression tree, for that data sample, is given by the LCR threshold of 150%, which can be seen as the central point of the mean-reversion behaviour. Below this level, UK banks tend to see a subsequent monthly increase in their LCR, of 1.6% on average. Above this level, UK banks tend to see a monthly decrease, of 3% on average.

This non-linear mean-reversion pattern, revolving around a LCR target above 100%, is indicative of major UK banks' deliberate LCR management strategy to actively maintain LCR levels well above the regulatory threshold, even during periods of market stress.

Annex 12: Accounting provisions, regulatory capital and procyclicality

This annex provides the full description of auxiliary analysis discussed in Section 4, which can be helpful for interpretation of regression results and conclusions. In particular, it includes an overview of the range of practices regarding managements' judgment in provisioning, as well as entries on jurisdiction-specific provisioning frameworks and practices, discussions of the EU IFRS9 transitional arrangements during the pandemic, and of the specifics of bank loan loss provisioning under the Japanese GAAP.

Management judgment in provision estimation

Management judgment may be needed anywhere in the provision estimation process. Such judgments include both in-model and post-model adjustments, sometimes referred to as overlays. During the pandemic, adjustments based on expert judgment were generally applied with the aim of better reflecting actual credit risk expectations in the light of unprecedented government support, sectoral vulnerabilities, economic uncertainty, and model and data limitations.

Scope for management judgment existed under the IL approach and exists under the ECL approach. ECL accounting frameworks were introduced to recognise credit losses earlier by incorporating forward-looking estimates. Under an IL approach, some management judgment was present in loss estimation, but provisions were mostly constrained to recognise those losses that had occurred or that, with objective evidence, would occur. Management judgment, informed by credit expertise, is a crucial component in the ECL estimation process. For example, judgment is applied when selecting forward-looking macroeconomic variables, in model design, in application of probability weightings, in the use of historical loss rates, and in applying model output override, to name a few instances.

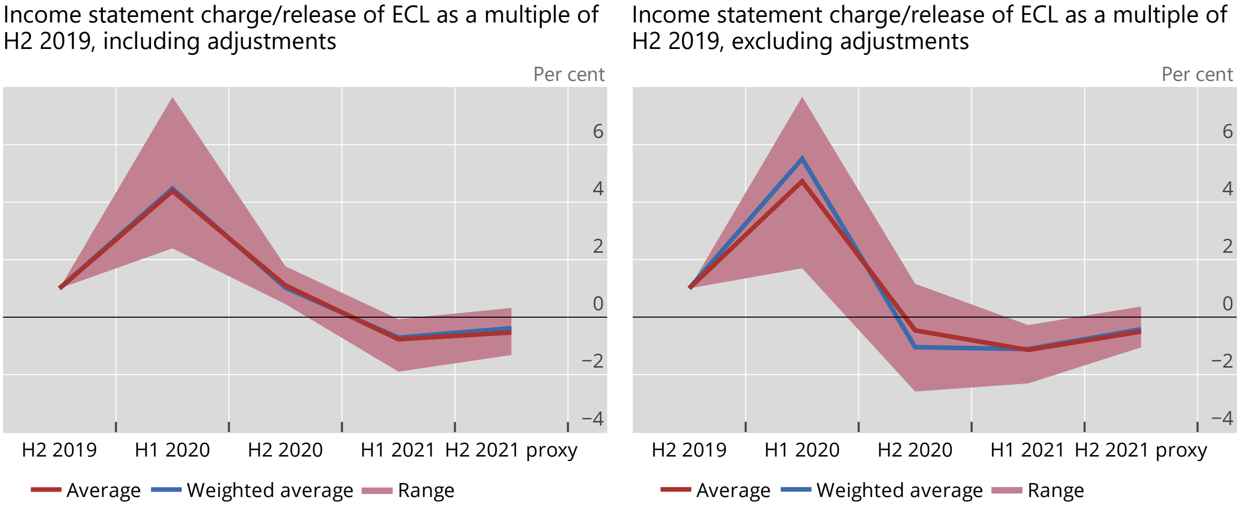
Management adjustments are not directly comparable between banks. Even though the adjustments vary among banks, it is useful to present a few regions' experience of the use of adjustments, where available.

Based on public information for six large UK banks amidst the Covid-19 pandemic, three key observations arise: (i) adjustments led to more intuitive and less volatile earnings; (ii) while use of expert judgment increased, banks enhanced their monitoring of forward-looking risk, including vulnerable sectors, to inform those judgments and support the size of adjustments; and (iii) banks enhanced public disclosures explaining the use of adjustments to investors. In an analysis of the overall ECL levels for a sample of 34 banks from the UK, US, and European jurisdictions, it was noted that the European banks reduced ECL volatility by relying on a longer-term macroeconomic outlook.

While practices have differed across jurisdictions, the use of management judgment under ECL approaches, particularly during the pandemic, generally appears to have helped to mitigate impacts on provisions and reduce the excessive earning volatility (see Graph A8), which could have helped to better reflect the overall expected impact of the pandemic including incorporating the effect of government and other support into the ECL estimation.

Impact of management adjustments on income statement volatility

Sample of UK banks Graph A8



Source: Public accounts for six large UK banks and UK PRA calculations.

EU banks and IFRS 9 transitional arrangements

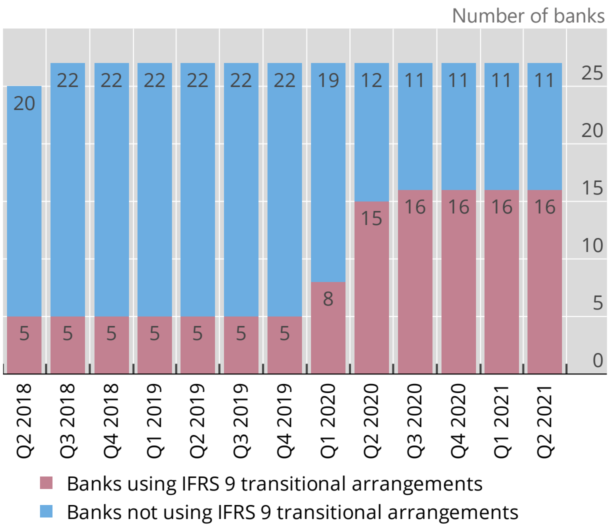
The EU regulatory framework includes transitional arrangements for IFRS 9 that allow banks to add back new IFRS 9 provisions to CET1 at a rate that decreases over time (reaching 0% from 2025). Graph A9 below indicates how many banks decided to use these optional arrangements (left-hand panel) and the boost to their CET1 ratio (right-hand panel).[135]

[135] Metrics presented in this section are based on EBA database (2022 EU-wide transparency exercise, European Banking Authority (europa.eu)). Among all EU banks covered in the database, the banks that are subject to G-SII disclosures and IFRS 9 adopters included in the sample which represents 27 institutions as of Q2 2021.

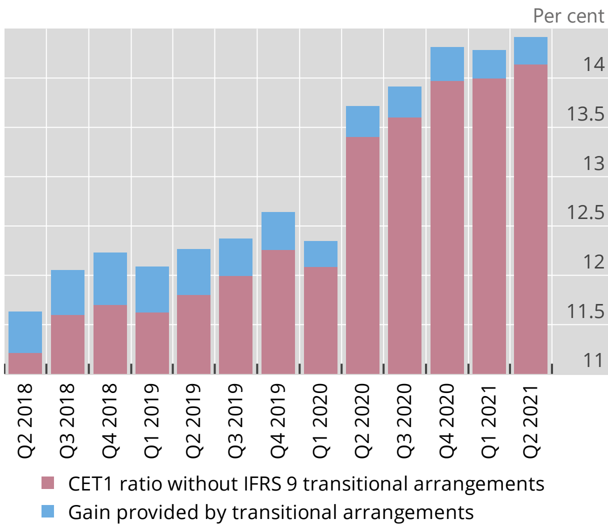
IFRS 9 transitional arrangements

Graph A9

Use of IFRS 9 transitional measures



CET1 % before and after ECL transitional measures



Source: EBA.

Since the option has been given to banks in 2018, 16 of the 27 banks have opted for these arrangements, five at the first-time of application of IFRS 9 and 11 as the Covid-19 pandemic occurred. The decisions appear quite correlated to the CET1 gain for the bank. In general, banks opting for the transition have lower CET1 ratios than the average. This is true in the first wave of decisions by banks (for the five first to opt in for 2018) as well as at the second wave (for 11 banks in 2020).

There is also a correlation in 2018 between the adoption of transitional arrangements and the use of SA approaches for calculating risk weights – SA represents 49% of exposures for banks opting in (against 25% for non-opting in banks), suggesting again that decisions were linked to CET1 positions.[136] The 11 banks that decided to use IFRS 9 transitional arrangements in 2020 were generally seeing ECL on IRB exposures rising towards the level of EL. In other words, accounting provisions started to threaten CET1 ratios for these banks.

Across the whole sample, the number of banks whose accounting provisions on IRB exposures exceeded the prudential EL metric jumped from four in 2014–19 to 12 in the Covid-19 pandemic period.

The estimated gain provided by transitional arrangements to CET1 ratios was 30 bp in 2020 against 45 bp on average during the two previous years. While this gain is not significantly material relative to the capital headroom of banks, it is not negligible, and may have been material in the absence of government economic support during the pandemic.

Bank loan loss allowance under Japanese GAAP

Under Japanese GAAP, a bank groups loans into "borrower classifications" according to the borrower's financial condition, cash flow, earnings ability and other considerations. For each "borrower classification", the bank calculates estimated credit losses based on the historical credit loss ratio and other ratios, and then books bank loan loss allowance.

[136] Under the current regulatory framework, any rise of provisions implies an immediate CET1 deletion for STA approaches, whereas for IRB approaches, the capital impact resulting from increase in provisions depends on whether or not an excess of provisions is created on regulatory EL.

If the credit risk of the loans held by the bank at the end of a period changes materially from the credit risk in the previous period, due to changes in underlying circumstances, it is necessary to adjust the historical credit loss ratio and the amount of the bank loan loss allowance based on future projections and other factors. As there are various credit risk factors in banks' loan portfolios, each bank should make an estimate to accurately reflect credit risk in its calculation of loan loss allowance. In general, a bank calculates the estimated credit losses for the average remaining repayment term of the loan.

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