EUROPEAN CENTRAL BANK

EUROSYSTEM

Annex 1: Analytical addendum underpinning the policy proposals

March 2022

Contents

This annex provides analytical and, where possible, empirical analyses underpinning the proposals set out in the ECB response to the European Commission's Call for Advice on the Review of the EU macroprudential framework. Chapter one analyses buffer usability and the effects of capital relief measures during the pandemic. Chapter two assesses policy options for enhancing macroprudential space. Chapter three provides evidence underpinning the policy proposals related to the revisions of the countercyclical capital buffer (CCyB) framework. Chapter four analyses the effects of other systemically important institution's (O-SII) leverage ratio buffers on bank resilience and the usability of capital buffers. Chapter five assesses the importance of granular and consistent lending standard indicators. Chapter six analyses the impact of system-wide restrictions on banks' distributions, while chapter seven provides an analysis of the importance of macroprudential adjustments to risk weights. Chapter eight discusses the differences in O-SII buffer setting practices across the euro area. The final chapter provides analytical support for the policy proposal on amending the additivity rules for the general and sectoral systemic risk buffer (SyRB), taking EU governance thresholds into account.

1 Evidence on buffer usability and the effects of capital relief measures during the pandemic

The case for operationalising an increase in the amount of releasable capital buffers (i.e. macroprudential policy space), as well as specific relevant policy options, were discussed by the ECB's Macroprudential Forum. The related final report is attached to this response to the Call for Advice (CfA) as a separate background document. This section briefly summarises the additional analytical work which was conducted by ECB staff and which informed the discussions of the Macroprudential Forum.

The available evidence from the pandemic suggests that current bank capital buffers may not be fully usable to absorb losses while avoiding excessive deleveraging. ECB analyses explored the materiality of impediments to banks' willingness to use management buffers from a macroprudential perspective, as well as the impact of the regulatory capital relief measures taken by prudential authorities during the pandemic.[1] Constraints on the usability of buffers arising from parallel minimum requirements were not considered in this study and are analysed separately.[2]

Microeconometric evidence shows forms of procyclical adjustments made by individual banks with lower management buffers since the outbreak of the pandemic. A difference-in-differences analysis is conducted to study whether the lending behaviour of banks closer to the combined buffer requirement (CBR)[3]

1 This text summarises the findings presented in the special feature by Couaillier, C., Lo Duca, M., Reghezza, A., Rodriguez d'Acri, C. and Scopelliti, A. (2021), "Bank capital buffers and lending in the euro area during the pandemic", *Financial Stability Review*, ECB, November. The analysis benefited from extensive comments and feedback from the members of the Financial Stability Committee, its substructures and the Expert Group on Banks' response to the crisis and policy effectiveness. For further evidence, see also the Basel Committee on Banking Supervision (2021), "Early lessons from the Covid-19 pandemic on the Basel reforms", *Bank for International Settlements*, July; Berrospide, J., Gupta, A. and Seay, M. (2021), "Un-used Bank Capital Buffers and Credit Supply Shocks at SMEs during the Pandemic", *Finance and Economics Discussion Series*, No 2021-043, Federal Reserve System, Washington, D.C.

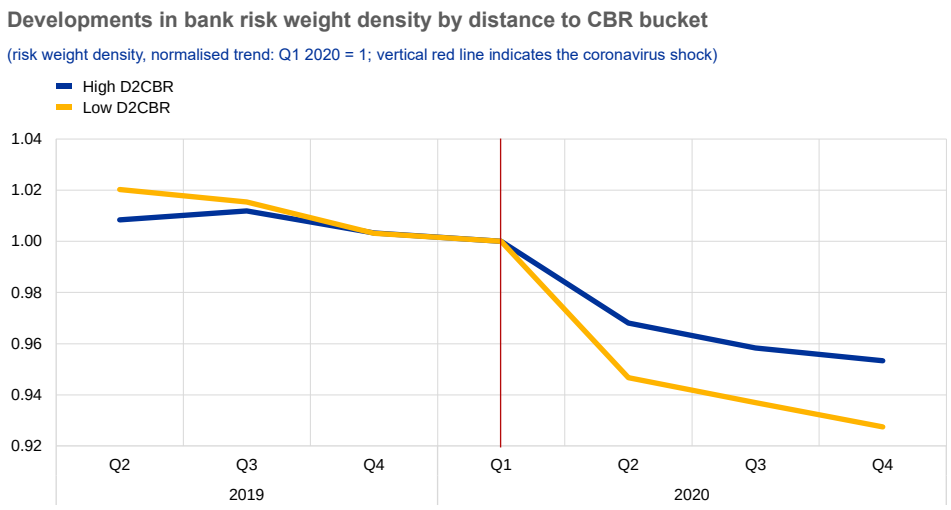
2 See European Systemic Risk Board (2021), "Report of the Analytical Task Force on the overlap between capital buffers and minimum requirements", December. Some of the key results and conclusions of this analysis are summarised in Section 4 of this annex.

3 The analysis classifies banks based on the distribution of the distance to the CBR, distinguishing between banks in the first quartile of the distribution and banks above that threshold. The first quartile of the distribution of the distance to the CBR is close to 3%.

differed significantly from that of banks with a larger headroom above the CBR.[4] Bank-level balance sheet data and loan-level data on corporate loans for a sample of euro area banks, from the second quarter of 2019 to the fourth quarter of 2020, are employed to control for bank-specific characteristics and credit demand across firms.[5] Additionally, information on banks' use of central bank funding (targeted longer-term refinancing operations) and on loan guarantees and moratoria at the loan level is used to isolate credit supply effects and to control for the impact of policy support on lending.

Chart 1.1

Banks closer to the CBR showed procyclical adjustments in their balance sheets during the pandemic



Sources: ECB supervisory data and ECB calculations.
Notes: "High D2CBR" refers to those banks that have a distance to the CBR which is above the first quartile of the distance to the CBR distribution. "Low D2CBR" refers to those banks that have a distance to the CBR which is below the first quartile of the distance to the CBR distribution. The trend is normalised so that the variable takes the value of 1 in Q1 2020.

4 Since proximity to the CBR is not completely exogenous, given that banks closer to the CBR may suffer from weaker balance sheets than banks further away from it, propensity score matching (PSM) is implemented before the difference-in-differences analysis in order to ensure comparability between banks in the treated group and those in the control group. The benefit of employing matching strategies such as PSM (Rosenbaum and Rubin, 1983) is that it completely removes banks with different bank-specific traits, hence leaving pairs of matched banks that are indistinguishable from one another except for one key characteristic: distance to the CBR (D2CBR). For the propensity score matching, see Rosenbaum, P.R., and Rubin, D.B. (1983), "The central role of the propensity score in observational studies for causal effects", *Biometrika*, 70 (1), 41–55. The matching strategies are always applied prior to the shock. This makes it possible to create two groups of banks that, pre-pandemic, are similar in respect of the covariates employed in the matching strategy. For more detailed information see Couaillier, C., Lo Duca, M., Reghezza, A. and Rodriguez d'Acri, C. (2022), "Caution: Do not cross! Capital buffers and lending in COVID-19 times", *ECB Working Paper Series*, No. 2644.

5 The bank-level analysis includes a sample of 110 banks, while 298 banks are employed in the analysis based on the AnaCredit dataset. The existence of multiple bank lending relationships facilitates the identification of supply-driven shocks because demand factors are captured by the inclusion of firm fixed effects, following the approach taken by Khwaja, A. and Mian, A. (2008), "Tracing the impact of bank liquidity shocks: Evidence from an emerging market", *American Economic Review*, Vol. 98, pp. 1413-1442. Since a large number of single-bank relationships involve SMEs, this analysis also employs firm industry-location-size fixed effects. This makes it possible to control for credit demand for firms of the same size in specific industries and geographical areas and to retain single-bank relationships (see Degryse, H., De Jonghe, O., Jakovljevic, S., Mulier, K. and Schepens, G. (2019), "Identifying credit supply shocks with bank-firm data: Methods and applications", *Journal of Financial Intermediation*, Vol. 40.

It was found that banks closer to their CBR de-risked their balance sheet and curtailed their lending growth to non-financial corporations (NFCs) more than other banks. Descriptive trends have already suggested that banks closer to their CBR reduced their risk weight densities (defined as the ratio of risk-weighted assets (RWAs) to total assets (TA)) more strongly during the pandemic than banks further away from it (see **Chart 1.1**). The econometric analysis also shows that, during the pandemic, proximity to the CBR was associated with a 1.3 percentage point decline in risk weight densities relative to other banks. In addition, closer proximity to the CBR was related to lower (-2.7 percentage points), but still positive lending growth to NFCs (see **Table 1.1**). Overall, these results suggest that banks react to reduced distance to breach and might be reluctant to dip into regulatory buffers.

Table 1.1

Estimated impact of proximity to the CBR on bank risk-weight density and lending

Variables	RWA/TA (1)	RWA/TA (2)	Log(lending) (3)	Log(lending) (4)
Effect of CBR proximity during the pandemic	-1.302**	-0.870*	-0.0269***	-0.0129***
	(0.541)	(0.504)	(0.0007)	(0.0008)
Observations	626	626	15,719,410	16,053,709

Sources: ECB AnaCredit data and ECB supervisory data.
Notes: The estimates are based on difference-in-differences regressions, the dependent variable being the RWAs to TA ratio (columns 1 and 2) and the change in the log of the lending stocks (columns 3 and 4) that can be interpreted as the growth rate. "Effect of CBR proximity during the pandemic" is defined as a product of low D2CBR and COVID-19. Low D2CBR is a dummy equal to 1 for banks that have a distance to the CBR below the first quartile of the distance to the CBR distribution (corresponding to 3%), 0 otherwise. COVID-19 is a dummy equal to 1 for the period after the pandemic, 0 otherwise. To control for heterogeneity among banks, the regressions include a large number of bank-specific control variables, as well as fiscal and monetary policy controls. The first column includes bank and time fixed effects, the second bank and country-time fixed effects, the third firm fixed effects, and the fourth industry-location-size fixed effects to control for credit demand. Standard errors clustered at the bank (columns 1 and 2) and bank/firm (columns 3 and 4) level are reported in brackets. ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

Lower levels of lending growth for banks closer to their CBR resulted in lower borrowing growth and potentially greater credit constraints for NFCs reliant on these banks. In principle, the effect on individual firms of lower credit supply growth for banks in the proximity of the CBR could be offset if other banks picked up the slack. However, firms which rely heavily on banks in the proximity of the CBR may struggle to find alternatives to existing sources of financing or establish new credit relationships during turbulent times. Firm-level analysis provides evidence of these substitution impediments. Firms exposed to banks in the proximity of the CBR exhibited 5.3% lower borrowing growth after the pandemic outbreak than firms borrowing mostly from banks with larger capital buffers.[6] In addition, borrowing growth for firms that prior to the pandemic only had a single relationship with a bank in the proximity of the CBR declined by an additional 1.7 percentage points after the pandemic broke out.

Further analysis shows that regulatory capital relief measures – which increase banks' available capital space – are effective in containing banks' procyclical behaviour. First, when capital requirements[7] are reduced banks tend to revise their capital targets accordingly, especially if the capital relief is permanent or long term. This may mitigate procyclical target adjustment in times of crisis. Second,

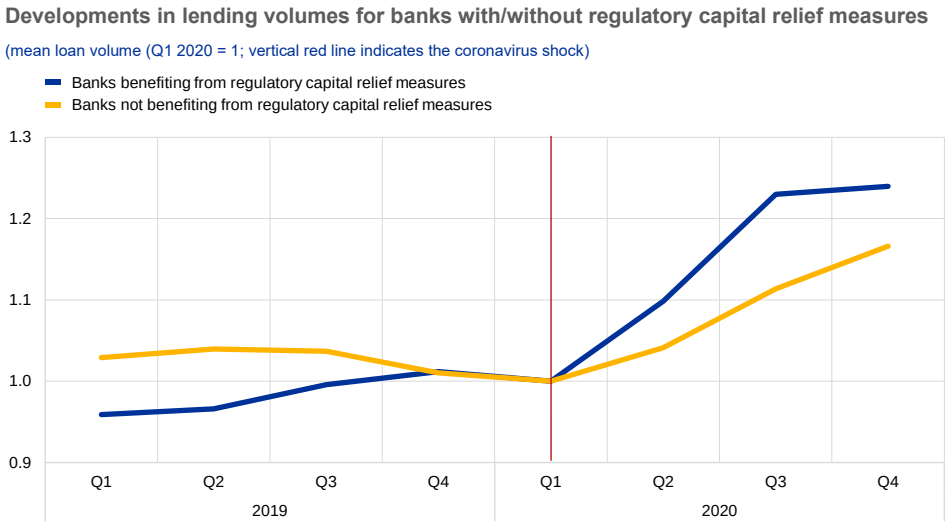
6 These firms are defined as firms obtaining at least 75% of their borrowing from banks which were closer to the CBR before the COVID-19 pandemic.

7 The capital requirements include the Pillar 1 Requirement, the Pillar 2 Requirement and the Combined Buffer Requirement.

if the CBR is reduced, banks increase their distance from the Maximum Distributable Amount (MDA)[8] threshold and may then be less prone to procyclical balance sheets adjustments.

Chart 1.2

Regulatory capital relief measures supported bank lending to corporations



Sources: ECB AnaCredit data, ECB supervisory data and ECB calculations.
Notes: Banks benefiting from regulatory capital relief measures took advantage of the frontloading of the change in the composition of the Pillar 2 requirement (P2R) and/or of the release of the CCyB or the reduction of other CBR buffers. The trend is normalised so that the variable takes the value of 1 in Q1 2020.

Regulatory capital relief measures taken by prudential authorities during the pandemic had positive effects on lending, especially for banks closer to the CBR.[9] A comparison of credit trends suggests that – after the policy measures had been implemented – banks benefiting from lower capital requirements expanded their lending volumes more than other banks (see **Chart 1.2**). A difference-in-differences analysis using firm-bank data on corporate loans to control for credit demand,[10] and accounting for bank-specific characteristics and other concurrent policies, confirms these results.[11] In particular, a 1 percentage point reduction in capital requirements induced an increase in credit volumes of 7.8%, and a decrease in lending rates of 40 basis points (see **Table 1.2**). Furthermore, the measures

8 The threshold for the MDA requires earnings distribution to be automatically restricted if a bank's CET1 capital falls below the sum of its Pillar 1, Pillar 2 and CRD buffer requirements.

9 Faced with the COVID-19 outbreak, the prudential policy authorities in the EU adopted two types of measures to ensure that bank capital was more usable. First, they reduced Common Equity Tier 1 (CET1) requirements (i) by anticipating the change in the composition of the P2R (already enshrined in CRD V but expected to come into force by 1 January 2021), which banks could now partially meet using Additional Tier 1 and Tier 2 capital (as opposed to 100% CET1 as before); and (ii) by reducing the CBR, thanks to the decisions taken by the national macroprudential authorities to release the CCyB and decrease SyRB rates. Second, banks were allowed to operate below their Pillar 2 guidance (P2G), meaning that dipping into it would trigger no supervisory intervention during the COVID-19 pandemic.

10 This approach, exploiting the multiplicity of lending relationships in loan-level data, also follows the methodology proposed by Khwaja and Mian, op. cit.

11 The dataset uses loan-level data for euro area significant banks, and covers a sample period running from the second quarter of 2019 to the fourth quarter of 2020, with the pre-COVID-19 period being defined as running from the second quarter of 2019 to the fourth quarter of 2019 and the COVID-19 period being defined as running from the second quarter of 2020 to the fourth quarter of 2020. The first quarter of 2020 is not included to minimise the confounding effects from different events, as policy measures were implemented towards the end of the quarter right after the outbreak of the pandemic.

provided capital space, in particular for banks which were reluctant to use or move closer to the CBR – the credit supply from these banks received relatively more support.

Table 1.2

Estimated impact of capital relief measures on bank lending volumes and rates

Variables	Δ Log (loans) (1)	Δ Log (loans) (2)	Δ Lending rates (3)	Δ Lending rates (4)
CAP.REL	7.744** (3.759)	9.966*** (2.762)	-39.943*** (10.523)	-33.817*** (7.165)
P2G	4.431 (4.032)	2.162 (2.712)	-32.887*** (9.209)	-31.550*** (8.562)
Obs.	737,498	1,749,253	691,659	1,675,846
Firm FE	YES	NO	YES	NO
Ind.-Loc.-Size FE	NO	YES	NO	YES

Sources: ECB AnaCredit data and ECB supervisory data.
Notes: The estimates are based on loan-level difference-in-differences regressions. CAP. REL. is the sum of the reduction in CBR and the change in P2R composition rules. The regressions include – as control variables – bank balance sheet characteristics (including the take-up of central bank liquidity operations) and firm-bank loan-level characteristics to account for loan guarantees and moratoria, as well as fixed effects for the country of the lender bank. Standard errors clustered at the firm and the bank level are reported in parentheses. ***, **, * and indicate statistical significance at 1%, 5% and 10% respectively.

Small and medium-sized enterprises benefited the most from the regulatory capital relief measures. The measures appear to have been more effective for the provision of credit to firms which were more reliant on bank lending, a result which is consistent with the objectives of the various policy actions taken during the pandemic.

The behaviour of individual banks during the pandemic offers some insight into the functioning of the Basel III capital buffer framework, in particular willingness to use capital buffers and the impact of regulatory capital relief measures. First, proximity to the CBR is associated with lower lending growth to NFCs, with the aim of insulating capital ratios. This could indicate that banks in proximity to the CBR have been reluctant to dip into regulatory capital buffers. While from a macro perspective credit growth has been strong and the euro area banking system has been able to meet credit demand during the pandemic, the behaviour of banks with limited capital space above the CBR could indicate possible impediments to the smooth functioning of the capital framework in periods of economic distress. Second, regulatory capital relief measures, which increased capital space above the CBR, had positive effects on the supply of credit from individual banks. This confirms that the reduction of regulatory capital buffers can mitigate the potentially procyclical behaviour of the banking system in periods of economic distress. From a policy perspective, these results also suggest that the availability of more releasable capital would be desirable to enhance the authorities' ability to act countercyclically when a crisis occurs.

2 Analytical assessment of policy options for enhancing macroprudential space in the form of different releasable buffers using the semi-structural macro-micro Banking Euro Area Sector Stress Test (BEAST) model

Several of the policy options discussed in the background document on enhancing macroprudential policy space were assessed employing the semi-structural macro-micro Banking Euro Area Sector Stress Test (BEAST) model.[12] The analysis explores the effects of a (partially) releasable capital conservation buffer (CCoB), a countercyclical capital buffer (CCyB) added on top of current requirements, a combination of the two instruments, and their interaction with profit distribution restrictions.[13] The analysis is tailored to assess the effects of the policy alternatives available in a *severe systemic crisis following three years of economic growth starting in 2020*. The analysis is anchored in the current banking sector, as well as the current policy and economic situation, though given its narrow set-up, it abstracts from very long-term effects of considered policy options including buffer replenishment following the severe systemic crisis. The buffer policies will influence the behaviour of individual banks in the three-year growth period and the subsequent crisis period and will therefore affect the system-wide response.

The BEAST model combines the dynamics of 19 euro area countries with those of around 90 individual banks which, jointly, account for around 70% of the euro area banking system. Each bank is modelled via a rich set of equations mapping macro-financial conditions into bank-level loan-loss provisioning parameters, risk weights or funding costs, and capturing banks' behavioural reactions, including adjustments to lending volumes, interest rates, liability structures and profit distributions. In addition, the model also captures two relevant feedback loops: the real-financial feedback loop (between the banking sector and the economy) and the solvency-funding cost feedback loop. The model has sound long-term properties, supported by tailored estimation techniques. These long-term properties support the building of longer-horizon conditional forecasts and the capturing of transmission lags in macroprudential policies or the persistency of systemic risks.

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12 Budnik, K., Balatti, M., Dimitrov, I., Groß, J., Kleemann, M., Reichenbachas, T., Sanna, F., Sarychev, A., Sinenko, N. and Volk, M. (2020), "Banking euro area stress test model", *Working Paper Series*, No 2469, ECB, September. The model is discussed and developed further within the Macro-Micro (MaMi) workstream of the Work Group on Stress Testing of the Financial Stability Committee.

13 The analysis does not expressly consider the option of a "core SyRB". However, akin to the CCyB, a "core SyRB" would be added on top of current requirements and buffers, so that the impact of the latter could be expected to be similar to the effect of the CCyB presented here.

Banks in the BEAST model are subject to system-wide and bank-specific capital requirements and buffers. The model accounts for Pillar 1 and Pillar 2 capital requirements, including P2G buffers and the full set of macroprudential capital buffers, which on top of the CCoB and CCyB also include the buffers for global and systemically important institutions (G-SIIs and O-SIIs) and the systemic risk buffer (SyRB). In addition, it includes the minimum leverage requirement, which kicks in in 2021, and a detailed specification of the non-performing loan coverage expectations which will enter into force in 2018[14]. Finally, the model allows for the interplay between various capital-based and monetary policies. Monetary policy is described by ECB interest rates and the size of the ECB balance sheet. Together, these variables represent the impact of conventional and unconventional monetary policy.

Capital buffers directly affect banks' lending and dividend distribution decisions. Lending volumes and interest rates depend on the combination of loan demand (driven by economic activity, inflation etc.) and supply factors (driven by profitability, non-performing loan burden, etc.). Among the latter, there is a non-linear dependency between lending volumes and interest rates and the distance between the actual capital ratio and the regulatory capital target (which includes Pillar 1 and Pillar 2 requirements and buffers) on the other. Banks with a capital deficit (where the actual capital ratio is below the regulatory target) shift to a steeper slope coefficient and thus deleverage more intensely. With regard to dividend distribution, banks seek to pay out any surplus profit over what is needed to keep their management buffer above the regulatory capital target. The management buffer itself depends on the asset and liability structure of each bank and the regulatory capital target varies according to individual macroprudential policy trajectories. When applicable, the intended amount is overwritten by the MDAs or other profit distribution restrictions.

2.1 Methodology

The BEAST[15] is a semi-structural model linking macro-level and bank-level data regularly used by the ECB for macroprudential stress testing and policy assessment. Both sides of banks' balance sheets are modelled to a great level of detail in order to closely capture bank heterogeneity. The asset side of each balance sheet distinguishes between different loan portfolios, equity exposures and securitised portfolios. The model also captures flows between the three IFRS 9 asset impairment stages and risk weight developments. For each bank, the dynamics of

[14] The analysis does not consider changes to the regulatory framework arising from the forthcoming implementation of the final Basel III reforms.

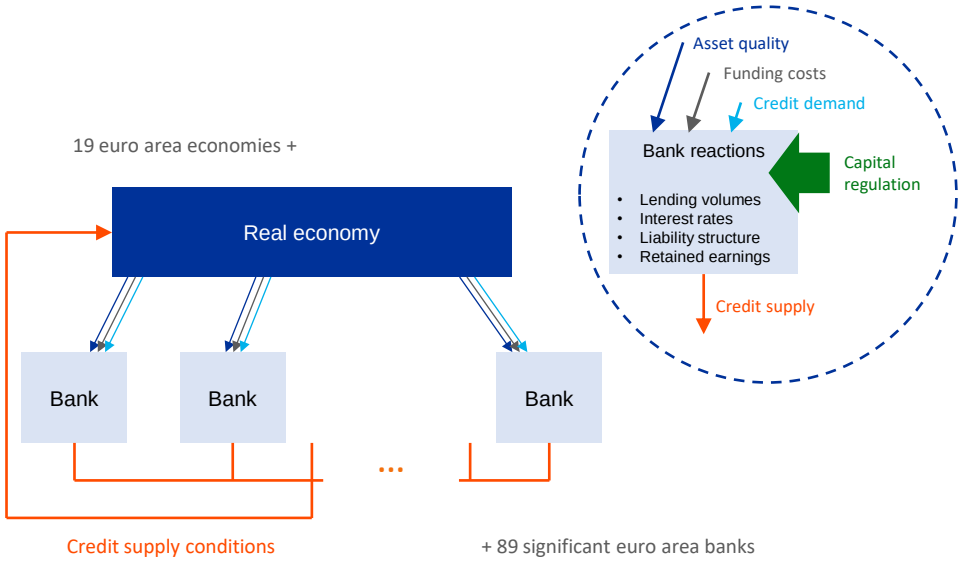
[15] The BEAST model is regularly used for the macroprudential stress testing of the euro area banking system (for the most recent results see European Central Bank (2021), "Macroprudential stress test of the euro area banking system amid the coronavirus (COVID-19) pandemic", October) and policy exercises (see Budnik, K., Dimitrov, I., Giglio, C., Groß, J., Lampe, M., Sarychev, A., Tarbé, M., Vagliano, G. and Volk, M. (2021), "The growth-at-risk perspective on the systemwide impact of Basel III finalisation in the euro area", *Occasional Paper Series*, No 258, ECB, July; or Borsuk, M., Budnik, K. and Volk, M. (2020), "Buffer use and lending impact", *Macroprudential Bulletin*, No 11, ECB, October).

profitability and solvency are further broken down into the impact of credit, market and operational risks, net interest income, and dividend payouts.

A number of model equations map the pass-through of scenarios into banks' balance sheet parameters. The BEAST model adapts several micro bank sensitivity equations that model the impact of macro-financial variables on RWAs, provisioning and net-fee and commission income. The cyclical patterns are derived in line with economic activity, whilst banks' structural features are accounted for by changes in banks' (endogenous) business model indicators. The model puts all equations together and solves them as a system, thus preserving internal consistency and allowing for simultaneous (same time period) feedback mechanisms.

Banks' behavioural responses include the adjustment of asset and liability volumes, pricing, and profit distribution (Figure 2.1). These equations, along with equations governing the evolution of funding costs, are based on empirical bank-level evidence. Banks react to changes in general economic conditions and seek to avoid breaching the capital targets set by a combination of regulatory capital minimum requirements and buffers. The evidence suggests that such solvency constraints are enforced not only by the regulator but also by market discipline. Other factors that shape banks' decisions regarding lending, dividend distributions and loan pricing include the quality of their assets, their profitability and their funding structures.

Figure 2.1
Schematic illustration of the BEAST model



Source: ECB.

The macroeconomic module captures the dynamics of each euro area economy, including trade spillovers between them. The dynamics of individual euro area economies are estimated using a structural panel vector autoregressive model employing Bayesian methods and introducing long-run priors to stabilise the long-run dynamics of the system at values consistent with long-run trends and

stylised facts. An additional block of cross-country trade spillovers link countries' import volumes to foreign demand variables, and their export prices to foreign price variables. As a result, the real economy may be described as a reduced-form multi-country setup.

The BEAST incorporates two amplification mechanisms. The first is the interaction between solvency and funding costs. A solvency shock reflected in an increase in a bank's leverage leads to an increase in the institution's funding costs. Decreasing a bank's solvency makes the institution more vulnerable to default, the risk of which is priced into the bank's unsecured funding costs. This, in turn, has an adverse effect on the bank's capital by eroding net interest income. Consequently, worsened solvency feeds additional shocks into the pricing of a specific bank's funding.[16]

The second amplification mechanism is the feedback loop between the banking sector and the real economy. The core of the feedback mechanism is a loop between the adjustments made by banks and the aggregate credit that is available to the real economy. More specifically, in normal times banks adjust their credit volumes and interest rates largely in line with changes in aggregate credit demand. In adverse conditions, banks attempt to restore eroded capitalisation and credit supply factors become more relevant.[17] Action taken by banks to repair their capital levels take the shape of a negative credit supply shock affecting the macro economy.

The model can be used to build confidence forecasts of macroeconomic and banking sector conditions. Its semi-structural design makes it possible to absorb the different sources of information available at the point of building a forecast. It concerns the most recent batch of macroeconomic data, as well as detailed information on banks' balance sheets and profit and loss accounts. The model also makes it possible to accommodate forward-looking information such as information regarding ECB staff macroeconomic projections of macro-financial variables available at the reference date for a horizon of up to three years, and information regarding upcoming macroprudential and supervisory policies.

2.2 Macroeconomic scenario and policy alternatives

Macroeconomic scenario

The scenario is designed to study alternative macroprudential response to a single, very deep recession. The simulations span a six-year long period from 2021 to 2026, with a deep systemic crisis starting in 2024. The first three years of the

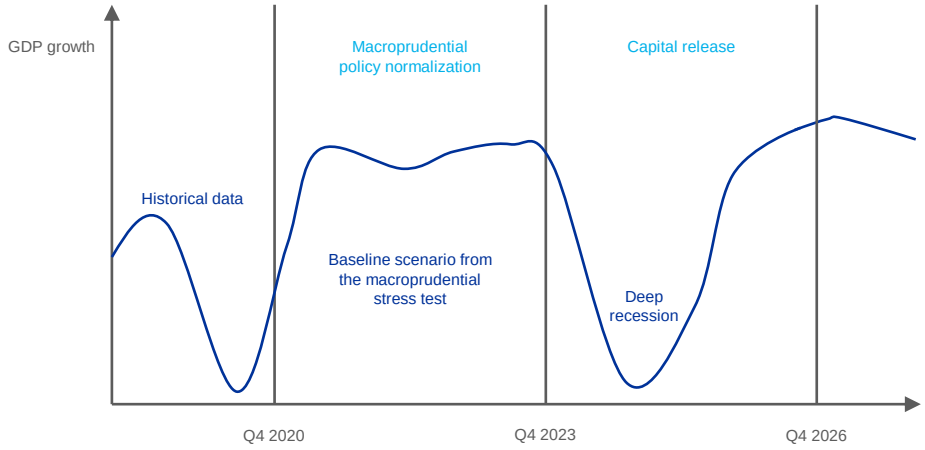
[16] However, the contagion effects of higher-risk individual bank failures on the solvency of other banks as well as effects of a possible general loss of market confidence are disregarded.

[17] In reality. this also triggers a degree of lending substitution from low-capitalised banks to well-capitalised banks, with well-capitalised banks taking over market share from capital-constrained banks. However, banks in the model do not strategically maximise their market share.

projection are anchored in the June 2021 ECB staff macroeconomic projections[18], reflecting the ongoing COVID-19 pandemic including containment measures, policy support and vaccination roll-out. The projection forecasts a strong recovery in euro area economic activity in the second half of 2021, driven by a sharp rebound in private consumption and an easing of supply bottlenecks.[19] The projected growth then remains stable, resulting in an average annual growth rate of 3.8% over the period 2021-23. **Figure 2.2** illustrates the dynamics of economic activity in the simulations in a stylised manner.

The adverse crisis episode commencing in 2024 is a tail event selected from the distribution of simulated scenario paths. The model makes it possible to derive the full distribution of possible macro-financial developments by bootstrapping from the historical distributions of structural shocks.[20] It encompasses the selection of 22 scenarios featuring a severe drop in economic activity in the euro area in 2024, and which will last until mid-2025, resulting from a cumulation of exogenous aggregate demand shocks.[21] These scenarios are then averaged to take account of scenario uncertainty and different combinations of shocks that could give rise to a strong contraction in economic activity.

Figure 2.2
Stylised macroeconomic conditions



Source: ECB.
Notes: BMPE stands for Broad Macroeconomic Projection Exercise; MST stands for macroprudential stress test 2021.

The deep economic crisis is characterised by a maximum drop of 4.9% in GDP in the fourth quarter of 2024 and 5.4% in lending to the non-financial private

18 See ECB staff macroeconomic projections for more information.

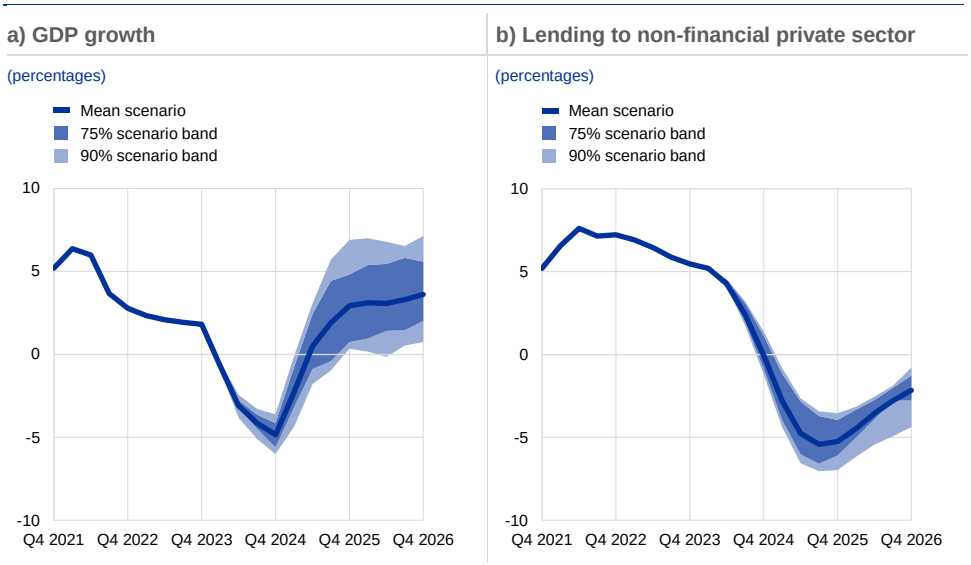
19 The updated December 2021 ECB staff macroeconomic projections remain very close to the earlier projections. They imply slightly higher growth in 2021, and a higher inflation path in 2021-22.

20 For more information about the scenario selection procedure see Financial Stability Review, November 2020.

21 Other recession designs could be considered, such as a combination of aggregate demand and supply shocks mimicking developments during the COVID-19 pandemics, as in Budnik et al. (2021), "Policies in support of lending following the coronavirus (COVID-19) pandemic", *Occasional Paper Series*, No 257, ECB, or with shocks originating directly in the financial system reflecting the unwinding of financial imbalances, mimicking 2008. As such, the recession remains a stylised event. The significant role of aggregate demand shocks translates into, for example, the relatively strong negative response of credit demand and a contraction in lending.

sector by the third quarter of 2025 in the absence of a macroprudential policy response. Corporate lending drops by a maximum of 9.3% in the third quarter of 2025. The fan charts for both GDP and non-financial private sector lending derived by assuming buffer build-up or release are displayed in **Chart 2.1**, illustrating the range of adverse scenario conditions and the mean path.

Chart 2.1
Macroeconomic scenario



Source: ECB.

Policy alternatives

The analysis considers four policy alternatives, each of which is expressed as the deviation from a benchmark of taking no policy action in response to the crisis. Given its narrow set-up, the analysis does not consider all policy options discussed in the annexed report on creating macroprudential space. In the benchmark, the CCoB remains at 2.5% and countries' CCyBs at Q4 2020 levels[22] over the six-year horizon. P2G buffers are replenished to their pre-COVID-19 levels during 2022, which adds approximately 1.5% of required capital in terms of risk-weighted amounts. The buffers are released in 2024. There are no caps on profit distribution beyond the standard MDA-based restrictions. The benchmark is summarised in the first row of **Table 2.1**.

The first policy alternative is called "passive policy" and assumes a build-up but no release of CCyBs. The CCoB remains at 2.5% over the six-year horizon. Country-level CCyBs are increased to 1.25% during 2021[23], which amounts to 0.8%

[22] The level of CCyB at the end of 2020 was zero in all euro area jurisdictions excluding Luxembourg and Slovakia.

[23] A relatively short phase-in is intended to ensure that the CCyB is established sufficiently ahead of a recession, i.e. that the impact of the phase-in fades before the CCyB is (potentially) released. A longer phase-in would likely dampen the costs of the CCyB, also in the light of non-linearities and the contemporaneous P2G replenishment.

of required capital in terms of banks' risk-weighted amounts. Country-level CCyBs are subsequently kept at the 1.25% level until the end of the horizon. The expectation that banks will meet P2G (pre-COVID-19 levels) is reinstated from the end of 2022, which adds approximately 1.5% of required capital in terms of risk-weighted amounts. P2G is then released in 2024.There are no caps on profit distribution beyond the standard MDA-based restrictions. The passive policy alternative is summarised in the second row of **Table 2.1**.

The second policy alternative is called "release of CCyB" and is characterised by a build-up and later release of CCyBs. The CCoB remains at 2.5% over the six-year horizon and country-level CCyBs are increased to 1.25% during 2021.[24] CCyBs are fully released in 2024 at the beginning of the crisis. The expectation for banks to meet P2G (pre-COVID levels) is reinstated from end-2022 and then released in 2024. There are no caps on profit distribution beyond the standard MDA-based restrictions. The release of CCyB policy alternative is summarised in the third row of **Table 2.1**.

The third policy alternative is called "release of CCoB" and is the first of the two alternatives which consider a CCoB release. Half the CCoB buffer is released, i.e. the buffer is reduced from 2.5% to 1.25%, at the beginning of the crisis in 2024.[25] CCyBs remain at Q4 2020 levels over the six-year horizon. The expectation that banks will meet P2G (pre-COVID-19 levels) is reinstated from the end of 2022 and released in 2024. In this case, three profit distribution options are considered (MDA-based, a 40% cap and full restrictions; more details below). The release of CCoB policy alternative is summarised in the fourth row of **Table 2.1**.

The fourth policy alternative is called "release of CCyB and CCoB" and considers a coordinated release of both capital buffers. As in the previous alternative, the CCoB buffer is reduced from 2.5% to 1.25%. By contrast, CCyBs are increased to 1.25% during 2021 and released in 2024 at the beginning of the crisis The expectation that banks will meet P2G (pre-COVID-19 levels) is reinstated from end-2022, and released in 2024. As in the CCoB release alternative, three profit distribution options are considered. The release of CCyB and CCoB policy alternative is summarised in the fifth row of **Table 2.1**.

[24] The uniform phase-in of CCyB in all jurisdictions will not take full account of country-specific economic forecasts. This stylised assumption will result in a conservative estimate of costs of phasing-in CCyBs.

[25] This is equal to the full 1.25% required capital in terms of banks' risk-weighted amounts.

Table 2.1

Macroprudential policy alternatives

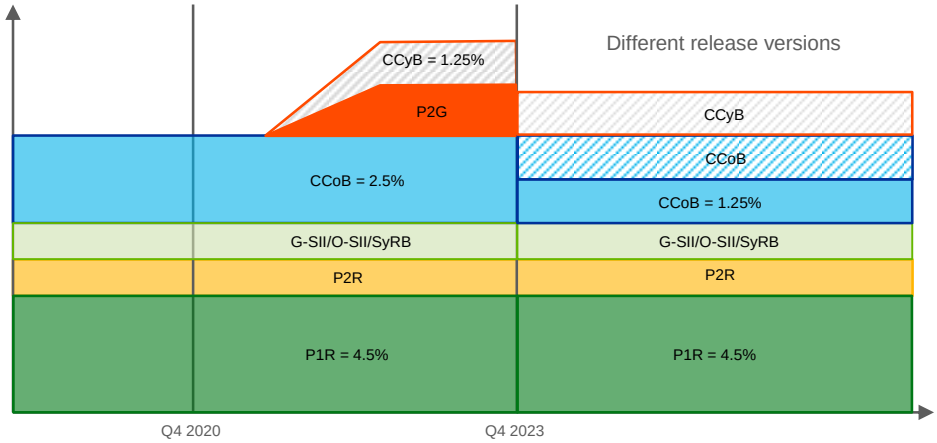
Label	Description	CCoB	CCyB	P2G	Profit distribution
Naïve benchmark	No action	CCoB=2.5%	CCyB constant at the end of 2020 levels	P2G reinstated** in 2022 and released in 2024	MDA
Passive policy	Rebuilding but no release of CCyB	CCoB=2.5%	CCyB replenished before 2022 to 1.25%* and constant thereafter	P2G reinstated** in 2022 and released in 2024	MDA
Release of CCyB	Rebuilding and release of CCyB	CCoB=2.5%	CCyB replenished before 2022 to 1.25%* and released in 2024	P2G reinstated** in 2022 and released in 2024	MDA
Release of CCoB	Release of CCoB in the absence of CCyB	CCoB=2.5% until 2023, and released in 2024 to 1.25%	CCyB constant at the end of 2020 levels	P2G reinstated** in 2022 and released in 2024	MDA / 40% cap from 2024 / Full restriction from 2024
Release of CCyB and CCoB	Release of CCoB and CCyB	CCoB=2.5% until 2023, and released in 2024 to 1.25%	CCyB replenished before 2022 to 1.25%* and released in 2024	P2G reinstated** in 2022 and released in 2024	MDA / 40% cap from 2024 / Full restriction from 2024

Source: ECB.
Notes: * Amounts to 0.8% of risk-weighted amounts at a system-wide level as the CCyB rate for individual banks is calculated as the weighted average of the CCyB rates set by the jurisdictions in which a bank has exposures multiplied by its total risk exposures. ** To 2019 levels. Amounts to approximately 1.5% in effective aggregate terms.

Figure 2.3 captures the trajectories of individual capital buffers in different policy alternatives. The CCoB can remain constant at 2.5% for the whole horizon or be reduced to 1.25% in 2024 at the start of the recession. CCyBs either remain at their Q4 2020 levels for the whole period (i.e. 0% for most of the euro area countries) or can be increased to 1.25% during 2021. Subsequently, they can be maintained at the higher level until the end of the horizon or fully released in 2024 at the start of the recession. The expectation that banks will meet P2G (pre-COVID-19 levels) is reinstated and is then released in 2024.

Figure 2.3

Overall summary of the capital requirements considered



Source: ECB.

A partial release of the CCoB is considered, along with three options for profit distribution restrictions. The first option is the standard MDA-based profit restriction, which does not place any additional limits on the way institutions can distribute their profits. This means that solvent and profitable banks can continue to pay out dividends, even in times of crisis. The second option considers a 0% cap on the dividend payout ratio – in other words, a full restriction on dividend payouts for all banks. The third option sets the dividend payout ratio cap at 40%, which places it somewhere between the first two options.

2.3 Results

Benchmark results

Increasing the CCyB to 1.25% on the back of the reinstatement of P2G in 2021 has only a moderately negative impact on lending at the aggregate euro area level. The build-up of the CCyB reduces lending to the non-financial private sector by approximately 0.7 percentage points in 2021-23, which can be read looking at the blue bars (the passive policy) or the yellow bars (the release of CCyB) in panel (b) of **Chart 2.2**.

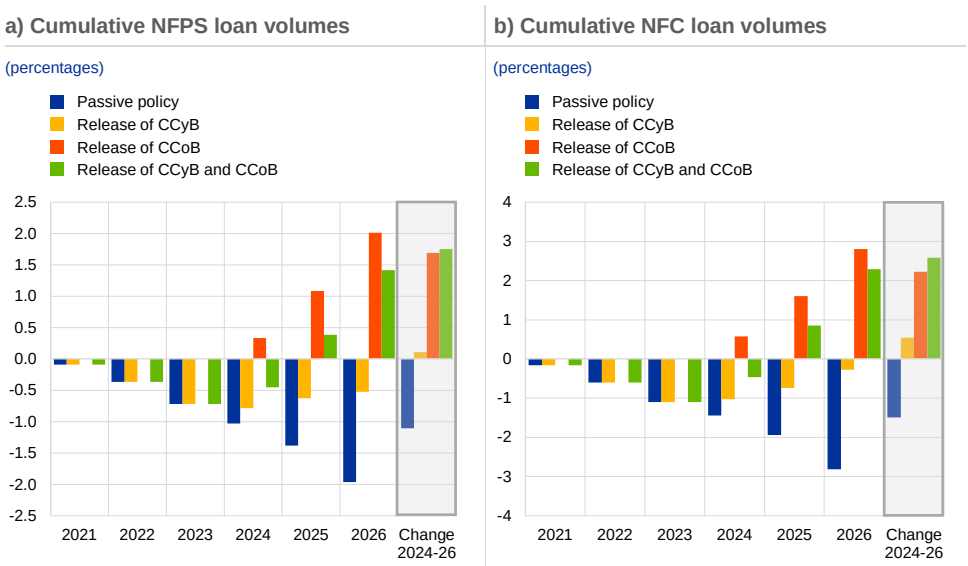
Releasing the CCyB could support lending during the recession. The cumulative reduction in lending to the non-financial private sector during the period 2024-26 in the benchmark, where the CCyB remains at its Q4 2020 level over the whole horizon, is - 8.3%. Maintaining CCyBs at 1.25% during the recession (the passive policy alternative) results in a reduction of over 1 percentage point in lending to the non-financial private sector in period 2024-26 compared with the benchmark. High regulatory capital targets foster deleveraging in a recession. By contrast, the buffer's timely release largely prevents this drop in lending during the recession, with an additional positive surplus effect on more procyclical lending to the corporate sector in the period 2024-26 (see data for release of the CCyB in panel (b) of **Chart 2.2**).

Analogously, a partial release of the CCoB could have a positive lending effect during the recession. A partial release of the CCoB mitigates the reduction in lending compared with the benchmark by 1.8 percentage points, with lending contracting by -6.5%. The marginal effect of releasing regulatory capital in the form of the CCoB is somewhat lower than that of releasing regulatory capital in the form of the CCyB (the release of 0.8% of RWAs in the form of the CCyB dampens the reduction in lending by 1.2 percentage points). This is due to (i) buffer overlaps with minimum leverage requirements which, when they become binding, have an effect on the usability of released CCoB capital, and (ii) the positive impact of actual solvency rates, which remain higher following CCyB release than CCoB release, on the funding costs of banks during the period of systemic stress. A joint release of the CCoB and the CCyB has a higher positive lending effect during the period 2024-26 than just the release of the CCoB. When accounting for the initial costs of building up the CCyB in 2021-23, the cumulative lending effect of the CCoB release in 2021-26

appears higher that the cumulative lending effect of the joint CCoB and CCyB release (see the release of the CCoB and the release of the CCoB and the CCyB in both panels of **Chart 2.2**).

Chart 2.2

Lending with pure MDA expressed as deviations from the benchmark



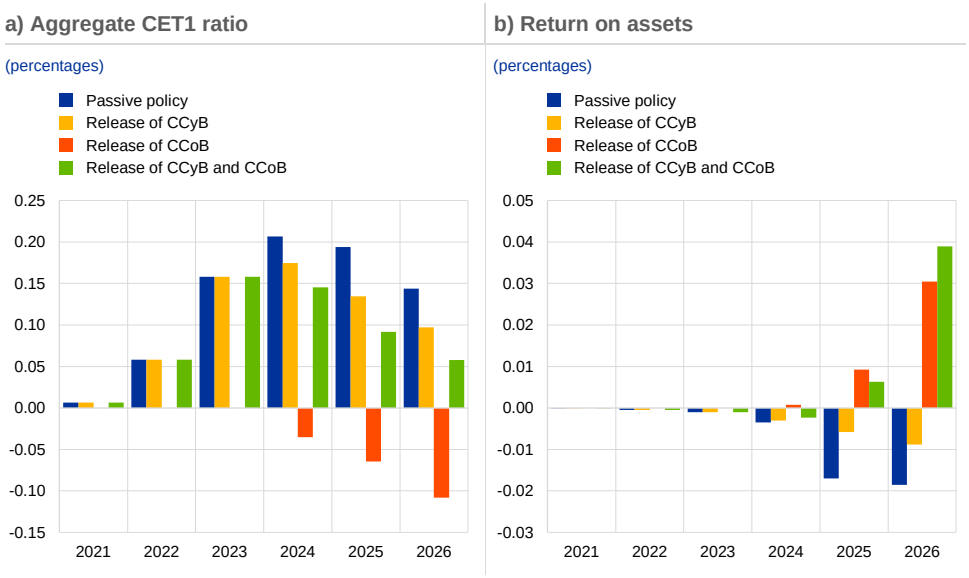
Source: ECB.
Notes: The bars in the grey field correspond to the deviation of cumulative 2024-26 loan growth from the naïve benchmark. NFPS stands for non-financial private sector.

An increase in CCyB rates to 1.25% has a positive impact on actual solvency rates at the beginning of the recession. The euro area CET1 ratio in 2024 is around 15 basis points higher with activation of the CCyB in 2021 than without it (see the passive policy and the release of the CCyB in panel (a) of **Chart 2.3**). A subsequent release of the CCyB has a modest negative effect on the actual capital ratios in 2024-26 compared with the passive policy alternative, although even following CCyB release the solvency outcome at the end of the horizon is almost 0.1 percentage points higher than in the benchmark. This reflects the positive impact of the capital release on lending and economic activity, which limits credit losses and benefits the profitability of banks during the recession (see passive policy and release of CCyB policy in panel (b) of **Chart 2.3**).

Releasing the CCoB can lead to a transitory deterioration in the actual CET1 ratio during the crisis. The negative solvency impact is most substantial in 2025 and in cases in which banks do not rebuild CCyB prior to the recession (see the release of the CCoB in panel (a) of **Chart 2.3**). However, the release of capital triggers the banking sector-real economy feedback loop, strengthening banks' profitability (see the release of the CCoB and the release of the CCyB and the CCoB in panel (b) of **Chart 2.3**). The joint release of the CCyB and the CCoB improves the 2026 capital ratios by around 5 basis points (see the release of CCyB and CCoB in panel (a) of **Chart 2.3**) in comparison with the naïve benchmark.

Chart 2.3

Solvency and profitability with MDA expressed as deviations from the benchmark



Source: ECB.

In the absence of profit distribution restrictions, the release of capital buffers could result in moderately higher dividend payouts during the crisis. An initial increase in the CCyB binds dividend payouts in the period 2021-23 (see passive policy and the release of CCyB in panel (a) of **Chart 2.4**) compared with the benchmark and also in the period 2024-26 if the CCyB is not released in 2024 (i.e. in the passive policy alternative). Releasing the CCyB in 2024 results in a modestly higher payout and releasing the CCoB by around 1% of CET1 capital at the starting point results in higher dividend payouts in the period 2024-26 compared with the benchmark. However, only a relatively small share of banks are able to pay dividends during the recession and almost 85% of total dividends distributed during the period are paid out by only 34 banks[26] – these have a solvency position and profitability above the median for the sample.[27]

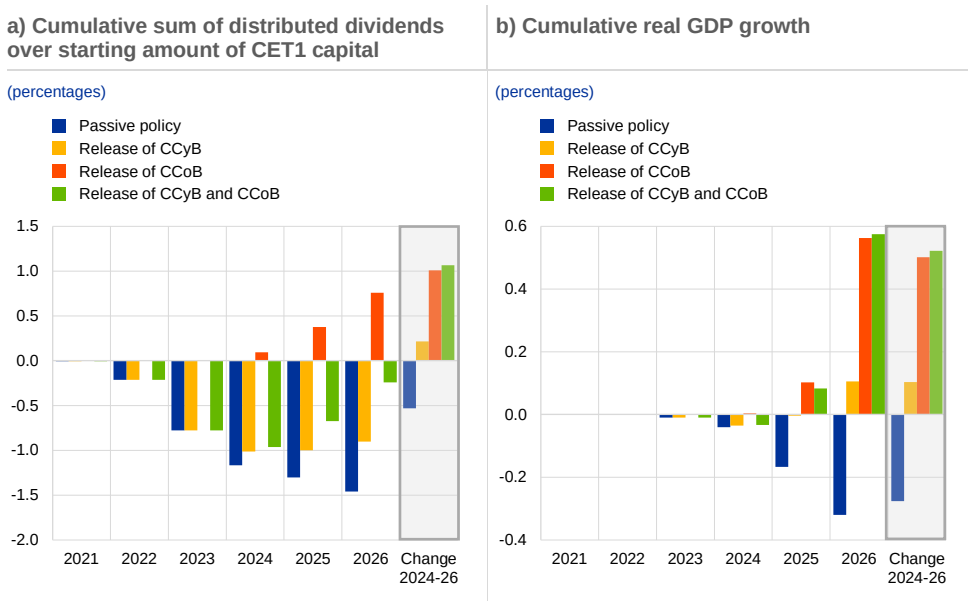
The release of capital buffers has a moderately positive impact on GDP growth. While the passive policy exacerbates the economic slowdown by further decreasing GDP growth by approximately 40 basis points in comparison with the benchmark during the period 2024-26 (see the passive policy in panel (b) of **Chart 2.4**), releasing the CCyB results in an improvement in GDP growth during the recession of roughly 10 basis points (see the release of the CCyB in panel (b) of **Chart 2.4**). The release of the CCoB reduces the contraction of GDP by around 50 basis points (see the release of the CCoB and the release of the CCoB and the CCyB in panel (b) of **Chart 2.4**).

[26] Out of 89 banks included in the sample.

[27] In total, 22 of the 34 banks are concentrated in three business models: diversified lenders, universal banks and corporate / wholesale lenders. In terms of geography, 19 of the 34 banks are concentrated in three geographical areas: Germany, Spain and the Netherlands.

Chart 2.4

Profit distribution and GDP with pure MDA expressed as deviations from naïve benchmark



Source: ECB.
Note: Bars in the grey field correspond to the deviation of the cumulative 2024-26 dividend distribution and GDP growth from the naïve benchmark.

Results for restrictions on profit distributions coupled with a release of the CCoB

In order to establish the role played by dividend payouts, this section considers a ban on profit distribution introduced in parallel with a release of the CCoB at the beginning of 2024. The dynamics of policy alternatives not involving CCoB release (i.e. passive policy and CCyB release) are identical to those presented in section “Benchmark results”. A ban on dividend payouts effectively reduces profit distribution in the CCoB release and the CCyB and CCoB release alternatives to 0. It results in a payout difference between the two alternatives and the naïve benchmark of almost -12% of CET1 capital at the starting point. Importantly, the analysis considers the effects of the conserved capital on banks’ capital levels, and after that debt funding costs and lending, while also abstracting from the possible adverse effects on banks’ equity funding costs that could result

from the imposition of system-wide distribution restrictions (e.g. in relation to competitive disadvantages or adverse effects on the long-term cost of capital).[28]

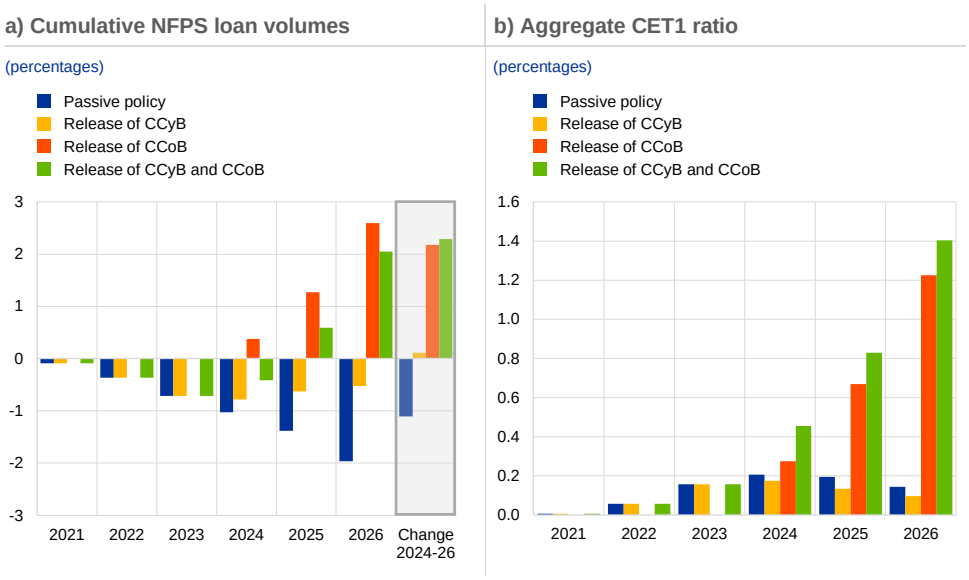
The partial release of the CCoB generates a stronger lending effect when coupled with full profit distribution restrictions during the recession. This effect amounts to 2.2 percentage points (i.e. a -6.1% cumulative drop in lending in the period 2024-26 versus -8.3% in the benchmark). As in the "Benchmark results" section, the joint release of the CCyB and the CCoB generates a slightly stronger positive lending effect during the period 2024-26 than the release of just the CCoB but, when taking the whole period into account, the effect of the joint release is diminished due to the initial costs of building up the CCyB in the period 2021-23 (see the release of the CCoB and the release of the CCyB and the CCoB alternatives in panel (a) of **Chart 2.5**).

The parallel introduction of profit distribution restrictions affects the impact of CCoB release on the CET1 ratio. In particular, the release of the CCoB coupled with full restrictions on profit distribution eliminates the transitory deterioration in the aggregate CET1 ratio and significantly improves the solvency ratio compared with the result in the absence of restrictions. In particular, the CET1 ratio at the end of the horizon is significantly higher, in comparison with the benchmark, by 1.25 percentage points and 1.40 percentage points for the CCyB release and the CCyB and CCoB release respectively (see the corresponding alternatives in panel (b) of **Chart 2.6**).

[28] As noted in Annex 2, on the one hand system-wide distribution restrictions would increase the likelihood of the released capital being used for lending inside the European banking supervision area and not for other purposes such as dividend payments, acquisitions or external investments. They would reflect the systemic and exceptional nature of the shock under consideration and prevent capital from flowing out of the banking sector, taking into account the fact that at the onset of the global financial crisis a number of banks continued to make large distributions in the form of dividends, share buybacks and generous compensation payments, even though their individual financial conditions and the outlook for the sector were deteriorating. On the other hand, such restrictions could put banks subject to European banking supervision at a competitive disadvantage compared with international peers (if other authorities do not impose similar restrictions) and possibly induce stigma effects, also leading to questions regarding how long it is possible to keep this measure in place, which may in turn impact banks' incentives to use the released capital in the first place. Moreover, the restrictions could be detrimental to banks' long-term cost of capital and could potentially restrict their future access to market funding.

Chart 2.5

Lending and solvency with full restriction expressed as deviations from the naïve benchmark



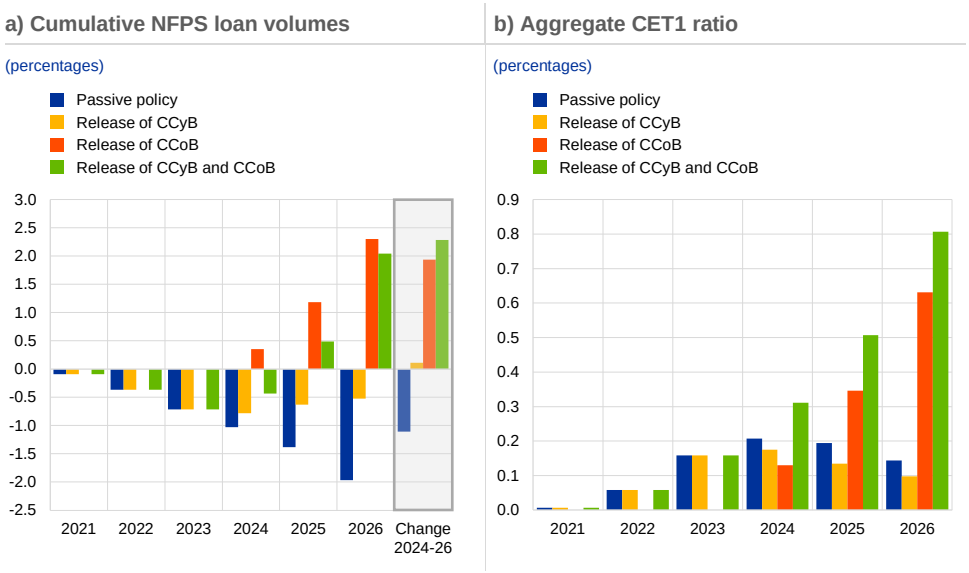
Source: ECB.
Notes: Bars in the grey field correspond to the deviation of cumulative 2024-26 loan growth from the naïve benchmark. NFPS stands for non-financial private sector.

The lending impact of a CCoB release with a 40% cap on the dividend payout ratio would be expected to strike the middle ground between the results for MDA-only and those for full restrictions on profit distribution. The effect on lending to the non-financial private sector amounts to approximately 1.95 percentage points, the difference between a -6.35% cumulative drop in lending in the period 2024-26 and -8.3% in the naïve benchmark (see release of CCoB and release of CCyB and CCoB in panel (a) of **Chart 2.6**).

There is no transitory deterioration in aggregate CET1 ratio with a 40% cap on the dividend payout ratio following CCoB buffer release. However, the increase in banking sector solvency vis-à-vis the benchmark at the end of the horizon is reduced somewhat, to approximately 0.6 percentage points in the case of release of the CCoB and 0.8 percentage points in the case of release of the CCyB and the CCoB, compared with the results for full profit distribution restrictions (see release of CCoB and release of CCyB and CCoB in panel (b) of **Chart 2.6**).

Chart 2.6

Lending and solvency with 40% cap expressed as deviations from the benchmark



Source: ECB.
Notes: Bars in the grey field correspond to the deviation of cumulative 2024-26 loan growth from the naïve benchmark. NFPS stands for non-financial private sector.

2.4 Conclusions

Releasing regulatory capital at the beginning of the recession triggers the virtuous feedback loop between the banking sector and the real economy. Banks draw on the released capital to support their lending activity during the recession. A shallower contraction in lending supports economic growth and limits banks' credit and market losses. An improved bank profitability outlook is ultimately reflected in banks' solvency rates. The release of capital buffers prevents an excessive credit crunch in the depths of the crisis and promotes a faster recovery once the economy starts to recover.

Building up and subsequently releasing the CCyB "smoothens" the credit cycle. The model analysis, which is anchored in current economic conditions and assumes that a deep recession will hit the economy in 2024, shows that the building-up of the CCyB has a contained negative effect on lending to the non-financial private sector during the post-pandemic recovery phase, while its timely release has a positive effect on lending during the later recession. Furthermore, the marginal effectiveness of releasing the CCyB in terms of boosting lending in the crisis period – when abstracting from the initial build-up costs in the pre-crisis period – is relatively high and supports the notion that the CCyB is the first line of defence against the stylised recession.

A partial release of the CCoB at the beginning of a large recession, especially when combined with a release of the CCyB, can substantially moderate the contraction in lending. Reducing the CCoB by 1.25% results in a contraction in lending which is 180-220 basis points lower during a deep recession compared with

a situation in which no policy action is taken. In any case, the marginal effect of CCoB release could already be lower than for CCyB, due to potential overlaps with minimum leverage requirements and the impact of buffer releases on the actual solvency of banks. It also moderates the contraction of economic activity by approximately 50 basis points.

The exact effect of CCoB release on lending and bank solvency depends on banks' own policies and supervisory policies regarding profit distribution. The enforcement of profit distribution restrictions in parallel with the CCoB is reflected in generally higher bank solvency rates during the recession. It reduces the trade-off between a positive lending effect and solvency, which could emerge at the onset of the recession when better capitalised and less risk averse banks – which are not fully discounting the depth and duration of the recession – continue to pay out dividends. In such instances, profit distribution restrictions may also have positive effects on debt financing costs and reduce tail risk for shareholders. A 40% cap on the dividend payout ratio is sufficient to balance this trade-off whilst allowing solvent and profitable banks to continue (at least partially) to distribute their profits to shareholders, unlike the case of the 100% cap in the scenario under consideration. Even so, blunt dividend payout restrictions might also have downsides which are not considered in the model, such as higher capital funding costs and blurred incentives to build-up solvency in the future.

The analysis focuses on policy trade-offs for addressing a very deep crisis event occurring three years from now, and abstracts from the longer-term consequences of policy options. The advantage of the approach is its focus on feasible policy alternatives to address a deep systemic crisis in about three years from now. At the same time, the analysis does not account for related policy costs and benefits following the recession. Beyond the time span covered by the analysis, the solvency impact of different policy options may be reflected in the risk of bank failures and will impact the stability of the banking sector. As such, the analyses do not consider the fact that banks may be hit by losses that materialise later or stem from subsequent shocks when releasing buffers (especially the CCoB) has reduced resilience and left banks more vulnerable. However, this may be mitigated by the fact that the results show that the solvency impact of a well-timed release of capital buffers during the recession can be positive – or only moderately negative – compared with a situation in which no buffers are released (especially in the presence of profit distribution restrictions).

The limited scenario horizon means it is not possible to take into account the potential costs of buffer (including the CCoB) replenishment. In contrast to the CCyB, the later CCoB replenishment would be less contingent on the financial cycle and may have to occur at a faster pace. This could imply higher costs and a proportionally greater negative effect on the recovery, depending on the precise arrangements for rebuilding the CCoB.

There are a number of further caveats to the analysis with regard to modelling assumptions. First, the model does not specify banks' incentives to use capital buffers. The analysis assumes that a buffer release increases banks' propensity to use the released capital. Second, banks do not tap capital markets and, accordingly,

the model does not capture the dependency of capital funding costs on the stability of dividend payouts. Third, the model only takes into account buffer overlaps with the minimum leverage ratio requirement, and not those with minimum requirement for own funds and eligible liabilities (MREL). Both are particularly relevant for the results regarding CCoB use, since provided the CCoB has not already been dipped into it occupies a de facto position which is lower in the capital stack than the CCyB.[29] The effect of the phase-in of Basel III finalisation is also not captured by the analysis. The full phase-in of Basel III finalisation could affect the policy trade-offs presented in the analysis and could be relevant for crisis events emerging further down the line than during the six-year horizon. Finally, the analysis does not capture the high uncertainty faced by policymakers at the beginning of a very deep recession. It assumes that the response will be immediate and will include decisive capital releases best tailored to trigger the positive banking sector – a real economy feedback loop. In reality, policymakers would have to exercise their judgement as to the depth of a recession, which could result in suboptimally strong capital releases at the onset of shallow recessions.

[29] Note that Box 3 in the report on "Enhancing macroprudential space in the Banking Union" shows that when taking MREL requirements into account a CCyB release is more usable than a CCoB release, with the gap narrowing for smaller magnitudes of release.

3 Evidence underpinning the need to reduce the prominent role of the credit-to-GDP gap in the CCyB framework

In its guidance on the CCyB the Basel Committee on Banking Supervision discusses the early warning properties of the credit-to-GDP gap, explaining the rationale for its selection as the guide indicator used to inform the decisions of authorities.[30] An analysis conducted in the immediate aftermath of the global financial crisis showed that the credit-to-GDP gap was found to be the best-performing single indicator among a range of other variables, including indicators used for banking sector credit developments[31]. As stated in the guidance, the specification of the credit-to-GDP gap presents some advantages over other indicators. More specifically, as it is expressed as a ratio to GDP, the variable is normalised in respect of the size of the economy. Given that it is measured as a deviation from its long-term trend, the credit-to-GDP gap should, in principle, allow for a long-term financial deepening trend. As it is a ratio of levels, it is smoother than a variable calculated as differences in levels, such as credit growth, and minimises spurious volatility. Given these characteristics the guide was considered to be the best warning signal for historical systemic banking crises in most, although not all, countries and, therefore, was deemed to be appropriate for the objective of the CCyB.

The evidence gathered and the experience observed in recent years have, however, shown that the credit-to-GDP gap has several shortcomings.[32] First, after prolonged periods of high credit expansion, the credit-to-GDP gap tends to have a downward bias that stretches far into the aftermath of a crisis. This implies an underestimation of cyclical risk, as the indicator will incorporate exuberant credit developments into the trend estimate, thus causing the gap to diminish. As shown in **Chart 3.1**, the Basel gap can also decrease in situations in which the credit-to-GDP ratio increases strongly, although it does this at a slower pace than the trend component. This situation has occurred in the past on many occasions across euro area countries plus Denmark, Sweden and the United Kingdom. The red dots in the chart display country-year observations with year-on-year decreases in the Basel gap, despite year-on-year increases in the credit-to-GDP ratio.

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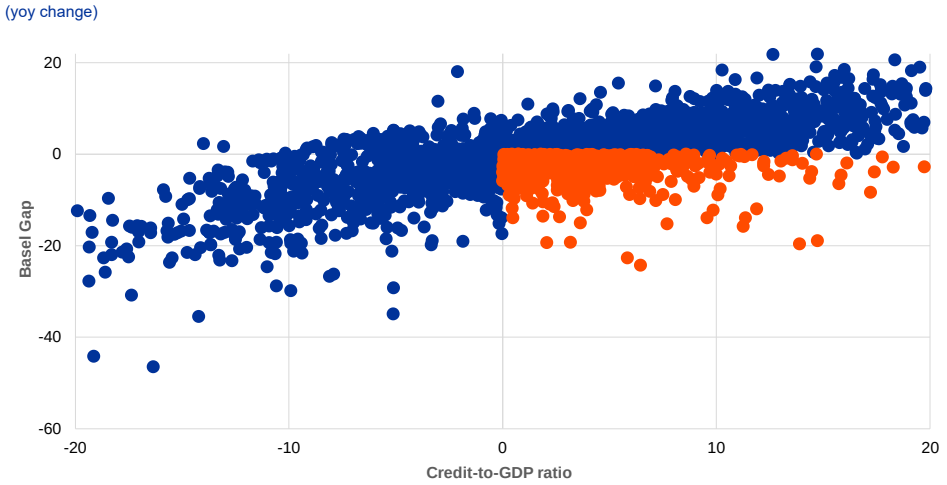
30 See Basel Committee on Banking Supervision (2010*), "*Guidance for national authorities operating the countercyclical capital buffer*"*, BIS, December.

31 See Drehmann, M., Borio, C., Gambacorta, G., Jimenez, G. and Trucharte, C. (2010), "Countercyclical capital buffers: Exploring options", *Working Papers*, BIS, No 317.

32 For a discussion of the shortcomings of the Basel gap, see Lang, J. H., Izzo, C., Fahr, S. and Ruzicka, J. (2019), "Anticipating the bust: a new cyclical systemic risk indicator to assess the likelihood and severity of financial crises", *Occasional Paper Series*, No 219, ECB; Lang, J.H. and Welz, P. (2017), "Measuring credit gaps for macroprudential policy", *Financial Stability Review*, ECB, May; Castro, C., Estrada, A. and Martínez, J. (2016) "The countercyclical capital buffer in Spain: an analysis of key guiding indicators", *Documentos de Trabajo*, No 1601, Banco de España; Repullo, R. and Saurina, J. (2011), "The countercyclical capital buffer of Basel III: A critical assessment", *CEPR Discussion Papers* No 8304, CEPR; Edge, R. M. and Meisenzahl, R. R. (2011), "The Unreliability of Credit-to-GDP Ratio Gaps in Real Time: Implications for Countercyclical Capital Buffers", *International Journal of Central Banking*, Vol. 7, No 4, December, pp. 261- 298.

Chart 3.1

Change of the Basel gap and the credit-to-GDP ratio

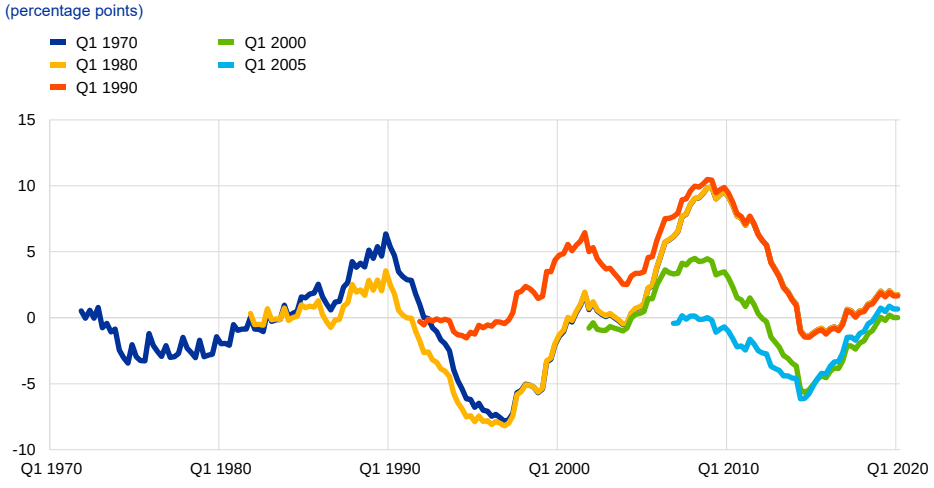


Sources: Eurostat, ECB, ECB calculations.

The credit-to-GDP gap measure is sensitive to the length of the time series available for computing it. ECB analysis finds that, if the time series is short – as is the case for many Member States – the gap measure can give the wrong signals in terms of the build-up of cyclical risks and the corresponding CCyB rate needed to address those risks. **Chart 3.2** shows that, even for the same underlying series for the bank credit-to-GDP ratio, using different starting dates to estimate the recursive HP-filter implies significantly different developments in the credit-to-GDP gap.

Chart 3.2

HP-filtered bank credit gaps based on different starting dates



Sources: Eurostat, ECB, ECB calculations.
Notes: The different credit gaps are based on the same underlying series for the bank credit-to-GDP ratio, although the starting date for estimating the recursive HP-filter is varied.

These shortcomings could generate issues of interpretation and communication for CCyB decisions and could argue against the mechanical application of the Basel gap. For instance, the gap could increase due to a decline

in GDP (which would happen during a crisis), which would be incorporated into its denominator, leading the ratio to increase during times of crisis when cyclical risks materialise. Repullo and Saurina (2011) argue that a mechanical application of the buffer would tend to raise capital requirements when GDP growth is low, and vice versa, thereby exacerbating the procyclicality of risk-sensitive bank capital regulation.[33]

There is now conclusive evidence that other early warning indicators of financial crises outperform the Basel gap in detecting the build-up of cyclical risks, particularly when combining the credit-to-GDP gap with other variables in a multivariate setting. ECB analysis[34] finds that, across the categories suggested for monitoring cyclical systemic risk in Recommendation ESRB/2014/1[35], a number of other indicators could have similar or even better in-sample and out-of-sample early warning properties than the Basel gap.[36] For the set of selected EU countries as a whole, credit gap variables are found to have slightly less information content than simple transformations of credit and asset price variables.[37] Importantly, Detken et al. (2014) find that, when the credit-to-GDP gap is combined with other variables in a multivariate signalling approach or in a discrete choice model, the overall signalling performance improves.[38] Lo Duca et al. (2017), using a financial crises database for European countries, confirm the finding that multivariate models can be an improvement on univariate signalling models.[39] This evidence, based on an analysis of data for EU countries, has also been confirmed in other recent studies, including by Tölö et al. (2018)[40], and Lang et al. (2019)[41].

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33 Repullo, R. and Saurina, J. (2011), "The countercyclical capital buffer of Basel III: a critical assessment", *CEPR Discussion Papers No 8304,* CEPR.

34 For details, see the results presented by Detken C., Fahr, S. and Lang, J.H. (2018), "Predicting the likelihood and severity of financial crises over the medium term with a Cyclical Systemic Risk Indicator (CSRI)", *Financial Stability Review*, Special Feature B, ECB, May, pp. 164-176.

35 Recommendation ESRB/2014/1 of the European Systemic Risk Board of 18 June 2014 on Guidance for setting countercyclical buffer rates (OJ C 293, 2.9.2014, p. 1).

36 The early warning properties are assessed based on the performance metric for the area under the receiver operating characteristic (AUROC).

37 In particular, the two-year change in the bank credit-to-GDP ratio presents in-sample and out-of-sample early warning properties that are considerably better than those of the Basel gap. The two-year change in the debt service ratio and the three-year change in the RRE price-to-income ratio are the next best early warning indicators in relation to the Basel gap. The two-year real credit growth rate has similar in-sample early warning performance to the Basel gap, although its out-of-sample performance is twice as good.

38 See Detken C. et al. (2014), "Operationalising the countercyclical capital buffer: indicator selection, threshold identification and calibration options", *Occasional Paper Series*, No 5, ESRB. The study considers different variables in a multivariate setting, including residential property price-to-income ratios, residential and commercial property price gaps, the debt service-to-income ratio for households, the overall debt service-to-income ratio, real bank and household credit growth, the current account-to-GDP ratio and real equity price growth.

39 Lo Duca, M., Koban, A., Basten, M., Bengtsson, E., Klaus, B., Kusmierczyk, P., Lang, J.H., Detken, C. and Peltonen, T. (2017), "A new database for financial crises in European countries", *Occasional Paper Series*, No 194, ECB.

40 See Tölö, E., Laakkonen, H. and Kalatie, S. (2018), "Evaluating indicators for use in setting the countercyclical capital buffer", *International Journal of Central Banking*, No 14 (2), pp. 51-112, March. In this paper, the authors propose specific suitable early warning indicators for setting the CCB based on an analysis of data for EU countries.

41 See Lang, J. H., Izzo, C., Fahr, S. and Ruzicka, J. (2019), "Anticipating the bust: a new cyclical systemic risk indicator to assess the likelihood and severity of financial crises", *Occasional Paper Series*, No 519, ECB. This paper presents a new domestic cyclical systemic risk indicator with predictive power for the likelihood and severity of financial crises.

Composite indicators based on multiple variables provide useful analytical tools for macroprudential policymakers. Detken et al. (2018) present a tractable, transparent and broad-based cyclical systemic risk indicator (CSRI) that captures risks stemming from domestic credit, real estate markets, asset prices, external imbalances and cross-country spillovers.[42] The CSRI increases, on average, several years before the onset of systemic financial crises and its level is highly correlated with measures of crisis severity. Model estimates suggest that high values of the CSRI contain information about large declines in real GDP growth three to four years down the road, as it precedes shifts in the entire distribution of future real GDP growth and, especially, of its left tail.[43]

The credit-to-GDP gap implies higher activation thresholds for the application of positive CCyB rates in comparison with composite CSRIs, and as such the CSRI could lead to more action. ECB analysis compares the activation thresholds and the target buffer rates for the Basel guide (based on the credit-to-GDP gap), the national preferred guide and the common composite indicator.[44] **Chart 3.3** relates the percentiles of the historical distributions of the Basel guide and the common composite indicator to the CCyB rates obtained based on such indicators. The Basel guide entails an activation threshold which is 10 percentage points higher than the corresponding threshold for the common composite indicator, meaning that the Basel guide may lead to inactivation of the CCyB, even when composite indicators trigger a positive CCyB. However, beyond the activation threshold the Basel guide triggers higher resulting rates than those implied by the common composite indicator.[45]

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42 See the Special Feature B of the ECB's May 2018 Financial Stability Review cited above.

43 The length of the crisis-prediction horizon is a key element for assessing the early warning performance of different indicators. The ability to predict a crisis event well in advance is crucial to allow for a gradual build-up of the CCyB in such a way that it can be fully deployed when the risk materialises. The study by Tölö et al. (2018) cited above analyses the early warning performance of different single indicators, also with regard to their crisis-prediction horizon. As Tables 7 and 8 of the study show, single indicators are classified into one of three categories, depending on whether they have a short-term (one to two years), medium-term (two to three years) or long-term (four to five years) prediction horizon. Composite indicators like the CSRI have the advantage of combining the early warning properties of single indicators, also from the point of view of maximising the length of the crisis-prediction horizon, as Detken et al. (2018) explain in the Special Feature B of the ECB's May 2018 Financial Stability Review cited above.

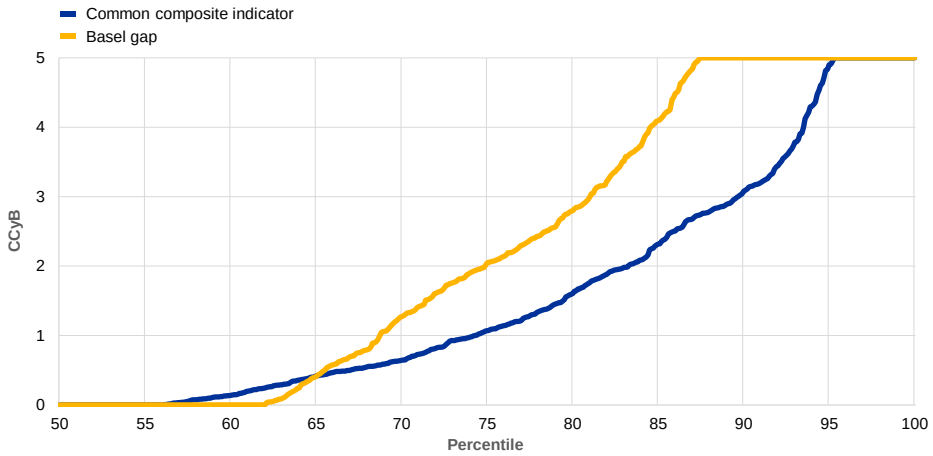
44 The assessment of the early warning properties of indicators may also depend on the preferences of policymakers in the balance between Type I errors (missing crises) and Type II errors (issuing false alarms), as reflected in their loss function. Some studies apply the relative usefulness measure to capture the difference between the loss that a policymaker obtains when using the early warning model and the loss when ignoring the model. See Alessi, L. and Detken, C. (2011), "Quasi real time early warning indicators for costly asset price boom/bust cycles", European Journal of Political Economy, Vol. 27(3), pp. 520-533. See also Sarlin, P. (2013), "On policymakers' loss functions and the evaluation of early warning systems", Working Paper Series, No 1509, ECB.

45 Differences due to the composition of the indicators may affect all phases of the financial cycle. The CCyB rates based on composite indicators tend to be more persistent before the crisis, decreasing just before the crisis begins, pointing towards the release. Historically, by contrast, Basel guides continue to increase in times of crisis.

Chart 3.3

The common composite indicator outperforms the Basel guide in detecting the build-up of risks for CCyB activation

(percentages)



Source: ECB Statistical Data Warehouse (SDW), ECB calculations.

Based on the above analytical evidence, excessive reliance on the Basel gap would not be appropriate for the calibration of the CCyB. This reliance might have been one of the important factors behind the very low aggregate CCyB (0.11% of total risk exposure amount (TREA)) built up in the euro area at the onset of the COVID-19 crisis despite several years of high credit growth and rising composite indicators of cyclical vulnerabilities. This would also explain the limited space for countercyclical capital to be released during the pandemic, and therefore the need to decrease other supposedly structural capital buffers, in order to provide capital relief to banks.

4 Analysis on the likely effects of O-SII leverage ratio buffers on bank resilience and an assessment of their implications for buffer usability

O-SII leverage ratio buffers would not generally materially improve bank resilience, as banks would remain mostly constrained by risk-based requirements even if O-SII leverage buffers were introduced. ECB analysis[46] shows that the introduction of O-SII leverage ratio buffers would increase capital requirements only slightly in aggregate[47]. Given that for most euro area banks the total capital required under the risk-based framework is greater than that required under the leverage ratio framework, the overall regulatory capital required would increase by roughly €3 billion, which is an increase of less than 0.3% or (0.04% of the TREA).[48] Furthermore, additional analysis using the approach of the ESRB analytical task force to the overlap between capital buffers and minimum requirements shows that the total usability of buffers (CBR and leverage ratio buffers combined) would increase by an average of 3 percentage points after the introduction of O-SII leverage ratio buffers.[49] This indicates that the benefit in terms of additional resilience and additional buffer usability will be rather small on average, but might be more significant for some G-SII/O-SII.

The usability of releasable buffers may be reduced to the extent that structural leverage ratio buffers overlap with risk-based CBR. Dipping into leverage ratio buffers would trigger MDA restrictions in the same way that dipping into risk-weighted capital buffers would. For banks which are reluctant to face MDA restrictions (see also Section 1 of this annex) this would imply that parts of the CBR, once released, may not be usable to the extent that there is an overlap with the (non-

[46] This analysis applies the Usability Simulation Tool (USIT), using Q4 2020 supervisory data for 111 banks subject to European banking supervision and compare outcomes under two scenarios. (1) G-SII scenario: G-SII leverage ratio buffer rate at 50% of G-SII RW buffer rate, no O-SII leverage ratio buffer in place. G-SII leverage ratio buffer to be met with T1. Note that the leverage ratio buffer for G-SIIs will apply only from January 2023. (2) G-SII + O-SII LRB scenario: G-SII leverage ratio buffer rate at 50% of G-SII RW buffer rate and O-SII leverage ratio buffer rate at 50% of O-SII RW buffer rate. G-SII and O-SII LRB to be met with T1. Interaction with MREL and forthcoming P2R for leverage ratio is not considered.

[47] Because risk-weighted O-SII buffer rates are currently higher than G-SII buffer rates for some G-SIIs, the introduction of an O-SII leverage ratio buffer would increase capital requirements in some G-SIIs as well.

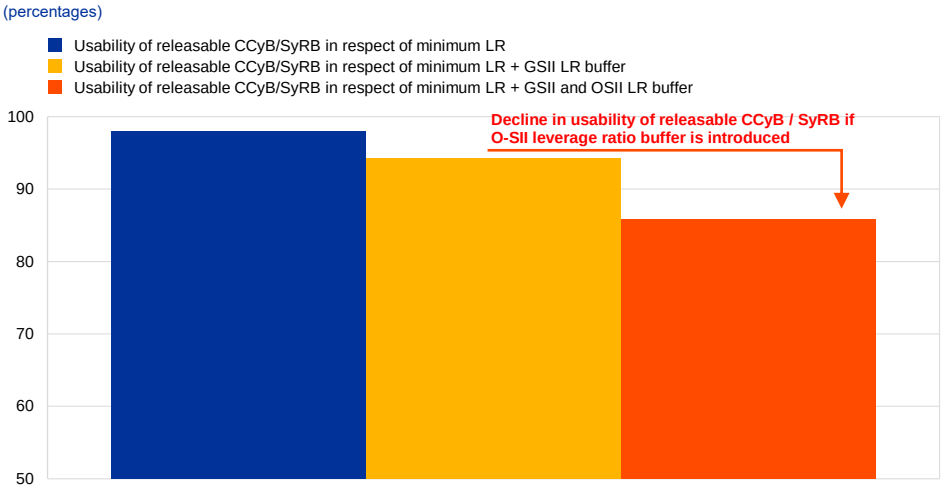
[48] For 91% of the 111 euro area banks in the sample, there would be no changes in capital requirements. For the remaining banks, capital requirements would increase from 3% to 22%, with affected banks concentrated in a few jurisdictions. In one Member State the overall increase in capital requirements would exceed 1% of the TREA, while in four other Member States the increase would not, on average, exceed 0.2% of the TREA. This increase in capital requirements could generally be easily absorbed by existing excess capital in the system, although certain individual banks would have to issue additional capital.

[49] Following the empirical approach adopted by the ESRB Analytical Task Force on the overlap between capital buffers and minimum requirements, total usability of buffers is measured as the unconstrained part of CBR and leverage ratio buffers, as a percentage of CBR. See also the Report of the Analytical Task Force on the overlap between capital buffers and minimum requirements (henceforth, the 'ATF Report').

released, structural) leverage ratio buffers. In this context, we define and calculate the usability of the releasable CBR as the share of CBR which, if released, is usable without dipping into leverage ratio requirements, including leverage ratio buffers.[50] The analysis shows that the average usability of a 1% releasable CBR (as defined above)[51] for the sample of banks will be reduced from 94% to 86% if, in addition to a G-SII leverage ratio buffer, an O-SII leverage ratio buffer were introduced. **Chart 4.1** illustrates this point, while detailed results by bank-type are demonstrated in **Table 4.1**. Potential impediments represented by structural leverage buffers to the usability of releasable risk-weighted buffers could be reduced, for example, through higher risk-based capital buffers or by mirroring releasable risk-based buffers in the leverage framework. Both these options would, on average, increase capital requirements.[52]

Chart 4.1

Changes in the usability of a 1% releasable CBR without dipping into leverage ratio requirements



Source: ECB.
Notes: Releasable buffer can be represented by a 1% CCyB on all exposures (or, equivalently, a 1% SyRB) placed on top of existing requirements as of end-2020. The blue bar shows the average usability of the releasable buffer as a percentage, in respect of 3% minimum leverage ratio (LR) requirements. That is the share of the releasable buffer that is usable without breaching the 3% LR minimum requirements. The yellow bar shows the usability of the releasable buffer as a percentage, in respect of the 3% LR minimum requirement and the G-SII LR buffer. The red bar shows the usability of the releasable buffer in respect of the 3% minimum LR requirements and the G-SII and O-SII LR buffers. That is the share of the releasable buffer that is usable without dipping into the respective LR buffers. MREL and forthcoming leverage. P2Rs are not taken into account.

50 The concept of usability of released buffers is analogous to the concept of "effective releasability" that is used in the ATF Report. Unlike in the ATF Report, the analysis here considers also impediments to usability of releasable buffers stemming from the presence of (non-releasable) leverage buffers.

51 The average usability of released buffers across the sample is calculated as the weighted mean of usability of released buffer over all individual banks, with each bank's share of total system CBR as weights.

52 See also the ATF Report.

Table 4.1

Usability of a releasable 1% CCyB / SyRB (i.e. the part of the releasable buffer that can be used without falling below the minimum leverage ratio buffer requirements)

(percentages)

Type	Usability of releasable buffer for LR minimum	Usability of releasable buffers for LR minimum + G-SII LR buffer	Usability of releasable buffer for LR minimum + G-SII LR buffer and O-SII LR buffer
All	97.53	93.99	85.98
G-SII	98.93	90.72	81.18
O-SII	96.99	96.99	88.8
Other	93.84	93.84	93.84

Source: ECB background analysis for CfA.
Notes: All banks are assumed to be holding a CCyB/SyRB at 1% of the TREA. Average usability of releasable buffers (CCyB / SyRB) for leverage ratio (LR) minimum is defined as the share of CCyB/SyRB that is usable without dipping into LR minimum requirements. Average usability of releasable buffers (CCyB / SyRB) for LR minimum + G-SII LR buffer (and O-SII LR buffer) is defined as the share of CCyB/SyRB that is usable without dipping into LR minimum requirements and G-SII (O-SII) LR buffers. MREL and forthcoming leverage P2R are not taken into account.

Introducing O-SII leverage ratio buffers in a manner which would not constrain the usability of releasable buffers, such as by mirroring the whole CBR, would require a fundamental change to the role of the leverage ratio in the framework. To ensure that leverage ratio buffers do not, in general, constrain the usability of releasable risk-weighted buffers, the entire CBR, including both structural and releasable buffers, could be mirrored in the leverage framework. This would improve total usability[53] of buffers without imposing impediments on the usability of releasable buffers (see ESRB ATF report).[54] However, the choice of conversion factor between risk-weighted buffers and leverage ratio buffers is not obvious. The extension of the current 50% conversion rate for the G-SII leverage ratio buffer to the entire CBR would lead to many more banks being constrained by the leverage ratio because the 50% conversion factor exceeds the average risk-weight density of banks subject to European banking supervision. On the other hand, using a conversion factor of below 50% would lead to possible inconsistency with Basel rules for the G-SII buffer, while using different conversion factors (e.g. 50% for a G-SII leverage ratio buffer and a lower conversion factor for other leverage ratio buffers) would add complexity to the EU capital framework. On the other hand, it can be argued that mirroring risk-weighted buffers to respective leverage ratio buffers would strengthen the role of the leverage ratio framework as an effective backstop and complementary requirement, also with regard to risk-weighted capital buffers. The implications of increased requirements could be, to some extent, reduced by a sufficiently long phase-in period.

Ensuring the leverage ratio buffers serve as an effective backstop would, however, require existing discrepancies to be addressed between risk-based

53 Total usability of buffers is understood as the unconstrained part of CBR and leverage ratio buffers, as a percentage of CBR. It therefore comprises both releasable and non-releasable buffers.

54 Another option would be to ease the consequences of dipping into leverage ratio buffers compared with CBR breaches. For example, distribution restrictions upon a breach could only be imposed if mandated by the authorities as, for instance, is now the case for risk-based buffers on top of MREL. However, this would imply differential treatment of the leverage ratio framework from the risk-based framework and would increase complexity and would also create inconsistency with international standards. Moreover, easing the consequences of the leverage ratio buffer could erode the role of the leverage ratio framework as an effective backstop. For these reasons, this alternative option is not desirable.

and leverage-based frameworks, and would create additional complexity. First, risk-weighted capital buffers are currently met by CET1 capital, while the G-SII leverage ratio buffer can also be met by Additional Tier 1 capital, which may not be readily available to absorb losses. Aligning the frameworks would therefore make it necessary to remove the possibility of meeting the leverage ratio buffer using Additional Tier 1 capital. Second, with a view to streamlining the overall framework, the leverage ratio buffers could be placed on top of leverage-based MREL, as is already the case in the United Kingdom. Introducing leverage buffers beyond G-SII may introduce additional complexity for bank capital management[55] and may also present challenges for buffer calibration by authorities.[56]

Given the above-mentioned complexities, additional leverage ratio buffers are not proposed by the ECB in the context of the current review[57]. However, further monitoring and assessment is warranted as restricted buffer usability undermines the effectiveness of macroprudential policy. Consistency in requirements between G-SIIs and O-SIIs and the sufficiency of risk-based buffers for banks with low risk weight density should also be considered. The European Commission, after consulting the ESRB and the European Banking Authority (EBA), should determine whether additional leverage ratio buffers should be introduced by the latest in the next review of the EU macroprudential framework.

The future discussion of the implications of leverage buffers should be also underpinned by the assessment of the usability of buffers when MREL is taken into account. It is important to acknowledge that the ECB analysis quantifies the usability of releasable buffers in respect of the leverage ratio, but not in respect of MREL for which intermediate targets apply since 2022 and fully phased in requirements apply by 2024. The O-SII leverage ratio buffer would, effectively, only reduce the usability of releasable buffers for those banks whose buffer usability is primarily constrained by the leverage ratio, as banks primarily constrained by MREL would not experience a further deterioration in buffer usability. After MREL is fully phased in, it might become the primary binding CET1 constraint for several banks under the current regulatory setup[58] and in such a case an O-SII leverage ratio buffer might not constrain the use of releasable capital beyond the impediments

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55 This could include having to monitor compliance with an addition prudential requirement and increasing the number of banks that would have to manage their distance to leverage buffer breach in terms of T1 capital compared to what is currently the case. Note that the G-SII leverage buffer will only be in place from January 2023 and experience of the complexities it poses for these banks is not yet available.

56 Buffers are currently calibrated within the risk-based framework and then, in the case of G-SII buffer, mechanistically mirrored in the leverage framework. This means that the size of the leverage buffer in nominal terms may far exceed the size of the corresponding risk-based buffer. While this feature ensures the backstop role of the leverage buffer, if extended to other buffers, it may lead to an excessive variation in effective buffer sizes between banks. As leverage buffers cannot be set directly, the authorities may decide to reduce the variation by amending the procedures they follow when setting the risk-based buffers. It could, however, be argued that the leverage buffer could improve level playing field between banks whose risk weight level differs and also improve their buffer usability.

57 A minority of Eurosystem members are, however, in favor of considering the introduction of additional leverage buffers already at this stage.

58 The ESRB ATF shows that, based on 2019 data and assumption of banks adjustments towards meeting MREL, MREL might in fact be the most binding constraint for many institutions when considering the bank specific CET1 components of the different parallel requirements. Whether MREL becomes the primary constraint for CET1 affecting buffer usability also depends on whether leverage ratio buffers are to be met with CET1 only and whether they can be counted towards non risk weighted MREL. The current G-SII LR buffer can be met with Tier 1 capital, and its interaction with MREL is unclear (see the ATF Report).

related to the MREL.[59] Additionally, the implications of CBR in the resolution stack (CBR on top of risk-based MREL) for buffer usability[60] would require further analysis and conceptual discussion.

[59] In this statement, it is assumed that the O-SII LR buffer only mirrors the risk-weighted O-SII buffer and that it is not placed on top of MREL.

[60] See Box 2 of the ATF Report.

5 Importance of granular and consistent lending standard indicators

Analysing and addressing vulnerabilities in the real estate sector is one of the key responsibilities of macroprudential authorities, who therefore need to have the necessary analytical frameworks and data in place. Both risk assessment and policy implementation depend crucially on the availability of reliable, granular and timely data on real estate markets. In particular, the distributions of lending standards indicators at origination, such as the loan-to-value (LTV), debt-service-to-income (DSTI) and loan-to-income (LTI) ratios are crucial to assess the risks inherent in housing loans as well as the risks related to the sustainability of household debt. Debt-to-income (DTI) and DSTI ratios provide information, respectively, about borrowers' overall repayment capacity and "liquidity" (i.e. their capacity to meet the regular loan repayments). As such, they are strongly related to borrowers' probability of default. On the other hand, the LTV ratio at origination reflects the amount of own funds borrowers have to provide in the financing of construction or the purchase of a real estate property. The lower the amount of own funds borrowers provide in real estate financing, the greater the LTV ratio at origination and the greater the potential loss banks may incur if borrowers defaults on their debt.

Availability of granular data on the lending standard indicators associated with residential real estate (RRE) is essential for the calibration and assessment of macroprudential measures, most notably borrower-based measures (BBMs), at the national level. For example, the availability of granular information on lending standards facilitates a detailed quantitative analysis of the effectiveness of BBMs. A cross-EU analysis based on the semi-structural approach followed by Gross and Poblacion (2017)[61], further refined in Giannoulakis et al. (2021, mimeo) and Jurca et al. (2020)[62], looks at the resilience benefits of implementing borrower-based measures (improvement in credit risk), while accounting also for second-round macro effects stemming from the credit-constraining effects of policy limits.[63] The impact of macroprudential policies is measured in terms of changes to resilience

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61 Gross, M. and Poblacion, J. (2017) "Assessing the efficacy of borrower-based macroprudential policy using an integrated micro-macro model for European households", Economic Modelling, Vol. 61, pp. 510-528.

62 Giannoulakis, S., Forletta, M., Gross, M. and Tereanu, E. (2021) *The Effectiveness of Borrower-Based Policies for Curbing Household Credit Risk – A Micro-Macro Model Approach*, ECB, mimeo (see also partial results in Ampudia, M., Lo Duca, M., Farkas, M., Perez-Quiros, G., Rünstler, G. and Tereanu, E. (2021). "On the effectiveness of macroprudential policy", *Discussion Papers*, No 2559, ECB, May). See also Jurca, P., Klacso, J., Tereanu, E., Forletta, M. and Gross, M. (2020) "The Effectiveness of Borrower-Based Macroprudential Measures: A Quantitative Analysis for Slovakia", *IMF Working Papers*, No 20/134; Neugebauer, K., Oliveira V. and Ramos, A. (2021) "Bridge over troubled water? The effectiveness of macroprudential policy during the Covid-19 pandemic in Portugal", *SUERF Policy Brief*, No 247; Cesnak, M., Klacso, J. and Vasil, R. (2021) "Cost-Benefit Analysis of Borrower-Based Measures in Slovakia", *SUERF Policy Brief*, No 206.

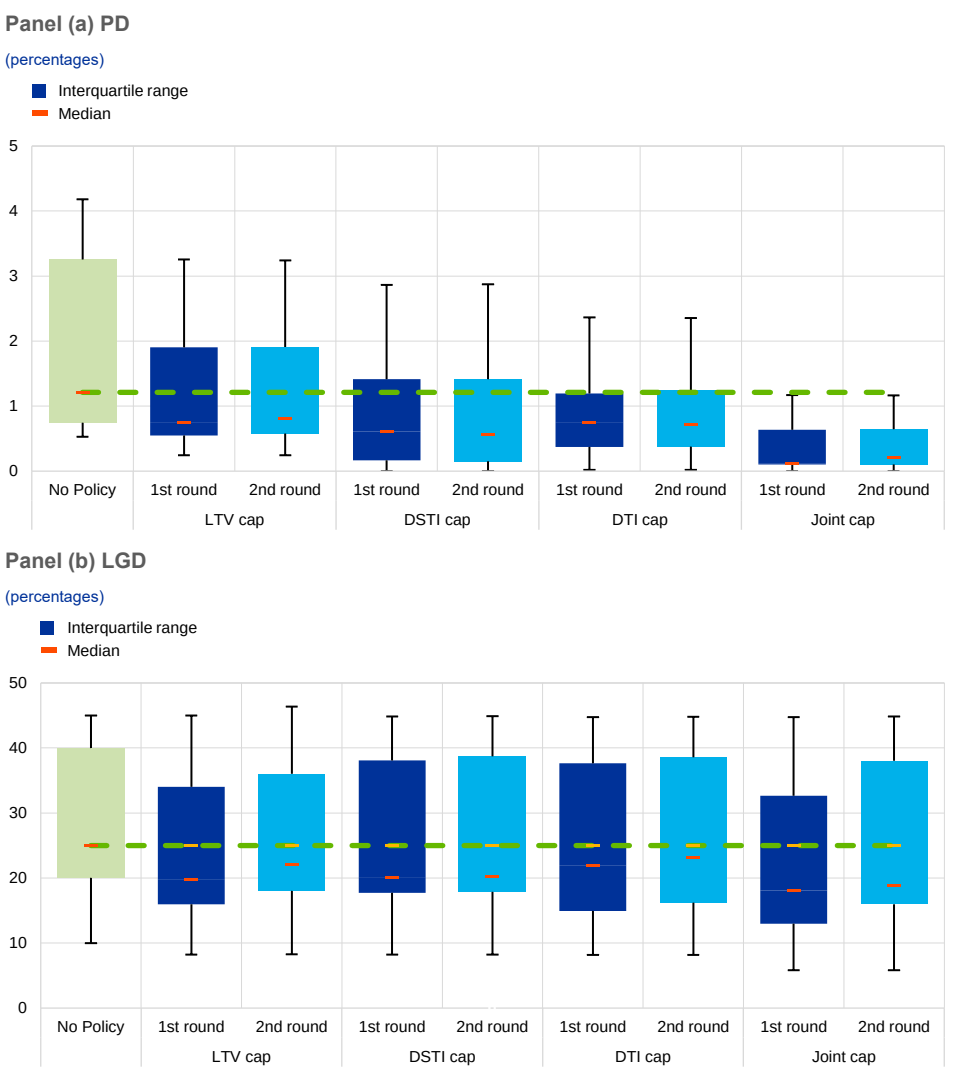
63 The methodology integrates an empirical micro module simulating the unemployment status of borrowers and a semi-structural macro module (SVAR) into a dynamic household balance simulator to determine the impact on household and bank resilience of borrower-based measures, compared with a no-policy scenario.

parameters, probability of default (PD), loss-given-default (LGD) and expected losses on bank mortgage portfolios, compared with a no-policy scenario. Borrower-based measures are also found to increase the quality of bank mortgage portfolios over time and, thereby, support banks' capital positions. Assuming a 100% pass-through of the simulated PDs and LGDs into the regulatory credit risk parameters associated with the mortgage loan exposures of banks[64], the median increase in the capital ratio across the 19 banking systems in the sample of countries is about 100 basis points, compared with a no-policy scenario. This effect is partial in that the impact of policy measures only translates into capital ratios via mortgage portfolios. About one-fifth of the contribution to improved solvency results from the reduction in loan loss provisioning, affecting the numerator of the capital adequacy ratio. The rest stems from the reduction in RWAs through the effect on the reduction in the credit risk parameters (PD and LGD) which are used in the calculation of risk weights.

[64] Borrower-based measures have been implemented sufficiently early to allow the new mortgage loan flows to feed into more resilient loan stocks on banks' balance sheets.

Chart 5.1

Median PDs and LGDs after the first and second-round effects of borrower-based measures



Sources: ECB calculations. Giannoulakis, S., Forletta, M., Gross, M. and Tereanu, E (2021), "The Effectiveness of Borrower-Based Policies for Curbing Household Credit Risk – A Micro-Macro Model Approach", ECB, mimeo (see also partial results in Ampudia, M., Lo Duca, M., Farkas, M., Perez-Quiros, G., Rünstler, G. and Tereanu, E. (2021), "On the effectiveness of macroprudential policy", Discussion Papers, ECB, No 2559).
Notes: Results are derived from a semi-structural, integrated micro-macro model framework simulating the behaviour of borrowing households and the associated dynamics of credit risk parameters in response to borrower-based measures. The chart on the left (right) displays the median and 25th-75th percentile distribution across households' simulated PDs (LGDs) aggregated at the country level across a sample of EU countries. The green bar and the respective median line refer to the PDs (LGDs) without borrower-based measures in place (no policies), the dark blue bars and the median lines refer to the first-round impact of the policy tightening in terms of increase in resilience (i.e. credit risk reduction via the decline in PDs(LGDs)), separately for each policy instrument (LTV, DSTI, DTI) and also for their joint constraint. The light blue bars and median lines also account for second-round negative macroeconomic effects from the policy induced negative credit demand shock.

The lack of comparable lending standards indicators across countries diminishes the reliability of financial stability analyses, making it difficult to accurately assess and compare risks and policy stances regarding BBMs across EU jurisdictions.[65] Earlier initiatives undertaken under the aegis of the ESRB and the ECB revealed the existence of significant gaps in the availability and

[65] See Cornacchia, W., Dierick, F., Pirovano, M. and Point, E., (2017), "Closing real estate data gaps for financial stability monitoring and macroprudential policy in the EU", in Bank for International Settlements (ed.), *Data needs and statistics compilation for macroprudential analysis*, Vol. 46.

comparability of real estate indicators across EU countries.[66] An important first step towards closing real estate data gaps was taken with the publication of Recommendation ESRB/2016/14[67] (later complemented and amended by ESRB/2019/3[68]) which set the foundations for establishing national frameworks for monitoring developments in residential and commercial real estate markets, based on a set of comparable, granular indicators. The ESRB Recommendation also contains a set of templates which guide the collection of statistical information on the distribution of lending standards at the national level.

The comparability of lending standards indicators at the EU level and the availability of corresponding statistical information supports knowledge exchange and enhances the use of BBMs across EU countries. BBMs on lending for RRE have become an effective and, therefore, important part of the national macroprudential toolkit in a number of Member States[69]. In line with the increasing activation of BBMs in the years since the financial crisis, the experience of implementation indicates that macroprudential limits to lending standards, in particular when limits to the share of loan financing in the overall financing of the construction or the purchase of RRE property (LTV) are combined with debt (service) limits relative to income, can provide effective support to financial stability in several ways. First, DTI and DSTI limits reduce the PD of individual borrowers by limiting indebtedness and debt servicing relative to income, while the aim of an LTV limit is to ensure that the value of the real estate property serving as collateral exceeds the value of the loans used in the financing of that property, reducing any losses in the case of a default. Second, when lending standards for new RRE lending are eroding, BBMs can reduce the riskiness of new lending flows and can gradually contribute to less risky mortgage lending stocks as the average riskiness of borrowers decreases[70]. In doing this, they may gradually reduce the need to tighten macroprudential risk weight measures on mortgage stocks. Third, they limit macro amplification effects (e.g. via lower consumption and investment), as more resilient borrowers are better positioned to absorb income and interest rate shocks. In addition, BBMs may contribute to "taming" the financial cycle by reducing credit growth.[71]

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66 See European Systemic Risk Board (2015), "Report on residential real estate and financial stability in the EU", December; and Boh et al. (2019), "European Macroprudential Database", *Statistics Paper Series*, No 3, ECB, December.

67 Recommendation ESRB/2016/14 of the European Systemic Risk Board of 31 October 2016 on closing real estate data gaps (OJ C 31, 31.1.2017, p. 1).

68 Recommendation ESRB/2019/3 of the European Systemic Risk Board of 21 March 2019 amending Recommendation ESRB/2016/14 on closing real estate data gaps (OJ C 271, 13.8.2019, p. 1).

69 See Chart 5.1, Chapter 5 of the ECB's Financial Stability Review, November 2019.

70 Model-based evidence indicates that the early implementation of borrower-based measures progressively translates into a reduced riskiness of mortgage portfolios through the impact on PDs and LGDs. In other words, resilience benefits tend to be more sizable if the measures effectively limit the accumulation of risk before a downturn occurs (Jurca, P., Klacso, J., Tereanu, E. and Gross, M. (2020), "The Effectiveness of Borrower-Based Macroprudential Measures: A Quantitative Analysis for Slovakia" *IMF Working Papers*, No 20/134, IMF.)

71 See Ampudia et al. 2021, "On the effectiveness of macroprudential policy", *Working Paper Series*, No 2559, ECB, May.

6 Impact of system-wide restrictions of distributions restrictions on banks

In times of crisis, when access to capital markets is limited, limiting payouts can contribute to banks' internal capital accumulation. Empirical analysis[72] suggests that bank dividend payouts are related to capitalisation, profitability, size and institutional framework. There are several arguments in favour of system-wide suspensions of distributions, such as supporting the critical function of banks in economic recovery, avoiding risk-shifting, mitigating procyclicality and avoiding stigma effects.[73] System-wide restrictions on distributions can complement and enhance the effectiveness of other prudential measures by helping to ensure that capital is used to support the real economy and absorb losses rather than make discretionary payouts.[74] It has been estimated that since the ECB Recommendation came into force, significant institutions kept around €27.5 billion in retained earnings, the equivalent of about 1.8% of shareholders' equity and 35% of total profits. Moreover, it has been calculated that these retained earnings could absorb an additional non-performing loan increase of around €60 billion.[75] Furthermore, the early evidence suggests that those banks which refrained from distributions in direct response to relevant recommendations increased their lending more than other banks. They increased their provisioning by around 5.5% relative to other banks, strengthening their capacity to absorb losses.[76]

On the other hand, research has demonstrated that the implementation of broad-based restrictions on distributions may negatively affect banks' valuations. The early evidence suggests that the introduction of system-wide restrictions could potentially create uncertainty over future payouts, which could have an adverse impact on bank valuations. It is estimated that the ECB recommendation on dividend distributions from March 2020 caused euro area banks' share prices to fall by 7% on average, clearly underperforming the broader market following the March announcement. However, the pattern was less visible for the two extensions (Chart 6.1).[77] Other analyses point to an average fall of 10% in stock prices for large banks in the euro area and the United Kingdom in the wake of communications on this matter from the ECB and the Bank of England[78]. As a consequence, investors'

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72 See Belloni, M., Grodzicki, M. and Jarmuzek, M. (2021), "What makes banks adjust dividend payouts?", *ECB Macroprudential Bulletin*, 28 June.

73 European Systemic Risk Board (2020), "System-wide restraints on dividend payments, share buybacks and other pay-outs", June.

74 Katsigianni, E., Klupa, K., Tumino, M. and Zsámboki, B. (2021), "System-wide measures on banks' distributions – motivations and challenges", *Macroprudential Bulletin*, Issue 13, ECB, June.

75 Gardó, S., Grodzicki, M. and Wendelborn, J. (2020), "Dividend payouts and share buybacks of global banks", *Financial Stability Review*, ECB, May.

76 Dautovic, E., Ponte Marques, A., Reghezza, A., Rodriguez d´Acri, C., Vila, D. and Wildmann, N. (2021), "Evaluating the benefits of euro area dividend restrictions on lending and provisioning", *Macroprudential Bulletin*, Issue 13, ECB.

77 Andreeva, D., Bochmann, P., Mosthaf, J. and Schneider, J. (2021), "Evaluating the impact of dividend restrictions on euro area bank valuations", *Macroprudential Bulletin*, Issue 13, ECB.

78 Hardy, B. (2021), "Covid-19 bank dividend payout restrictions: effects and trade-offs", *BIS Bulletin*, No 38, Bank for International Settlements.

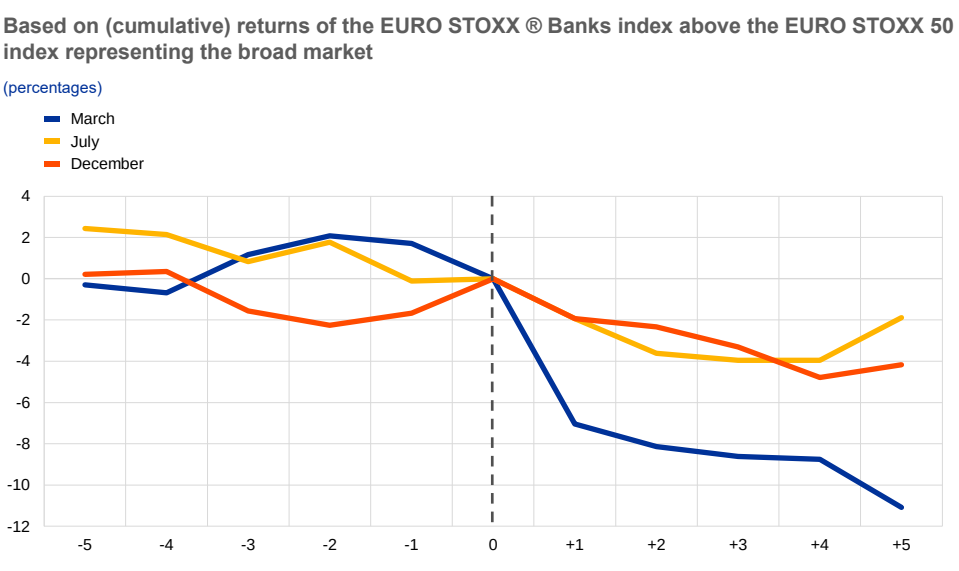
preferences for capital instruments that are subject to such restrictions could be affected, possibly hampering the ability of banks to raise additional capital and increasing their cost of capital, which could have a negative effect on the long-term sustainability of institutions and markets. System-wide restrictions on distributions could also negatively affect investors who rely on dividend income. Although investors would be able to sell their shares under normal circumstances, this could be hindered in periods of severe crisis[79].

However, restrictions also enable bank shareholders to benefit from the positive impact of reduced systemic risk and higher stability, in a context in which higher solvency reduces the tail risk of a loss of capital investment in shareholders' own banks and, hence, increases the chances of profiting from the bank's recovery. In addition, restrictions help to mitigate uncertainty, as higher solvency reduces uncertainty and risk for unsecured bondholders and depositors, as well as for shareholders (tail risk).

Overall, it is not clear why the power to set legally binding restrictions would have an additional effect on bank valuations and refinancing costs compared with the precedent set by the already-observed effect stemming from the non-binding recommendation during the pandemic in the EU.

Chart 6.1

Euro area banks' cumulative returns pre and post dividend recommendation (extension) announcement, compared with the market in general



Sources: Bloomberg and ECB calculations from the article entitled "Evaluating the impact of dividend restrictions on euro area bank valuations", Macroprudential Bulletin, No 13, ECB.

[79] European Systemic Risk Board (2020), "System-wide restraints on dividend payments, share buybacks and other pay-outs", June.

7 Analysis of the importance of macroprudential adjustments to risk weights

7.1 Motivation for risk weight measures when sectoral SyRB is available

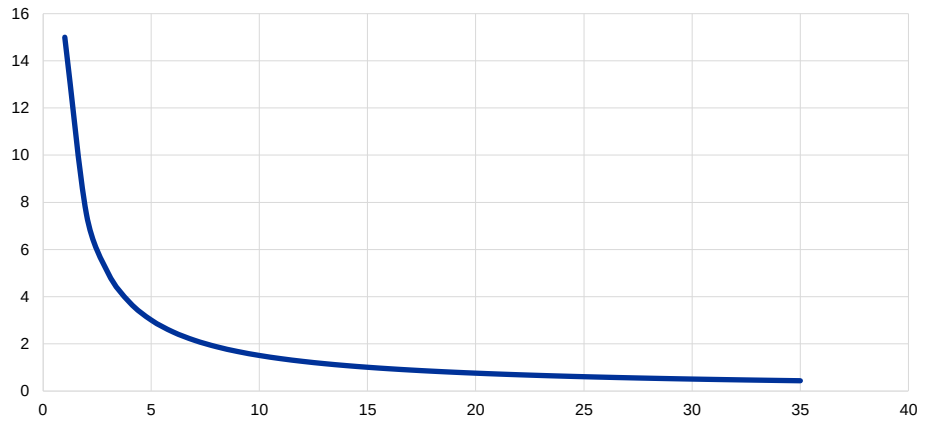
The sectoral SyRB cannot fully replace a risk weight measure, although it could be more effectively used in cases where exposures have relatively high risk weights. This can be shown by assessing the sectoral SyRB rate that would produce the same capital effect as a 1 percentage point increase in risk weights, depending on the initial risk weight level (**Chart 7.1**). For example, increasing risk weights from 3% to 4% would increase capital requirements for the targeted exposure by one-third. The same impact could also be achieved by increasing the capital requirements ratio applicable to the targeted exposure by one-third. This would require a sectoral SyRB of about 5%. On the other hand, increasing risk weights from 34% to 35% would be equivalent to a sectoral SyRB of about only 0.4%. This is because a given increase of a risk weight has a relatively larger impact on capital requirements in percentage terms when risk weights are low.[80]

[80] These results are derived by equating the capital impact of a risk weight measure with the capital impact of a sectoral SyRB. The capital impact of a risk weight measure is the change in risk weights multiplied by the exposure value and the capital requirements ratio. The capital impact of a sectoral SyRB is the product of the actual risk weight, the exposure value and the sectoral SyRB rate. This means that the sectoral SyRB with the same capital effect as the risk weight measure is equal to the relative change in risk weights multiplied by the capital requirements ratio. As increasing risk weights from 3% to 4% would mean a 33% increase in capital requirements on the targeted exposure, while increasing risk weights from 34 to 35% would imply only a 3% relative increase, much lower SyRB would suffice to achieve the same effect.

Chart 7.1

Sectoral SyRB rate producing an increase in capital requirements equivalent to a 1 percentage point increase of a risk weight

(y-axis: equivalent sectoral SyRB rate, x-axis: initial risk weight, percentages)



Note: Assuming a capital requirements ratio of 15%.

When the underlying risk weights are low or the capital requirements ratio is high[81], the sectoral SyRB will have to be set at a particularly high level to achieve the same intended capital impact as an increase in risk weights. Notification received from the Swedish authority in 2021[82] demonstrates that in the case of very low risk weights a sectoral SyRB of around 100% would be necessary to produce the same effect as the 25% risk weight floor for Swedish banks. High sectoral SyRB rates would, nevertheless, also be necessary in different set-ups. For instance, a sectoral SyRB of 30% would be needed to increase capital requirements by the same magnitude as an increase in risk weights from 5% to 15%.[83] If a capital increase corresponding to a risk weight level of 15% is assumed to be the macroprudential policy target, a 3% sectoral SyRB could only have the desired effect if the initial level of risk weight were above 12.5%.[84]

Sectoral SyRB rates increase capital requirements more significantly in nominal terms for banks with high risk weights, which may not be warranted if systemic risk primarily originates in banks with low risk weights. Unlike risk weight floors, which target low risk-weight exposures directly, a sectoral SyRB rate (unless it is adjusted for different banks) would increase capital requirements most for banks with higher initial risk weights. For example, let us suppose the regulator wished to implicitly increase risk weights to 15% for three banks with initial risk

81 The capital requirements ratio is understood here as Pillar 1, Pillar 2 and CBR as a proportion of the TREA. Any risk weight measure increases the TREA of a bank to which all of Pillar 1, Pillar 2 and CBR apply, while a sectoral SyRB is imposed on a fixed TREA. A higher capital requirements ratio increases the capital impact of any risk weight measure and therefore necessitates a higher sectoral SyRB rate to achieve the same capital effect.

82 Notification from Finansinspektionen, September 2021.

83 This is calculated as [(15-5)/5] * 15, assuming a 15% capital requirements ratio, comprised of Pillar 1, Pillar 2 and CBR, and roughly corresponding to the EU/euro area average capital requirement under normal circumstances.

84 This is calculated as [(15-x)/x]* 15 = 3, where x is the initial risk weight level. Once again, a 15% capital requirements ratio is assumed.

weights of 3% (Bank A), 5% (Bank B) and 10% (Bank C) respectively. Using Bank B as a reference point, a sectoral SyRB rate of 30%, which would be equivalent to an implicit risk weight of 15%, is set for all three banks. This increases the capital charge on a mortgage with an exposure value of 100 from 0.45 to 1.35 for Bank A and from 1.50 to 4.50 for Bank C[85], meaning that Bank C will have to hold over three times as much capital as bank A to cover the same macroprudential risk. With higher initial risk weights, the equivalent sectoral SyRBs are smaller (and the coefficient of variation between banks' risk weights is likely to decline too), which reduces the extent of this potentially distortionary effect.

The different nature of the specific systemic risk targeted affects the optimal design of the measure. For systemic risks that are expected to cause a minimum unexpected loss for all exposures, a risk-weight floor would appear to be appropriate: this ensures that every bank has at least a certain minimum amount of capital for every exposure. This type of design has been used by Estonia, the Netherlands, Finland, Sweden and Norway.[86] On the other hand, for systemic risks that will increase unexpected losses equally for all exposures, regardless of their risk weights, a risk-weight add-on would appear to be the appropriate macroprudential measure: this ensures that the same additional amount of capital is required for all exposures. This design was used by Belgium in 2013. Finally, if systemic risk is expected to increase unexpected losses in proportion to the underlying riskiness of the exposure, then a risk-weight multiplier would appear to be appropriate: this ensures that more additional capital is available for exposures with higher risk weights. The multiplier design complemented the add-on design in Belgium in 2017. This suggests that the flexibility offered by the various risk-weight policy designs makes it possible to cater policy responses to the specific vulnerabilities that individual authorities face and need to address. The flexibility in the design of the risk-weight measures needs to be upheld.

7.2 The importance of risk-weight measures after Basel III is implemented

Macroprudential risk-weight measures will not be redundant following the implementation of the Basel III reforms. ECB analysis suggests that the implementation of input and output floors is unlikely to lead to a sufficiently large increase in risk weights to eliminate the need for macroprudential intervention. Moreover, the objectives of input and output floors differ from those of macroprudential risk-weight measures. The analysis below assumes that Basel III reforms are implemented in the EU in complete alignment with the Basel agreement.

While Basel III will increase the PD floors, it will not generate the same impact as macroprudential measures tightening the level of risk weights. Basel III will increase the PD floor for residential mortgages from its current level of 0.03%[87] to

[85] Assuming once again a 15% capital requirements ratio.

[86] In the case of the Netherlands, the floor was differentiated according to the average LTV in the portfolio. See Notification by De Nederlandsche Bank from March 2020.

[87] Article 163(1) of the CRR.

0.05%. While this change could be relevant for some portfolios, its impact on risk weights for residential mortgages will be very small, in particular for mortgages with low LGDs.[88] At a LGD floor of 10%[89], the resulting risk weight would increase from 0.9% to 1.4%. Even with a very conservative 45% LGD parameter, the resulting risk weight would not exceed 7%. This demonstrates that the 0.05% PD floor cannot by itself ensure that risk weights would fall in the range that some authorities consider to be sufficient from a macroprudential viewpoint (**Table 7.1**). Taking into account the LGD values of 10-20% that correspond to the estimates of the overvaluation of property prices in some EU countries,[90] the PD needs to be in the range of 0.5% to 1.35% in order to generate a risk weight of about 15%, which corresponds to the actions the authorities have taken under Article 458 of the CRR[91] (**Table 7.1**).

Table 7.1

Resulting risk weight for a given combination of PD and LGD parameters for residential mortgages

		LGD							
		45%	40%	35%	30%	25%	20%	15%	10%
PD	0.03%	4.1%	3.7%	3.2%	2.8%	2.3%	1.8%	1.4%	0.9%
	0.05%	6.2%	5.5%	4.8%	4.2%	3.5%	2.8%	2.1%	1.4%
	0.10%	10.7%	9.5%	8.3%	7.1%	5.9%	4.8%	3.6%	2.4%
	0.20%	18.1%	16.1%	14.0%	12.0%	10.0%	8.0%	6.0%	4.0%
	0.30%	24.3%	21.6%	18.9%	16.2%	13.5%	10.8%	8.1%	5.4%
	0.40%	29.9%	26.6%	23.3%	20.0%	16.6%	13.3%	10.0%	6.7%
	0.50%	35.1%	31.2%	27.3%	23.4%	19.5%	15.6%	11.7%	7.8%
	0.60%	39.8%	35.4%	31.0%	26.6%	22.1%	17.7%	13.3%	8.9%
	0.70%	44.3%	39.4%	34.5%	29.5%	24.6%	19.7%	14.8%	9.8%
	0.80%	48.5%	43.2%	37.8%	32.4%	27.0%	21.6%	16.2%	10.8%
	0.90%	52.6%	46.7%	40.9%	35.0%	29.2%	23.4%	17.5%	11.7%
	1.00%	56.4%	50.1%	43.9%	37.6%	31.3%	25.1%	18.8%	12.5%
	1.10%	60.1%	53.4%	46.7%	40.0%	33.4%	26.7%	20.0%	13.3%
	1.20%	63.6%	56.5%	49.5%	42.4%	35.3%	28.3%	21.2%	14.1%
	1.30%	67.0%	59.6%	52.1%	44.7%	37.2%	29.8%	22.3%	14.9%
	1.40%	70.3%	62.5%	54.7%	46.8%	39.0%	31.2%	23.4%	15.6%
	1.50%	73.4%	65.3%	57.1%	49.0%	40.8%	32.6%	24.5%	16.3%
	2.00%	87.9%	78.2%	68.4%	58.6%	48.9%	39.1%	29.3%	19.5%

Source: ECB calculations.
Notes: Risk weights lower than 15% are highlighted in grey. A version of the formula without the 1.06 scaling factor present in the current Article 154(1) of the CRR is used as this scaling factor will be discontinued in Basel standards from 1 January 2023 (see Basel Committee on Banking Supervision (2017), High-level summary of Basel III reforms, BIS, p.2). Note that current risk weights would be 6% (not to be mistaken for 6 percentage points) higher than shown in the table, which would not change the results materially.

88 See Section 4.3.2 of the EBA's Basel III reforms: Impact study and key recommendations and Section 4.2.3(i) of the EBA's Policy advice on the Basel III reforms: credit risk.

89 Article 164 of the CRR.

90 The ECB's model of the overvaluation of property prices, using data mostly from the third quarter of 2018, published in the ESRB Report on vulnerabilities in the RRE sector shows that in countries exhibiting house price overvaluation, the average overvaluation is 14.9%.

91 Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012 (OJ L 176, 27.6.2013, p. 1).

Moreover, while the Basel output floor has the potential to address low risk weights in some internal ratings-based (IRB) banks, it is not specifically designed to address macroprudential risks in the RRE market. The Basel III output floor will safeguard against the excessive deviation of IRB banks' capital requirements from their counterparts using the standardised approach to credit risk. The TREA of IRB banks cannot fall below 72.5% of the TREA calculated using the standardised approaches. If banks only have a residential mortgages portfolio, that will set a floor for the respective risk weights at around 25%[92]. However, the presence of additional exposures on banks' balance sheets could lead to a situation where banks could still have a very low risk weight for their mortgage portfolios from the perspective of systemic RRE, despite staying above the output floor.

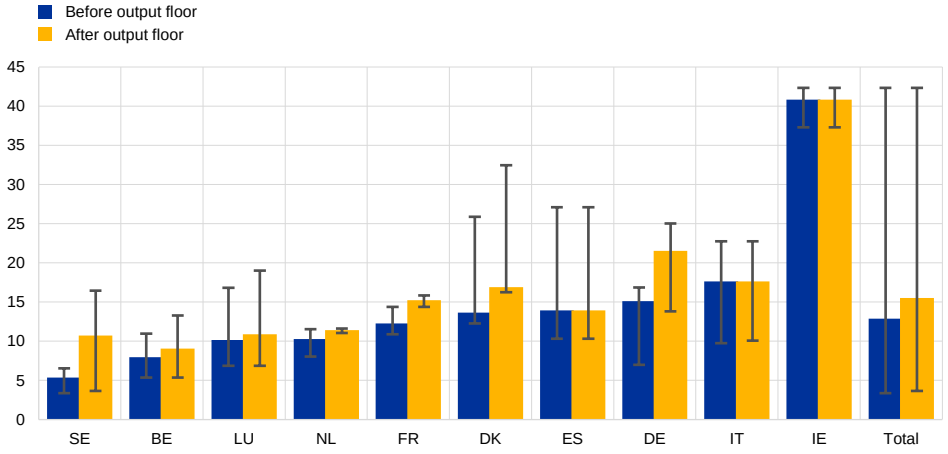
An empirical exercise shows that for some banks with low risk weights for residential mortgages the implementation of the output floor may only have a small impact. To demonstrate this, an increase in the TREA generated by the output floor was attributed to the IRB RRE portfolio in order to approximate the implied RRE risk weight once the output floor had been implemented. As the output floor does not apply at the level of the RRE portfolio, the analysis assumes that any additional TREA is attributed in proportion to the unweighted RWAs in the IRB mortgages portfolio, relative to total assets. For a sample of 38 large EU banks for which data were available, the Basel III output floor increases the TREA relative to a post-Basel III situation without any floor in place in 19 out of 38 banks. The average increase in the TREA is 16.7% in the affected banks. The weighted average risk weight increases from 14.7% to 17% However, more than 25% of banks remain with risk weights below 15% even after the output floor has been implemented. Generally, banks representing a total share of assets of 52% of the sample of 38 banks remain under the 15% risk weight level. Country results support the findings that while the output floor is expected to increase the implied RRE IRB risk weights, in some jurisdictions their level will not be comparable with the level required in the past to address macroprudential risks (**Chart 7.2**).

[92] 72.5% of a 35% preferential risk weight for exposures fully and completely secured by a mortgage on RRE.

Chart 7.2

Changes in IRB RRE risk weights due to Basel III output floor per country (before macroprudential interventions)

(IRB risk weight for residential mortgages before and after Basel III output floor, percentages)



Source: EBA, ECB calculations.
Notes: The bars show volume-weighted averages, where the blue bars show current levels and yellow bars show the outcomes after the Basel III output floor. The black bars highlight the minimum and maximum bank value in each Member State. The list of Member States included reflects confidentiality considerations. The Member State reflects a bank's domicile rather than the location of borrowers or real estate collateral. Macroprudential measures tightening risk weights via Article 458 of the CRR are not reflected in the chart, as the need for such macroprudential interventions is assessed after the output floor is in place. Based on a sample of 38 banks as of end-2019.

8 Differences in O-SII buffer setting practices across the euro area

As stated in the Capital Requirements Directive (CRD)[93], the O-SII buffer is set with the aim of limiting negative externalities that the failure of a systemically important bank could pose to the domestic financial system and the wider economy. The EBA Guidelines strengthened harmonisation in respect of the identification of O-SIIs across Member States.[94] Heterogeneity in the calibration of O-SII buffers has been partly reduced in the banking union since the introduction of the ECB's O-SII buffer floor methodology in 2016. The floor has led to an increase in the O-SII buffers at the lower end, aimed at addressing concerns over insufficient capital being held by systemically important banks.[95]

Notwithstanding the reduction in heterogeneity, national buffer-setting practices continue to vary, leading to different requirements for banks with the same O-SII scores across countries. The relationship between buffer rates and scores has varied across countries which are members of the banking union (see Chart 8.1). A paper by Sigmund (2019)[96], using publicly available data to infer the relationship between scores and buffer rates, provides econometric evidence that cross-country practices differed substantially and that adopting a specific national practice across the EU would have led to a radically different level of O-SII buffers.

93 Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC (OJ L 176, 27.6.2013, p. 338).

94 See Guidelines on criteria to assess other systemically important institutions (O-SIIs).

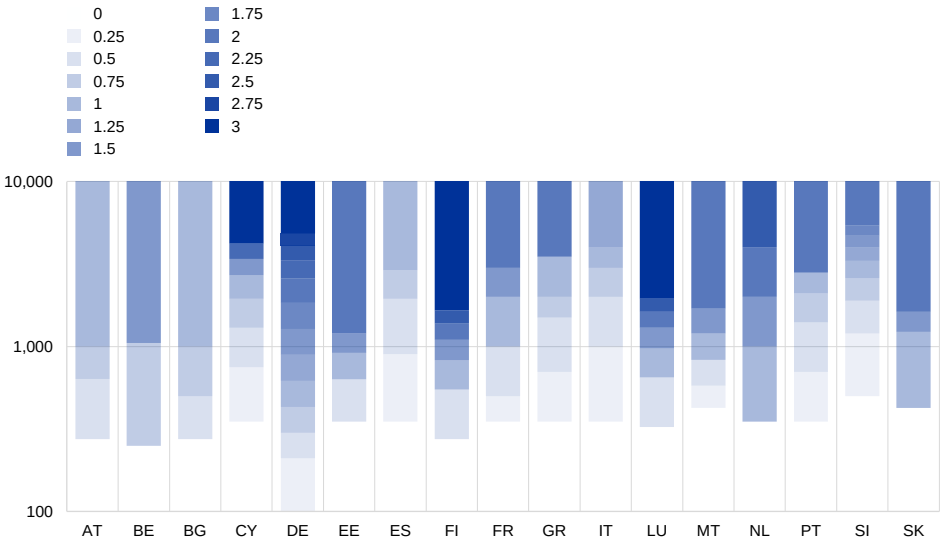
95 See Behn, M., Cappelletti, G., Kaltwasser, P., Kolb, M., Pawlikowski, A., Tracol, K., Salleo, C., and van der Kraaij, A. (2017), ECB floor methodology for setting the capital buffer for an identified Other Systemically Important Institution (O-SII), *Macroprudential Bulletin*, No 3, ECB.

96 Sigmund, M. (2019), *The Capital Buffer Calibration for Other Systemically Important Institutions – Is There Too Much Country Heterogeneity?*, memo.

Chart 8.1

The relationship between buckets for O-SII buffer rates and scores in selected countries subject to European banking supervision

(O-SII buffer rates by countries, percentages; y-axis: O-SII scores, logarithmic scale, basis points)



Sources: ECB and 2021 O-SII notifications.
Notes: Country ordering follows buffer rates and bucket widths: the further to the right, the lower the buffer rate assigned to the top bucket and the higher the threshold for the top bucket. Not all buckets are populated. The chart only covers those countries for which the calibration methodology features an explicit bucketing approach linking O-SII scores and buffer rates. For Belgium and the Netherlands, which do not disclose the threshold between two buckets, it is assumed that this threshold lies mid-way between the highest score of an O-SII assigned to bucket 1 and the lowest score of an O-SII assigned to bucket 2. A logarithmic scale is used to present O-SII scores for readability purposes.

The large variation in O-SII buffers cannot be fully explained by different levels of systemic risk. O-SII buffers do not necessarily increase with higher levels of systemic importance when indicators which are not part of the EBA O-SII framework are treated as proxies for systemic importance. Alternative proxies for banks' systemic importance include the ratio of banks' size to domestic GDP and an indicator capturing banks' share of the financing of the domestic real economy. While banks with higher asset-to-GDP ratios tend to be assigned higher buffer rates, a significant degree of variation in buffer rates for banks of relatively similar size is observed (see **Chart 8.2**, panel a). Also, there is a pronounced variation of buffer rates among banks which play a very important role in extending credit to their domestic private non-financial sector (see **Chart 8.2**, panel b). Some of the O-SIIs required to hold high buffers stand out among their euro area peers as being relatively small, both in terms of total assets and in terms of exposure to the domestic real economy. In some countries, the O-SII methodology[97] may also have been effectively capped by the applicable G-SII buffer rates of G-SIIs in those jurisdictions, leading to smaller O-SII buffer rates in those countries overall. For subsidiaries of EU banks, which are designated as O-SIIs, the binding requirement is constrained by the subsidiary cap (which is set to 1 percentage point above the buffer rate set for the parent institution), although this only applies to a limited number of banks.

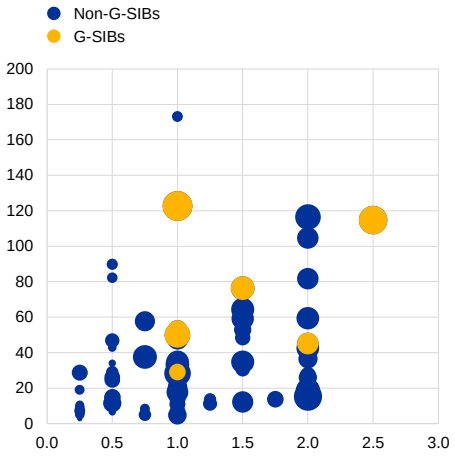
[97] See also the ESRB Review of macroprudential policy in the EU in 2019. There is no legal restriction on setting O-SII buffer rates higher than G-SII buffer rates. G-SIIs have to meet the higher of the applicable G-SII and the O-SII buffer.

Chart 8.2

The relationship between O-SII buffer rates and bank size and substitutability

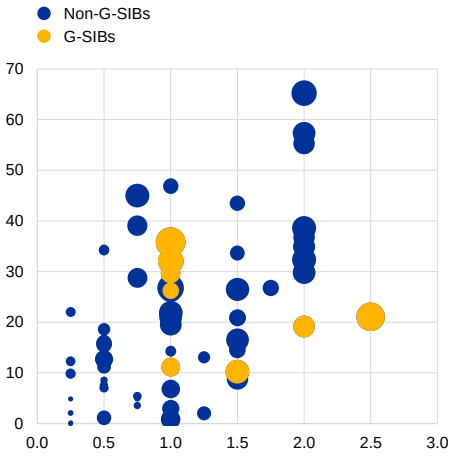
a) O-SII buffers and bank assets to GDP

(y-axis: bank assets to GDP; percentages; x-axis: O-SII buffer rates; percentages; bubble size corresponds to the O-SII scores reported in the 2021 notifications)



b) O-SII buffers and domestic real economy exposure

(y-axis: share in exposure to domestic real economy; percentages; x-axis: O-SII buffer rates; percentages; bubble size corresponds to the O-SII scores reported in the 2021 notifications)



Sources: ECB calculations, ECB and supervisory data and notifications by national authorities.
Notes: Panel (a):Total assets divided by nominal GDP for 97 O-SIIs. Panel (b): Bank loans to domestic households and firms over total loans to domestic non-financial private sector for 71 O-SIIs. G-SIB refers to global systemically important bank.

An econometric model has been developed in order to assess the variation of O-SII buffer rates in the light of the scores and alternative indicators. This model was developed to assess the probability that a given O-SII would be assigned any of the buffer rates permitted under CRD. It does not seek to assess whether the absolute level of O-SII buffers is appropriate – rather it helps to identify the variation in country-specific buffer-setting practices. An ordered probit model was fitted to the cross-section of O-SII buffer data,[98] using three specifications:

- using the O-SII score as the explanatory variable;
- using alternative indicators such as the banks' RWAs, the relative size of the bank (total assets of the bank over total assets of the domicile's banking system), the financial cycle indicator based on Schüler et al. (2015)[99] which measures the position in the financial cycle of the bank's home country, the size of the country's banking system (total assets) and the concentration on financing the economy (the market share of the bank with regard to financing NFCs and households);[100]
- using the principal components of the alternative indicators and the variables used in the standard EBA methodology for determining scores.

98 Owing to the very limited variance of O-SII buffer rates over time, the value added associated with employing the full panel of data would be limited.

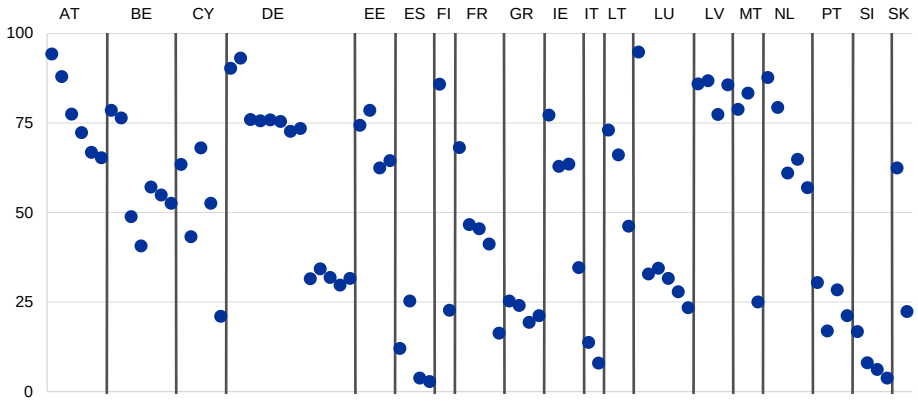
99 Schüler, Y., Hiebert, P. and Peltonen, T. (2015), "Characterising the financial cycle: a multivariate and time-varying approach", *Working Papers*, No 1846, ECB.

100 A wide range of other explanatory variables was tested and the final selection was performed in order to avoid multicollinearity issues which would be difficult to account for in a simple ordered probit model.

Chart 8.3

The variation of O-SII buffer rates cannot be fully explained by bank-specific and country-specific characteristics

(relative position (percentile) of actual buffer rates in the distributions of buffer rates obtained from the benchmarking models(percentages))



Source: ECB calculations based on ECB data.
Notes: The dots represent the positions of each O-SII's actual buffer rates vis-à-vis their buffer rates implied from the model, evaluated at O-SII-specific covariates. Values above 50 indicate that actual buffer rates are higher than the fitted buffers rate implied from the model. Each dot represents a single O-SII. O-SIIs are ordered by country, and by O-SII buffer rate within a country, with a descending order of buffer rates. The topping-up of O-SII buffers with systemic risk buffers is not accounted for in the analysis. Probabilities refer to the average probability from the three model specifications. Owing to the unavailability of some input data, distributions cannot be calculated for some O-SIIs. Buffer rates refer to their fully-loaded levels announced in 2018. Revisions of the O-SII buffer rates, especially in view of the entry into force of CRD V (Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC (OJ L 176, 27.6.2013, p. 338)), may have reduced some of the observed buffers at the upper end of the buffer range.

The resulting benchmarking model provides further evidence of high buffer variance among O-SII peers, even after accounting for bank-specific and country-specific indicators not captured by the O-SII score. The ordered probit model yields a probability distribution of the O-SII buffer rate that a bank should be assigned, conditional on observed bank-specific and country-specific explanatory variables.[101] As the model is estimated based on actual buffer-setting practices in 19 euro area countries, this is a benchmarking exercise that does not assess whether a specific buffer rate is adequate, excessive or insufficient in absolute terms. National specificities not captured by the model may well explain some of these differences. As the heterogeneity of practices at the lower end of the distribution has been addressed by the implementation of the ECB floor, the model can be used to identify clusters of banks for which the buffers deviate far from the median towards the upper tail of the model-implied distribution (see **Chart 8.3**).

Some features of the current heterogeneous buffer-setting practices could unintentionally create disincentives for cross-border mergers. An ECB analysis shows that the O-SII requirements of a merged cross-border bank would depend

[101] The exercise involves two steps. The first is to determine a link between potential buffer rates and the probability that the bank will be assigned these buffer rates based on the bank and country-specific explanatory variables. This link is referred to as bank-specific probability distribution and is an outcome of evaluating the ordered probit model via marginal analysis. The second step is to compare the expected buffer rate stemming from the probability distribution (averaged across the three specifications) with the actual buffer rate of the bank, and to assess the resulting difference in terms of the percentiles of the probability distribution.

crucially on the location of the head office.[102] The buffer size may be affected by country-specific heterogeneous buffer settings and surcharges for cross-border exposure within the banking union.[103]

The absence of a commonly recognised methodology for measuring absolute systemic importance complicates the economic assessment of O-SII buffer appropriateness. Most macroprudential authorities in SSM-participating countries rely on bucketing approaches, which assign larger buffer rates to banks with a larger share of banking activities in the domestic market. This does not, however, shed light on whether the buffer rate can sufficiently mitigate risk for the financial system. While the model-based approaches used by some authorities to inform the calibration of O-SII buffers offer a perspective on the appropriateness of absolute O-SII buffers, the EBA report on the calibration of O-SII buffers concludes that it would be premature to commit to using any of the available national methods at the EU level. The methods currently available, such as the Equal Expected Impact approach, can yield a very broad range of results depending on the assumptions made, so further work is warranted.[104]

[102] Figueiras, I., Gardó, S., Grodzicki, M., Klaus, B., Lebastard, L., Meller, B. and Wakker, W. (2021), "Bank mergers and acquisitions in the euro area: drivers and implications for bank performance", *Financial Stability Review*, ECB, November.

[103] The O-SII buffer requirement for a merged bank can vary significantly, depending on the merger direction. Under current national O-SII frameworks, there are two country-specific factors that influence the size of a merged bank's O-SII buffer: the relative size of the acquirer's domestic banking sector and national buffer-setting practices. Our analysis indicates that the size of the merged bank's O-SII buffer is driven by the national buffer-setting practice rather than its importance to the acquirer's domestic banking sector. For the largest banks under European banking supervision, the difference in O-SII buffer rates in a hypothetical cross-border merger can be as high as 1.75 percentage points, depending on the direction of the merger. In the banking union, such buffer-setting practices offer an advantage to acquirers based in countries where O-SII buffers are set at relatively low levels.

[104] See also EBA Report on the appropriate methodology to calibrate O-SII buffer rates for an overview of methods and their pros and cons.

9 Amending the additivity rules of the general and sectoral SyRB when considering EU governance thresholds

According to the CRD, each Member State may introduce a SyRB, for the financial sector or one or more subsets of that sector, on all or a subset of exposures. The setting of the SyRB, both on a standalone basis and when combined with other structural buffers, is subject to a complex set of thresholds triggering EU governance, as presented in **Table 9.1**.

Table 9.1

EU-level governance procedures relevant to SyRB applied to domestic exposures

EU-level governance trigger	Governance procedure applicable	Legal basis
Triggers for EU governance when setting the SyRB in isolation (on any set or subset of exposures)		
Combined SyRB rate up to 3%	Notification only	Art. 133(10) CRD
Combined SyRB rate between 3% and 5%, where the entity is not a subsidiary of a parent established in another Member State	1. Notification 2. COM's opinion 3. CA/DA complies or explains	Art. 133(11) CRD
Combined SyRB rate between 3% and 5%, where the entity is a subsidiary whose parent is established in another Member State	1. Notification 2. Recommendation from the COM and the ESRB 3. If authorities of concerned Member States disagree and if both recommendations are negative, activating CA/DA can request EBA's binding mediation	Art. 133(11) CRD
Combined SyRB rate above 5%	1. Notification 2. ESRB's opinion to the COM 3. Optionally, opinion from the EBA to the COM 4. COM decides on adopting implementing act authorising the CA/DA to apply the SyRB	Art. 133(12) CRD
Triggers for EU governance procedures when setting SyRB (on any set or subset of exposures) in combination with O-SII/G-SII buffers		
Sum of combined SyRB rate, as per Art. 133 (10)-(12) CRD, and the O-SIIB/G-SIIB rate to which the same institution is subject to, higher than 5%.	1. Notification 2. Opinion from the ESRB 3. Optionally, opinion from the EBA 4. COM decides on adopting implementing act authorising the CA/DA to apply the O-SIIB/G-SIIB.	Art. 131(15) CRD

Notes: COM – European Commission, CA – competent authority, DA – designated authority. Currently, Article 133(10) of CRD stipulates that the recognition of a SyRB rate set up by another Member State shall not count towards the 3% threshold. No such exception when reciprocating a SyRB is mentioned in Articles 133(11) and 133(12) of CRD, which refer to cases where the combined SyRB is higher than 3%.

The current framework does not sufficiently enshrine the principle of proportionality as it requires authorisation to be received from and possibly a consultation to be held with the EU authorities when measures are activated which have a relatively moderate capital impact. This results in onerous procedures. In particular, the current threshold mechanisms apply at the exposure level and do not consider the impact of SyRB rates on the total capital requirement. This does not appear to be an approach which is warranted in the face of the proportionality principle as it could lead to situations in which a high sectoral SyRB rate applied on a relatively small portfolio could trigger a stricter EU governance

procedure. However, a relatively lower general SyRB rate would not, despite it having a much greater impact on overall capital requirements at the bank or jurisdiction level as well as greater substantial cross-border effects if reciprocated. Acknowledging the fact that current thresholds are in place to safeguard the integrity of the single market, the total capital impact appears to be the best metric for allowing measures to be detected that warrant the scrutiny of EU authorities.

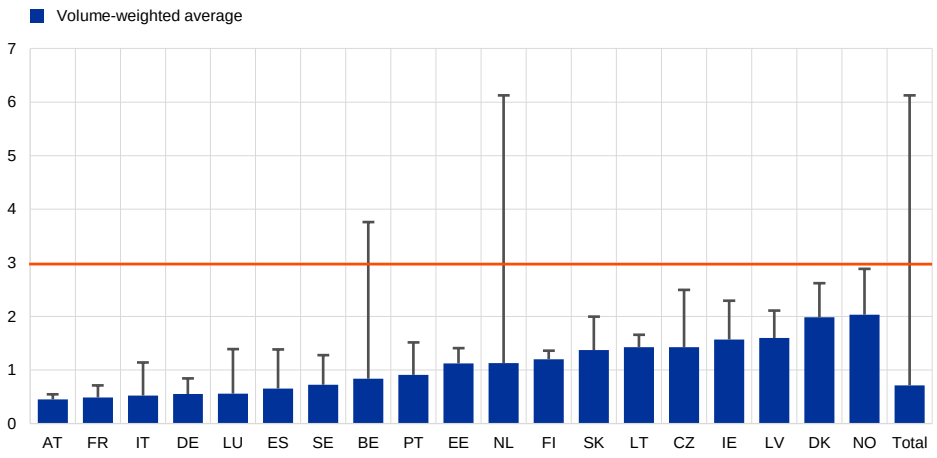
Converting the sectoral and general SyRB rates to a common denominator when applying EU-level governance thresholds would increase the consistency of the buffer framework and would eliminate disincentives which discourage the application of the sectoral SyRB. Sectoral SyRB rates may need to be calibrated at a higher level than a general SyRB rate to effectively increase resilience to a level which is commensurate with underlying risk and provide incentives for banks to manage their risks. Since the current framework does not take into account the capital impact resulting from the application of sectoral and broad SyRB, the thresholds applicable at the exposure level would be more restrictive for sectoral SyRB compared with the broad SyRB if the respective rates were calibrated in a way which resulted in the same capital impact at the bank or jurisdiction level. As a result, the current framework might discourage the use of sectoral as opposed to broad-based SyRB.

An empirical analysis shows the difference in the capital impact of broad versus sectoral SyRB, which justifies the proposal to express the latter in TREA terms. To this end, an analysis has been carried out on a sample of 79 banks, comparing the capital effect of potential sectoral SyRB rates, expressed in TREA terms and applicable to IRB RRE exposures, with broad SyRB. This analysis shows that a 10% sectoral SyRB rate applied on IRB residential mortgages would imply a lower capital impact than a 3% SyRB applicable on all exposures (**Chart 9.1**), for which authorisation is not required. To replicate the same capital impact as a SyRB of 3% applicable on all exposures, it would be necessary to apply a sectoral SyRB of 42%, as an EU-wide average, on IRB residential mortgages.

Chart 9.1

Capital impact of a hypothetical 10% sectoral SyRB rate applied on IRB residential mortgages compared with the capital impact of a 3% SyRB on all exposures

(percentage of TREA)



Sources: EBA, ECB calculations.
Notes: The grey bars represent the bank which experiences the largest capital impact of a 10% sectoral SyRB in a given Member State. The red line shows the capital impact of a 3% SyRB on all exposures.

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

For specific terminology please refer to the ECB glossary (available in English only).