The impact of the Countercyclical Capital Buffer on credit: Evidence from its accumulation and release before and during COVID-19*

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Abstract

The Countercyclical Capital Buffer (CCyB) has become a very important macroprudential tool to strengthen banks' resilience due to its countercyclical design and releasability. However, there is still limited evidence of its impact on lending over the cycle. We contribute to this literature by providing a comprehensive assessment of the effects of the CCyB's accumulation in good times and its release in bad times, taking advantage of the COVID-19 shock. Using data of 170 banks in 25 European Union countries, we find that the CCyB has significant effects on lending, but that these effects are highly dependent on banks' capitalization levels and, more importantly, their headroom over regulatory requirements. On the one hand, the accumulation of the CCyB negatively affects lending, but this is only observed in the short term and for the most capital-constrained banks, which face higher costs of raising capital. However, in the medium term, their stronger solvency position allows them to lower their cost of equity and increase lending. On the other hand, the release of the CCyB in response to the pandemic had positive effects on lending for all banks. However, the lowest-capitalized banks, and especially those with the lowest headroom over requirements, increased lending significantly more than those banks in a better position. Our results provide evidence of the benefits of the CCyB, particularly in supporting lending during adverse economic times. However, they also highlight heterogeneous effects across banks, which policymakers should take into account when implementing this tool.

Keywords: Bank credit, Capital buffers, COVID-19, Macroprudential policy, Capital regulation.

JEL classification: C32, E32, E58, G01, G28.

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1. Introduction

Motivated by the role of excessive credit growth in the build-up of systemic vulnerabilities that preceded the great financial crisis (GFC) and the large negative consequences of the crisis on the economy (Schularik and Taylor, 2012), the Basel III regulation provided macroprudential authorities with instruments in the form of capital buffers. Of these buffers, the Countercyclical Capital Buffer (CCyB) is one of the most important due to its countercyclical design and its full releasability.

This buffer is primarily aimed at protecting the banking sector from the build-up of systemic risk derived from periods of excessive credit growth, understood not only as increasing banks' resilience, but also ensuring the flow of credit to the economy during periods of stress, when the buffer is intended to be released (BIS, 2010). The accumulation of the CCyB is intended to be carried out during financial expansions, when it is also expected to smooth the credit cycle and help to lean against the wind during the build-up phase of the financial cycle. However, the empirical literature on the effect of the CCyB on lending is still scarce due to the short-lived existence of the instrument and the rare occurrence of systemic events. Against this background, our study contributes to this literature by providing a comprehensive assessment of the effects of the CCyB on lending, both when it is accumulated and when it is released, by taking advantage of the COVID-19 shock.

In general, the literature on capital requirements and lending assumes that the Modigliani-Miller theorem does not hold due to the presence of frictions such as taxes deductibility, asymmetric information and adjustments costs, among others, which makes raising equity more expensive than debt, thereby having negative effects on lending (Thakor, 1996; Kopecky and VanHoose, 2006). However, there is still disagreement regarding the impact of capital requirements on bank credit supply (Thakor, 2014). Empirical studies on the effects of capital buffers is limited and provides mixed evidence (Araujo et al., 2020). Some previous cross-country studies have found negative effects on credit growth related to leaning against the wind effects (Claessens et al. 2013, Cerutti et al., 2017), while others find non-significant effects (Alam et al., 2019). Studies distinguishing banks by their level of capitalization also show mixed results. On the one hand, highly capitalised banks have been found to face low costs of equity, which allows them to raise capital and increase lending simultaneously (Heid et al, 2004; Gambacorta and Shin, 2018). On the other hand, other studies have found that lowly capitalized banks do not react differently in terms of lending (Rime, 2001; Stolz and Wedow, 2011).

The literature on the effects of capital buffer releases, is even more limited due to the rarity of crisis events. Jiménez et al. (2017) and Sivec et al. (2019) are among the few pre-pandemic studies examining this question, by studying the impact of the dynamic provisioning system in Spain and of a temporary deduction in the capital calculation in Slovenia during the GFC, respectively. However, these tools differ from the current implementation of capital buffers. In this regard, the COVID-19 pandemic shock provides a useful opportunity to assess the benefits of capital buffer releases. As such, some recent studies have used the pandemic to shed light on this issue. Berrospide et al. (2021) and Couaillier et al. (2022a) find that banks with little capital headroom over requirements reduced lending more than banks with high headroom in the US and Europe, respectively. Other recent studies have directly assessed the impact of buffer releases during the pandemic. For instance, Avezum et al. (2021) use synthetic controls to assess the impact of buffer releases on lending in European countries. Couaillier et al. (2022b) study how the release of capital buffers affected corporate lending. Mathur et al. (2023) study explicitly the impact of the CCyB release in the UK on loan conditions in the mortgage market while Dursun-de Neef et al. (2023) conduct a difference-in-differences analysis of the impact of CCyB releases in Europe. In general, these studies find positive effects on lending but the impact of the previous accumulation of these buffers on lending remains unclear.

In this context, we assess the effects of the CCyB over the cycle, including its release during the pandemic and its accumulation in the preceding years. We explicitly account for the relationship between the size of management buffers and the provision of credit. In particular, we study how CCyB increases and releases interact with banks' regulatory capital level and their headroom over the combined buffer requirement (CBR).[1] We also study the relationship between variations in the CCyB rate and banks' responses, both in terms of the total level of capital and of the headroom over requirements over time. We use bank-level data of 170 banks in 25 EU countries for the period 2013Q4-2020Q4. We estimate panel regressions, control for bank-specific characteristics, macro-financial variables, and unobserved heterogeneity. Further, for the study of CCyB releases, we also control for other relevant policies implemented during the pandemic, such as the fiscal stimulus and the dividend restriction recommendations. Last, to identify the impact of the CCyB on capital and lending over time, we employ local projection methods (Jordà, 2005).

Our results suggest that the accumulation of the CCyB has negative effects on lending, but only in the short run and for the most capital-constrained banks. This is likely because of the high costs of raising equity that these banks face in the short term. In the medium term, however, these banks are able to raise capital in order to preserve the previous distance to the CBR, and the effects on lending dilute, suggesting that their improved solvency position would lower their cost of equity. Highly capitalized banks and those with the highest headroom over the CBR seem to not transmit the effect of a higher CCyB on their credit supply, and even tend to increase lending in the mid-rum. These findings reconcile previous literature that has found opposite or unclear effects on lending after an increase in capital requirements.

Finally, we find that the release of the CCyB helped banks to support the provision of lending during the pandemic, and that this positive effect was especially important for the most capital-constrained banks in terms of headroom over the CBR. This result is very robust to different specifications and sets of controls, and corroborates recent findings on the effects of capital releases during the pandemic (Couaillier et al., 2022b; Dursun-de Neef et al., 2023). Moreover, we show that the release of the CCyB had a significant positive impact on the lending growth rate of banks with the lowest capital headroom over the CBR, which represented up to 0.65 pp, and that this effect lasted for around 3 quarters.

Overall, we find that the countercyclical effects of the CCyB are asymmetric. These effects are mainly evident in adverse times, when the benefits of its release on the provision of lending are significant. During the accumulation phase of the buffer the countercyclical effects are limited, which is a consequence of the stronger solvency position that banks

[1] The CBR consists of the sum of the Capital Conservation Buffer (CCoB), the Systemic Risk Buffer (SyRB), the buffer for global systemically important institutions (G-SII), the buffer for domestic systemically important institutions (O-SII), and the CCyB. Following the EU CRR/CRD-V Directive, the highest of the SyRB, the G-SII, and the O-SII buffers is applicable.

achieve in the medium run. From a macroprudential policy perspective, these results would support the use of the CCyB as a tool for increasing resilience even in neutral phases of the financial cycle, when credit imbalances are not being observed, and validate the implementation of the tool as an effective instrument to mitigate the negative consequences of systemic events on lending. Nonetheless, we identify significant heterogeneous effects of the CCyB among banks with different levels of capitalization and headroom over requirements, which highlight the importance of accounting for the individual capital position of banks when implementing this tool.

The rest of the paper is organized in six additional sections. Section 2 presents a brief literature review. Section 3 describes the implementation of capital buffer requirements in Europe after the entry into force of the Basel III regulatory framework. Section 4 describes the data and sample. Section 5 presents the analysis of the effects of the accumulation of the CCyB previous to the pandemic, and Section 6 analyses the impact of the release of the CCyB as a response to the pandemic shock. Finally, section 7 concludes the paper.

2. Literature review

The Modigliani-Miller theorem states that in the absence of frictions, changes in the composition of banks' liabilities do not affect funding costs and thereby lending (Modigliani and Miller, 1958). However, the existence of asymmetric information, adjustment costs, barriers to access equity markets, deposit insurance, among others, makes equity more expensive than debt, implying that increasing capital requirements has negative effects on lending (Thakor, 1996; Kopecky and VanHoose, 2006). Nonetheless, the impact of capital requirements on lending remains a controversial topic in the literature (see Thakor, 2014 for a discussion). Theoretical studies that account for frictions find that changes in capital requirements have a negative impact on lending, but the effects are moderate when the increase in funding costs is low (VanHoose, 2007; Miles et al., 2013). Empirically, the evidence is scarce and results are mixed. Araujo et al. (2020) conducts a meta-analysis of research studies on the effectiveness of macroprudential policy on aggregate outcome variables, and find that although the weighted average effect of bank capital on lending is negative, it is small and the individual standardized coefficients have large uncertainty. The response of banks to shocks in capital has also been shown to differ depending on the capitalization level of banks. In particular, highly capitalised banks have been found to be able to raise capital and increase lending simultaneously due to the lower costs of equity these banks face (Heid et al, 2004; Gambacorta and Shin, 2018). However, other studies have found that highly and lowly capitalized banks react similarly to changes in requirements in terms of their response on credit supply (Rime, 2001; Stolz and Wedow, 2011).

Another characteristic of previous literature on the effects of bank capital on lending is that the majority of studies have focused on bank leverage ratios, mainly due to the short history of data on regulatory metrics of capital.[2] That is, they do not distinguish the part of capital that is a requirement from the one that is voluntary, nor recognize differences in the risk of

[2] Only after the introduction of the Basel III reform, regulatory capital in terms of CET1 ratios was implemented, as well as distinct types of buffer requirements. Before that, the Basel II accord just implied a common 8% requirement in terms of a measure of total capital encompassing CET1, additional Tier 1 capital (AT1) and Tier 2 capital (T2).

assets. This is very relevant since regulatory buffers are set in terms of ratios of high quality capital (CET1) with respect to risk-weighted assets (RWA). Gambacorta and Shin (2018), for instance, find that bank total equity determines both the bank's funding costs and its lending, which can ultimately affect the bank's profitability through its credit ratings as well. Specifically, they find that a 1 pp increase in the equity to assets ratio is related to a 4 bp decrease in the cost of debt and a 0.6 pp increase in annual loan growth. Noss and Toffano (2016) also focus on the role of capital on bank lending, and using bank capital and lending data for the UK for around 30 years, they provide evidence that higher capital requirements negatively affect bank lending after 16 quarters. Bedayo et al. (2020) also highlight the role of bank capital on lending expansions and contractions, where historical data for around 150 years about bank capital and lending in Spain is used to conclude that bank capital serves as a countercyclical tool, where increases of capital ahead of an expansionary period limits credit growth.

Other recent studies have assessed the effects of the implementation of capital-based macroprudential requirements on credit, using normative measures of regulatory capital. That is, through indices that signal the implementation of capital regulatory measures regardless of their magnitude. These indicators usually aggregate different types of minimum requirements, capital buffers, loss provisions, risk-weight add-ons, and reserve requirements, among others, in order to assess their impact on credit. As such, Claessens et al. (2013) analyse a wide sample of 2800 banks in 48 countries during the period 2000-2010, finding that countercyclical capital measures help to mitigate bank leverage during expansions but that they are not useful in adverse times. Cerutti et al. (2017) analyse macroprudential policies in a cross-country study of 119 countries between 2000 and 2013, and find that capital buffers have negative but non-significant effects on lending except for developing economies, where they can help to manage financial cycles. Also, in a cross-country study with data from 2000 to 2013, Akinci and Olmstead-Rumsey (2018) find that capital requirements, provisioning and limits to credit growth have a negative impact on lending. More recently, Alam et al. (2019) use cross-country data for a longer sample from 1999 to 2016 and find that an aggregation of leverage limits, capital buffers and capital requirements have only significant and negative effects on lending in emerging economies. In general, either small or non-significant effects of the implementation of macroprudential measures on credit have been found. Nonetheless, these studies classify a wide group of macroprudential tools as capital and countercyclical capital measures including reserve requirements, limits on profit distributions, loan-loss provisions, dynamic provisioning systems and limits to credit growth. Although the purpose of these measures could be countercyclical, they are different instruments and act in a different way than the CCyB.

The short history of the accumulation of capital buffers and in particular of the CCyB, on which the first decisions in the EU were taken in 2016, together with the lack of events where it could be released before the pandemic, have made rare the studies on the impact of this instrument. The closest studies in the past to the identification of the impact of capital buffer releases are those by Jiménez et al. (2017) and Sivec et al. (2019). These studies use natural experiments of the release of two measures that have similar characteristics to the CCyB. Jiménez et al. (2017) study the effect of the dynamic provisioning system in Spain during the GFC, finding that it helped to support credit at firm level in up to 9pp for each additional pp of pre-crisis provision funds of those banks working with the firm. Sivec et al. (2022) study the impact of an unexpected temporary relief of capital at the start of the last GFC in Slovenia. In 2006 the Slovenian central bank introduced a temporary deduction item in the capital calculation, generating a capital buffer that was released in 2008. The authors find that firms borrowing from banks holding a 1 p.p. higher capital buffer received 11 p.p. more in credit and that the additional credit was mainly directed towards creditworthy firms.

Recently, and taking advantage of the COVID-19 shock, some studies have assessed the effect of capital buffers on lending. Berrospide et al. (2021) use loan-level data of credit to SMEs in the US to assess the role of voluntary or management buffers computed as the distance between the observed CET1 ratio and the CBR. The authors find that buffer-constrained banks (below the median distance to CBR) reduced credit to SMEs 1.4% more than unrestricted banks, and were 4% more likely to end pre-existing lending relationships during the pandemic as compared to those buffer-unconstrained banks (those entering the pandemic with capital ratios above the median distance to the CBR). In a similar analysis for Europe, Couaillier et al. (2022a) use loan-level data to show that European banks with little headroom above regulatory buffers reduced lending by about 3.5% to non-financial corporates relative to other banks during the pandemic.

Regarding the explicit effects of capital buffer releases during the COVID-19 period, Couaillier et al. (2022b) find a positive impact of the reduction of CET1 requirements in Europe on corporate lending, which was more relevant for those banks with low headroom over requirements. In particular, the authors identify that 1% release of CBR and Pillar 2 requirements (P2R) during the pandemic increased lending to firms between 1.2% and 2.7%. In the household sector, Mathur et al. (2023) also provide evidence on the usefulness of releasable capital buffers to support lending. Focusing on the UK mortgage market, this paper shows that the more-constrained banks tightened mortgage conditions and reduced loan values during the pandemic. Nonetheless, banks that benefitted the most from the release of the CCyB maintained their conditions more stable. Similarly, and more recently, Dursun-de Neef et al. (2023) conduct a difference in differences analysis of the effects of the CCyB releases in Europe on total credit. Using bank-level data, the authors find that banks in jurisdictions where the CCyB was released increased lending by 5.6 pp relative to banks where this instrument was not released. Finally, using data at the country-level and synthetic controls, Avezum et al. (2021) compare European countries which did release completely or partly their CCyB and the Systemic Risk Buffer (SyRB) during the pandemic with a counterfactual for each country. The authors conclude that banks in countries that released the CCyB provided around 1 pp more credit to households.

Overall, previous studies have focused on studying a specific aspect of the effect of capital on lending. Also, some of them study broad definitions of capital or normative measures of requirements, usually very different in their design and mechanism to the CCyB. Against this background, our study integrates many of these pieces to provide a complete overview of the impact of the CCyB over the cycle.

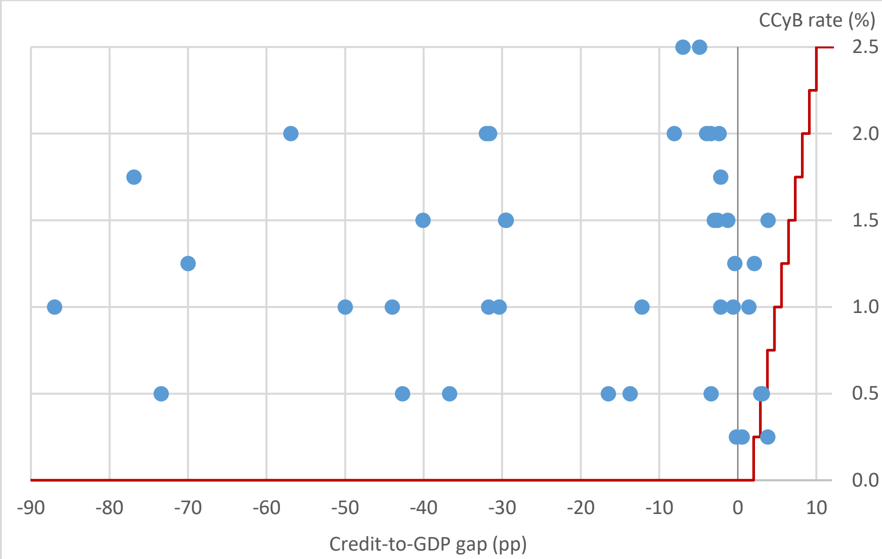
3. The implementation of the CCyB in Europe

European countries have become relatively active in the use of the CCyB after the GFC and its inclusion in the EU regulatory framework.[3] Certainly, 14 countries in the European Economic Area (EEA) had activated the instrument before the pandemic, being Norway the

[3] EU Regulation 575/2013 (EU CRR) and EU Directive 2013/36/EU (EU CRD-IV).

first country in taking this decision as early as at the end of 2013. The CCyB has been implemented following primarily resilience objectives, and even in cases where credit imbalances are not very evident. This can be seen in Figure 1, where we compare the credit-to-GDP gap, which is the main CCyB guiding indicator suggested by the Basel Committee for Banking Supervision (BCBS), with the implemented CCyB rates. It is observed that only in 2 out of 38 CCyB increase decisions taken in the EEA before the pandemic, the credit-to-GDP gap presented values above the suggested rule by the BCBS (BIS, 2010). Moreover, in most of the cases the gap was largely negative (between -10 pp and -90 pp). This is a characteristic that is very relevant for the implications of our results in further sections.

Figure 1. CCyB increase announcements and the credit-to-GDP gap in the EEA

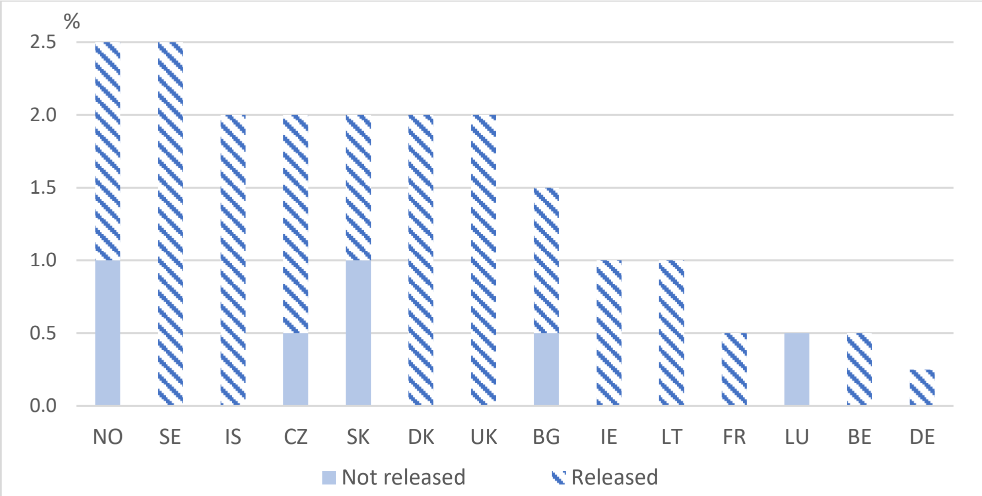


Notes: CCyB increase announcements in the EEA between 2013 and 2019. The vertical axis represents the announced CCyB rate. The horizontal axis represents the Basel credit-to-GDP gap at the date of the announcement. The red line represents the suggested rule by the BCBS linking the CCyB rate to observed values of the credit-to-GDP gap.
Source: ESRB. Own ellaboration.

Another interesting characteristic of the banking sector in the EU after the crisis has to do with the important increase in the level of high quality regulatory capital, as measured by the CET1 ratio over RWA. This ratio increased around 7 pp between 2008 and 2019 in the EU. This increase seems to be mostly explained by the increase in the minimum requirements (from 2% to 4.5%) and the CBR (4.3%) (see Figure A1 in Annex 1). This adds interest to the assessment of the relationship between capital levels above the CBR, from which the CCyB is one component, and lending. In particular, at the outbreak of the pandemic, the CCyB represented, on average, 1.5 pp of the CET1 ratio (equivalent to 17% of the CBR) in those countries that implemented positive CCyB rates (see Figure A2 in Annex 1). The magnitude of the cumulated CCyB in those countries during the previous years is sufficiently large to study its impact on lending.

The previous accumulation of this buffer allowed EEA countries to release the CCyB after the irruption of the pandemic. In Figure 2 we show that, with the exception of Luxembourg, all countries that had previously accumulated the CCyB, released it at least partially as a response to the shock. In those countries, the size of the released CCyB was not negligible, representing 1.2 pp of the CET1 ratio, on average. Additionally, the fact that the CCyB is the only buffer designed to be fully released in adverse times, makes it very relevant to identify whether or not this buffer helped to support lending during the pandemic. Overall, our analysis of the effects of both the accumulation and the release of the CCyB provides macroprudential authorities with an integral assessment of the benefits of the countercyclical use of the CCyB.

Figure 2. CCyB releases during the pandemic



Notes: The full length of the bars represent the CCyB rate in place or already announced in March 2020 in EEA countries. The dashed section represents the part of the CCyB released as a response to the pandemic, and the solid section represents the non-released part.
Source: ESRB. Own ellaboration.

4. Data

We use bank-level quarterly data for a sample of 170 Banks from 25 EU countries for the period 2013Q3-2020Q4 from several publicly-available sources. We focus on this period since our purpose is to assess the impact of the accumulation of the CCyB up to the irruption of the pandemic and its release during the first quarters. Nonetheless, in Section 6.3.1 we extend this sample up to 2023Q2 in order to assess the impact of the release over a longer period. We employ SNL for bank accounting and prudential magnitudes including gross loans, assets, RWA, equity, CET1 capital, ROA, and cost-to-income. For the CBR components, we use the European Systemic Risk Board (ESRB) national capital-based measures database.[4] Our definition of the CBR consists on the sum of CCoB, CCyB, SyRB, G-SII and O-SII buffers.[5] The starting date of our sample coincides with the first announcement to cumulate the CCoB in an EU country, which was the first CBR component established after the GFC.

Regarding the decisions made by jurisdictions about the CCyB rate's settings and its announcements, the ESRB also publishes the date on which the decision to increase or decrease the CCyB rate is taken, the date on which the decision was publicly announced and the date on which the decision comes into practical effect and starts applying. This data

[4] https://www.esrb.europa.eu/national_policy/ccb/html/index.en.html

[5] Following the EU Directive 2019/878/EU (CRD-V), the highest of the G-SII, and the O-SII buffer is applicable. The maximum of these buffers is added to the SyRB, if any, with a maximum of 5% without need of authorization from the European Commission.

is provided at a jurisdictional level. We use the announcement date to identify the time at which the market learns the new decision regarding the CCyB rate's increase or decrease, and hence study the decision's impact on credit using this reference date.

The reported CCyB rate is the rate applied to domestic exposures in a given country, while the bank credit variable available in SNL is measured at a consolidated level. The fact that bank credit is measured at consolidated and not at country level reduces the size of the estimated impact on credit of the announcements of changes in the CCyB rate. Given that the CCyB applies, to the credit exposures the bank has in the jurisdiction where the CCyB applies but we observe an effect on the credit stock measured at a consolidated level, if the credit observed were the credit stock at the country level, the announcement's impact on domestic bank credit would be more pronounced than what we actually estimate at the consolidated level. This is due to the fact that the CCyB rate in principle affects a bank's credit decisions in that jurisdiction more than it does in other jurisdictions, so if we observe an effect in a bank's consolidated credit following a CCyB announcement, the impact on the country's credit is likely to have been stronger.

Besides, we obtain quarterly information about countries' macroeconomic variables from the Bank of International Settlements (BIS) for the whole period. In particular, in order to control for macroeconomic characteristics, we use the annual GDP growth, houses' annualized price growth in the last two years and the two-year average annual growth of the credit-to-GDP ratio. These variables are widely used for the monitoring of financial stability and capture measures related to banks' credit evolution, so they are appropriate macroeconomic controls.

Further, given the unusual public support to hold the economy up during the COVID-19 pandemic, we employ a country level variable of the fiscal support measures implemented during 2020, in order to control for the effects that this policy had on lending during the same period. Although fiscal aid took several forms, the most direct and comparable measures were related to those defined by the IMF as the "below-the-line measures", which involved loan guarantees, equity injections, loans, asset purchase and debt assumptions. We collect this variable from the IMF and denominated as reported in terms of GDP.

Last, the European Central Bank (ECB) recommended on 27 March 2020 that credit institutions do not pay out dividends nor conduct share buy-backs aimed at remunerating shareholders. This recommendation, which was meant to last at least until 1 October 2020, was prolonged on 27 July 2020 inviting credit institutions to refrain from these activities until 1 January 2021.[6] We obtain data from Reuters about the list of credit institutions that announced dividend payouts through 2020 before the ECB recommendation was announced and which did not distribute them following the recommendation. Hence, we can compare whether those banks which announced dividend payout but refrained from doing so provided higher lending based on the capital which was supposed to be distributed but in the end was not, than banks which did not announce any dividend payout. A table with the descriptive statistics of every variable used throughout the analysis is shown in Table 1.

[6] Recommendation ECB/2020/19. This was followed and complemented by an ESRB recommendation in the same direction (ESRB/2020/7).

5. The accumulation of the CCyB

5.1. Effects on the CET1 ratio and the distance to the CBR

Since the purpose of our study is to provide an integral analysis of the effects of the CCyB on lending, we study the impact of both its increase and its release. We start by assessing the impact of its accumulation. Nonetheless, before studying the direct impact on lending, it is important to understand how banks react to the CCyB announcements in order to comply with the requirements. In particular, if the Modigliani-Miller theorem does not hold and raising capital is costly, banks may react by cutting lending instead of increasing their capital level. However, if banks face low costs of equity, they would increase capital to comply with the requirement and thereby increase their credit supply. This could be the case for well capitalized banks. Thus, we first estimate the impact of the announcement to increase the CCyB on the CET1 ratio, and the distance to the CBR, which provides a measure of how constrained are banks in terms of capital, through the following specification:

$$Capital_{i,t} = \beta_1 \, CCyB\_increase_{c,t-1} + \boldsymbol{\gamma} \, \boldsymbol{X}_{i,t-1} + \delta_i + \varphi_c + \tau_t + \epsilon_{i,t}, \quad (1)$$

where $Capital$ represents either the total CET1 ratio or the distance between the CET1 ratio and the CBR (in terms of RWA), and $CCyB\_increase$ is a dummy variable signaling the announcement to increase the CCyB rate. We also add a set of controls $\boldsymbol{X}_{i,t-1}$ aimed at capturing time-varying bank characteristics (log of total assets, log of total equity, ROAE and cost to income ratio), as well as bank (δ_i), country (φ_c) and time fixed effects (τ_t), alternatively and additively.

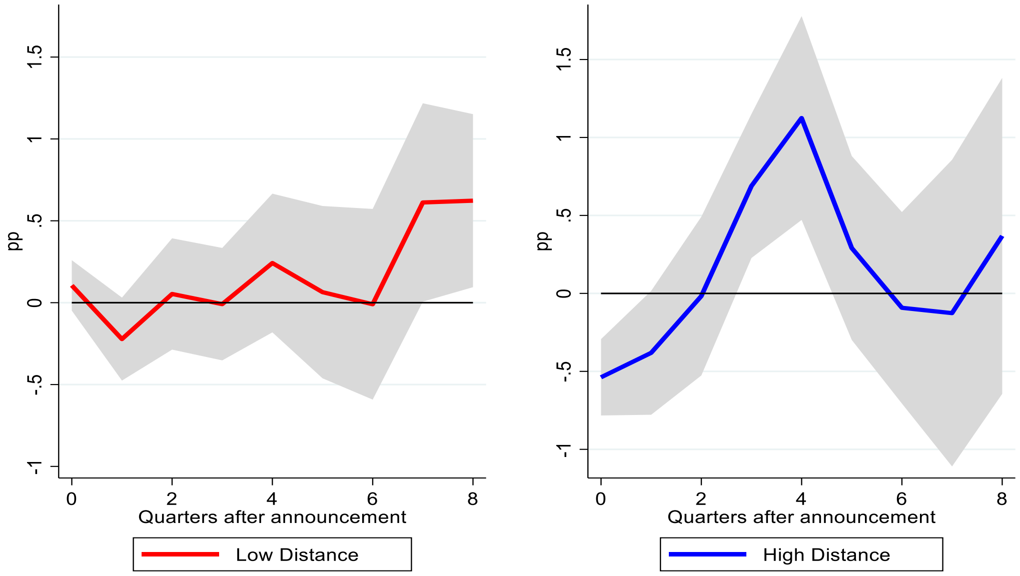
We estimate several specifications based on Equation (1), using different combinations of bank, country and time fixed effects, where consistent results are found across them. In Table 2, we show that an increase of this buffer is related to a decrease of the distance to the CBR but has no effects on the total level of the CET1 ratio. This suggests that the increase in the buffer requirement is mainly achieved by a reduction of the voluntary buffer instead of by raising capital. However, this can be a mechanical effect in the short-term. However, in practice banks are usually allowed to have one year after the announcement to comply with the requirement. This may delay the recognition of the buffer by banks and their response to adjust their capital level up to 4 quarters after the announcement.

Therefore, in order to identify the impact of CCyB-increase announcements over the following quarters, we conduct a local projection exercise (Jordà, 2005). We assess the impact up to 8 quarters ahead to account for the effects up to one year after the increase is enforced. We estimate the following local projection model:

$$Capital_{i,t+h} - Capital_{i,t-1} = \beta^h CCyB_{increase_{c,t}} + \sum_{k=1}^{4} \left(\theta_k^h Capital_{i,t-k} - Capital_{i,t-k-1} \right) + \boldsymbol{\gamma}^h \boldsymbol{X}_{i,t-1} + \varphi_c^h + \delta_i^h + \epsilon_{i,t+h}; \; h = 0 \ldots 8, \quad (2)$$

where *h* represents the number of periods after the announcement (from 0 to 8 quarters), and the impulse responses are constructed based on the estimated β^h coefficients at each time horizon *h.* We also include the first 4 lags of the variation in capital (measured as the distance or headroom), as well as the same controls and fixed effects as in Equation (1).

Figure 3: Response of the distance between the CET1 ratio and the CBR to the announcement of an increase of the CCyB over an 8-quarters horizon by the banks' initial distance to CBR



Note: The graph plots the coefficients from a local projection model of the effect of the announcement of CCyB increases on banks' distance to the CBR over an 8-quarters horizon. The heterogeneous effect on banks with a high (higher than the median in each quarter) and low (lower than the median in each quarter) distance is separately displayed, together with the confidence interval at 90% significance area.

Given the possibility that the announcement may impact banks in a different way based on their capital adequacy relative to regulatory requirements, we segment the sample into the most and least capital constrained institutions, employing the median values as the dividing points. In Figure 3 we observe that the distance to the CBR is reduced just after the announcement to increase the CCyB (as presented in Table 2), but that this is mainly observed in the least capital-constrained banks. It is likely due to the fact that banks with more capital headroom recognize the new buffer in their balance sheets immediately given that they have enough capital to comply with it. Moreover, these banks recover the previous distance to the CBR just 2-quarters ahead of the announcement and even end-up with around 1 pp more of capital headroom over the new CBR by the enforcement date. The behavior seems to be different for the most capital-constrained banks. In particular, these banks try to hold their distance to the CBR unaltered until the enforcement date by adjusting their CET1 ratio over the year. Nonetheless, they increase their distance to the CBR around 2 years after the announcements, improving their capital headroom with respect to the original situation.

These findings suggest that, in the medium term, banks preserve or even increase their level of capital headroom over requirements after an increase of the CCyB, which translates into a greater resilience of the system. Nonetheless, banks react differently to the announcements depending on how close they were to requirements. This could be reflected on lending, provided that the upward adjustment of the CET1 ratio could be achieved either by raising equity or by reducing RWA.

5.2. The effects of the accumulation of the CCyB on lending

The effects of CCyB announcements in terms of CET1 ratio provide an overall indication of how banks react to new buffer requirements. Nonetheless, banks may adjust this ratio either by raising capital or reducing RWA. If banks face a high cost of funding and prefer to do the latter, then increases of the CCyB would lead to reductions on lending, while the opposite would occur if banks effectively raise capital and finance lending at least partly with equity. Thus, we next estimate the impact of CCyB-increase announcements on lending, which in combination with the results from the above specifications, would provide a wide view of the channels through which buffer requirements act. Since it is very likely that the behavior of banks differs based on their capital level and their headroom over requirements, we account for this type of heterogeneity by including an interaction between the increase of the buffer and both the CET1 capital level and its distance to CBR. The estimated specification is the following:

$$ln(Gross\ bank\ loans)_{i,t} = \beta_1 CCyB\_increase_{c,t-1} + \beta_2\ Capital_{i,t-1} + \beta_3\ CCyB\_increase_{c,t-1} * Capital_{i,t-1} + \boldsymbol{\gamma}\ \boldsymbol{X}_{i,t-1} + \varphi_c + \delta_i + \tau_t + \epsilon_{it}, \quad (3)$$

where the dependent variable is included in levels[7], together with bank, country and time fixed effects, and as independent variables we include bank controls as well as the CET1 ratio and its distance to CBR, as continuous lagged variables as well as dummy variables identifying those less capitalized and more capital constrained banks. Hence, $Capital_{i,t-1}$ represents either the total CET1 ratio or the distance between the CET1 ratio and the CBR (in terms of RWA), which provides a more direct measure of how constrained a bank is in terms of capital.

We include the capital measures using different metrics: i) as a continuous variable, ii) as the variation with respect to the previous quarter, and iii) as dummy variables identifying those banks that are more constrained in terms of having the lowest values of the CET1 ratio and its distance to the CBR each quarter. In particular, we classify those banks below the 25th and the 50th percentiles of the distributions of the CET1 ratio and the distance to CBR in each quarter. We also add a set of controls capturing time-varying bank characteristics and we estimate different specifications using, alternatively and additively, bank, country, time and country*time fixed effects. When we consider country*time fixed effects to control for time-varying unobservable characteristics at country level, those variables measured at the country level and that vary over time (such as the CCyB announcement), are absorbed by the fixed effects.

In Table 3 we present the estimation results of Equation (3), where we interact the CCyB increase announcements with the capital situation of banks. In particular, we use the CET1 level and the distance to the CBR, as well as dummies identifying those banks with the lowest levels of capital and with the shortest distance to buffer requirements. In general, we find that the effect of the increase of the CCyB on lending is highly dependent on the capital situation of banks. Specifically, increasing the CCyB leads to a reduction of credit in low capitalized banks, which would be consistent with the high costs of raising equity that these banks may face.

[7] By considering total loans in levels, the bank fixed effects would avoid capturing permanent effects of credit over time for each bank.

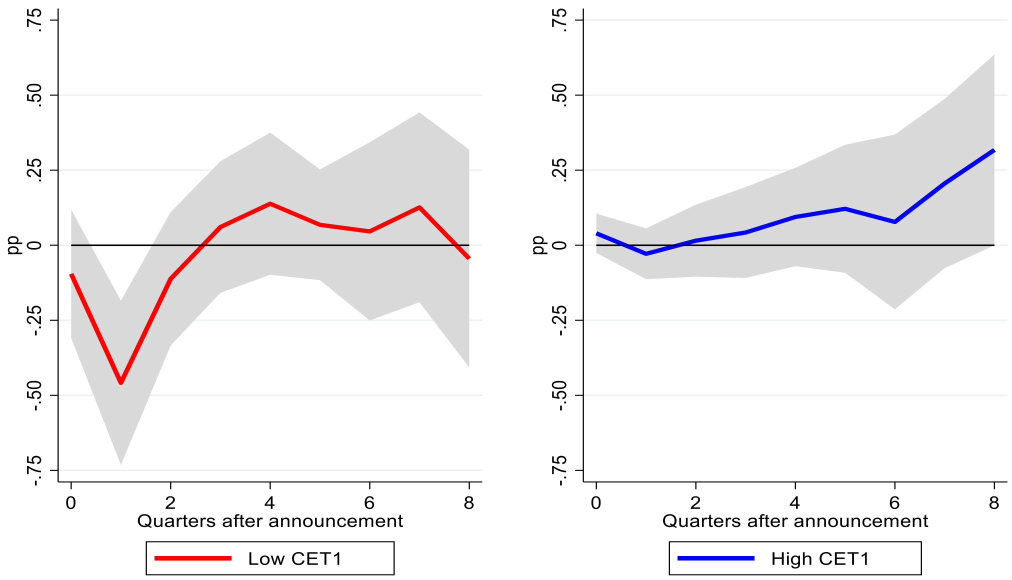
Certainly, we identify a positive and significant coefficient for the interaction term of the CCyB increase announcement with both the CET1 level and the distance to the CBR. This implies that, even if the average effect of increasing the CCyB is negative on lending (Columns 6 and 8), the effect decreases with the level of capital and its distance to requirements. That is, the higher the capitalization of a bank and the higher its capital headroom, the lower the negative effect of the CCyB increase. This suggests that banks that are more capitalized or have a larger headroom over the CBR reduce lending less. This is likely due to the fact that these banks would have less urgency to raise capital and may face lower costs of funding due to a stronger solvency position. Moreover, our results using dummy variables to identify banks with the lowest level of CET1 capital and with the smallest headroom over requirements (below the 25th and 50th percentile), imply that the negative effect of increasing the CCyB on lending is only observed in those banks (Columns 2 to 5). In contrast, the average effect identified for banks above the 25th or the 50th percentile of both measures is positive, suggesting that banks in a relative good position of capital increase lending after the announcement of a higher CCyB rate.

Nonetheless, similar to the effects on capital, the impact of CCyB-increase announcements is not likely to be observed as fast as in the next quarter mainly due to two main reasons. First, banks usually have one year to accumulate the CCyB after an increase is announced. This may postpone or dilute the effect of the increase over time, making necessary to assess the effect of a CCyB increase announcement over a longer horizon. Second, the fact that credit developments are usually observed during a complete expansionary phase of the credit cycle implies that CCyB decisions are made progressively, cumulating the buffer in steps. This is something that has been ignored in most of the empirical literature assessing the impact of capital requirements on lending. Thus, in order to better identify the effects on lending, we estimate a local projection model based on Equation (2) where we identify the impulse response of credit growth to an announcement to increase the CCyB over the following 8 quarters, as follows:

$$\ln\left(\frac{Gross\ bank\ loans_{i,t+h}}{Gross\ bank\ loans_{i,t-1}}\right) = \beta^h CCyB_{increase_{c,t}} + \sum_{k=1}^{4} \theta_k^h \ln\left(\frac{Gross\ bank\ loans_{i,t-k}}{Gross\ bank\ loans_{i,t-k-1}}\right) + \boldsymbol{\gamma}^h \boldsymbol{X}_{i,t-1} + \varphi_c^h + \delta_i^h + \epsilon_{i,t+h}\ ;\ \ h = 0 \dots 8, \tag{4}$$

Given the evidence we find above on the heterogeneous impact of the CCyB across banks depending on their solvency position, we estimate the local projection model separately for banks with CET1 capital above and below the median, as well as for banks with capital headroom over the CBR above and below median values. We plot the cumulative responses of credit growth for each group of banks both in terms of CET 1 capital level (Figure 4) and of distance to the CBR (Figure 5). In general, we observe a different pattern between both groups, mainly in the short term, which confirms previous results regarding the effect of the CCyB increase announcement on capital. That is, the response of lending to an increase in the CCyB is negative and significant only in lowly capitalized banks and in those with low capital headroom over requirements. In particular, the growth rate of lending of these banks decreases up to 0.5 pp in the quarter following the announcement to increase the CCyB, but this effect dilutes towards the date banks have to comply with the requirement, suggesting that once these banks accommodate the new requirement, their improved solvency position allows them to mitigate the effects on credit. The impact on lending in highly capitalized banks and those with high headroom over the CBR is not significant, although it tends to be positive and economically significant in the medium term.

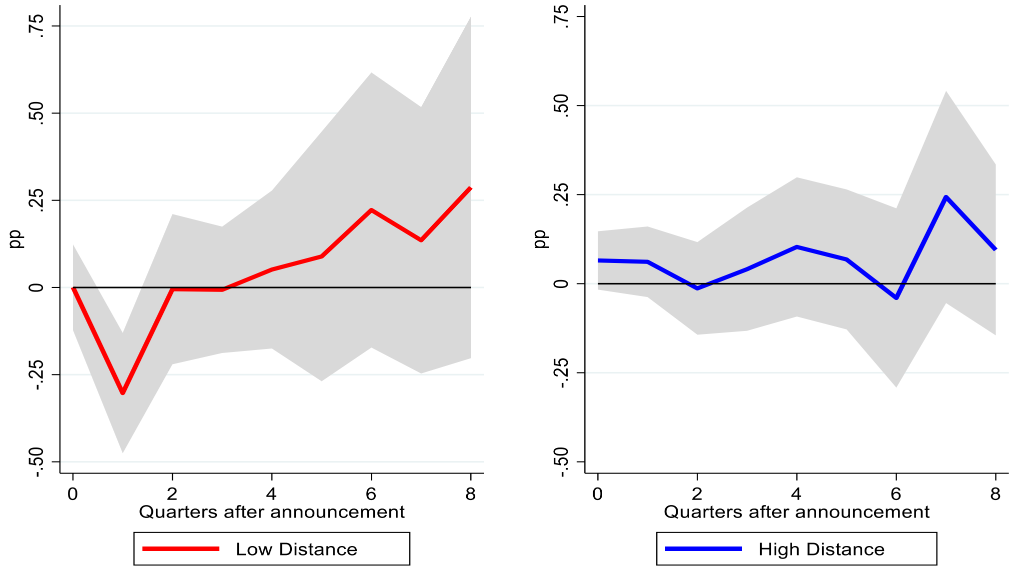
Figure 4: Response of bank lending to the announcement to increase the CCyB over an 8-quarters horizon by banks' CET1 level



Note: The graph plots the coefficients from a local projection model of the effect of the announcement of CCyB increases on lending over an 8 quarters horizon. The heterogeneous effect on banks with a high (higher than the median in each quarter) and low (lower than the median in each quarter) distance is separately displayed together with the confidence interval at 90% significance area.

The heterogeneous effects among banks with different capitalization and over time, suggest that various mechanisms of transmission of the CCyB could be in place but they differ depending on the solvency position of banks and the time elapsed after the announcement of the measure. On the one hand, highly capitalized banks would absorb the increase with part of their management buffer in the short-run, having non-significant effects on lending. In the medium term, these banks would raise capital while preserving or even increasing lending due to the low cost of equity that they face. These results would be consistent with previous findings in the literature regarding the low costs of funding of highly capitalized banks, which allow them to raise capital and increase lending simultaneously (Heid et al, 2004; Gambacorta and Shin, 2018). In contrast, the high cost of equity for low capitalized banks and for those with little headroom over requirements induce these banks to cut lending instead of raising capital in the short-run. Nonetheless, the differences between both types of banks tend to dilute in the medium term, which is consistent with the literature identifying similar responses in banks with low and high capital (Rime, 2001; Stolz and Wedow, 2011).

Figure 5: Response of bank lending to the announcement to increase the CCyB over an 8-quarters horizon by banks' distance to CBR



Note: The graph plots the coefficients from a local projection model of the effect of the announcement of CCyB increases on lending over a 2 years (8 quarters) horizon. The heterogeneous effect on banks with a high (higher than the median in each quarter) and low (lower than the median in each quarter) distance is separately displayed.

6. Releasing the CCyB and the support of lending

6.1. The primary effect on the CET1 ratio and the distance to CBR

Our previous results on the effects of the accumulation of the CCyB on bank lending suggest that the countercyclical effects of the buffer are not evident and cannot be generalized. Reductions in credit supply are only significant for banks with the lowest capital headroom over the CBR, and only in the short-run. Whether this could be associated to benefits or costs of the tool is not trivial given that the countercyclical nature of the CCyB implies that its accumulation during periods of high credit growth also aims at smoothing the cycle by curbing credit growth, which can be considered as a benefit rather than a cost. However, the main feature of the CCyB is that it is aimed to be released under adverse scenarios, when it is more clear that supporting the provision of credit to the economy is a benefit. Thus, we study the impact of the release of the CCyB during a negative shock by taking advantage of the COVID-19 pandemic, which provides a natural experiment to study the impact of the release of this buffer since the adoption of Basel III in Europe.[8]

It's noteworthy that the release of the CCyB exhibits distinct characteristics compared to its accumulation process. A crucial distinction lies in the implementation lag, which is absent when the buffer is released. That is, banks may use the buffer immediately. Also, the fact that, under adverse scenarios, macrofinancial risks are materialized very quickly and with high intensity, makes macroprudential authorities to act promptly and more aggressively when they decide to release the buffer than when they increase it. This implies that the

[8] The only release announcement before the pandemic was made by the UK after the Brexit referendum.

magnitude of a CCyB release decision is usually higher than the one of an increase announcement, as recent experiences suggest.

As in our analysis of the accumulation of the buffer, we start by studying the impact of the release on the CET1 ratio and the distance to the CBR by replicating the specification in Equation (1), but substituting $CCyB\_increase_{c,t-1}$ by $CCyB\_release_{c,t-1}$, which captures the time in which the announcement to release the CCyB is made public by the competent authority. We show the results in Table 4. As we expected, the distance to the CBR increases after a release of the buffer. This is something that should be mainly automatic in the short-run given that the CBR is reduced when the CCyB is released. Nonetheless, we also identify a positive effect on the CET1 ratio. Given that banks would not typically be in a position to raise capital after a negative shock, the explanation is a reduction of the RWA. Although this could signal a reduction in lending, the observed increase of bank credit in the quarters following the onset of the pandemic, points to the high importance of public guaranteed loans with very low or zero risk weight during that period. We explore the role of fiscal policies further below.

6.2. The impact on lending during the pandemic

Against this background, we continue our analysis of the impact of the CCyB releases on lending by accounting for heterogeneous effects depending on banks' capital position. As such, we aim to discern the differential effect of the CCyB release depending on banks' total level of CET1 and on their distance to the CBR. Hence, we re-estimate Equation (3) substituting $CCyB\_increase_{c,t-1}$ by $CCyB\_release_{c,t-1}$. We also account for time-varying controls at bank and country level, and bank, country, time and the most inclusive, country*time fixed effects to account for countries' different responses to the COVID-19 pandemic.

Estimation results are shown in Table 5. We identify a positive and significant effect of the CCyB release on credit. This result holds after adding bank controls and is robust to the inclusion of bank and country fixed effects. Nonetheless, as we identified in the case of the buffer increase, this effect is dependent on the capital position of banks. In particular, we find that, although the effect of the CET1 ratio is not always statistically significant, its level at the moment of a release is positively associated to more lending, suggesting that more capitalized banks are able to support more lending to the economy under adverse shocks. However, we find that the interaction between the capitalization level of a bank and the CCyB release is negative and highly significant in most specifications. This implies that the positive effect of the release of the CCyB on lending is particularly relevant for low capitalized banks, which would benefit the most from the release. This result is robust to the inclusion of country*time fixed effects, which allows us to control for all other non-observable factors occurring at country level that might have influenced banks' behavior regarding credit concession besides the CCyB release, such as fiscal aid programs. This is highly relevant, specifically, after the onset of the COVID-19 shock, when different public policies were undertaken to support the real economy.

This result is confirmed when we use a dummy variable identifying those banks with a level of CET1 capital below the median.[9] We show these results in Table 6, where we also find that, although banks with low levels of capital provide less lending, on average, compared

[9] This result holds when we use the lower threshold at the 25^{th} percentile as well.

to banks with high CET1 ratios, they grant relatively more credit conditional on a CCyB release. In Columns 2 and 4, we further control for the interaction between the ROA and the capital level to take into account the possibility that lowly capitalized banks may take higher risks than highly capitalized banks by, for example, increasing their lending to risky customers. In particular, we observe that banks below the median CET1 level increased lending between 5% and 8% after the CCyB was released. We obtain similar results when we use the distance to the CBR, suggesting that banks that were ex-ante more capital-constrained, and therefore benefiting marginally more from the CCyB release, provided more lending than those with larger headroom over requirements. This result is consistent with recent evidence on the effects of capital buffers during the pandemic (Couaillier et al., 2022b; Dursun-de Neef et al., 2023).

In the context of the pandemic, we also study whether banks' reaction to the COVID-19 shock differed depending on the magnitude of the CCyB released. With that in mind we focus on the interaction between COVID-19 and the magnitude of the CCyB released. This also allows us to identify an elasticity of the supply of credit to the size of the released CCyB. This is highly relevant since, as showed in Section 3, there was large heterogeneity in the size of the released CCyB among countries in Europe. As such, the estimated equation reads as follows:

$$ln(Gross\ bank\ loans)_{i,t} = \beta_1 Covid_t + \beta_2\ \Delta CCyB_{c,t} + \beta_3\ \Delta CCyB_{c,t} * Covid_t + \boldsymbol{\gamma}\ \boldsymbol{X}_{i,t-1} + \delta_i + \varphi_c + \tau_t + \epsilon_{it}\ , \quad (5)$$

where $Covid_t$ is a dummy variable that takes value 1 for the period 2020Q1-2020Q4 and value 0 before that. This variable is interacted with the magnitude of the CCyB release. In this specification we also include time fixed effects additively instead of multiplicatively since otherwise the interaction between the COVID-19 variable (which does not vary by country) and the CCyB measures (which varies across, but not within countries) would be absorbed by the fixed effects.

The results presented in Table 7 show that in absence of controls, the COVID-19 period had a positive impact on bank lending, which can be explained by all the policies carried out during that period that helped to support credit. However, once controls are included, this effect vanishes. Regarding the CCyB release, we find that bank lending during the pandemic increased with the size of the released buffer. Note that the variable capturing the CCyB variation takes negative values when the CCyB rate decreases. Hence, the negative sign of the interaction between the variation of the CCyB and the COVID variable implies that the higher the size of the released CCyB the more lending was provided during the pandemic. This result is robust to the addition of interactions between bank controls and the pandemic in order to account for the possibility that bank characteristics played a distinctive role in determining lending during that period. For instance, the interaction between banks' assets and the COVID variable controls for the fact that bigger banks might behaved differently from smaller banks during the pandemic. The economic significance of the identified impact of the CCyB release during COVID holds in all specifications.

6.3. The banks' capital position at the irruption of the pandemic

We are interested to observe whether the CCyB release had a differential effect between banks with low and high CET1 ratios, and between those less and more constrained in terms of their distance to the CBR, just before the irruption of the pandemic. This allows us to identify whether beyond the effect of the release of a capital buffer, the bank capital level and its headroom explains the provision of credit during a negative shock. Thus, we re-estimate Equation (5) substituting $\Delta CCyB\_release_{c,t}$ by $Capital_{i,2019Q4}$, which represents banks' level of capital in 2019Q4. This variable takes the form of alternative dummy variables identifying those banks below the 25th and 50th percentiles of the distributions of the CET1 ratio and of the distance to CBR, right before the outbreak of the COVID-19 pandemic. In this specification we include country*time fixed effects in order to control for the heterogeneous time-varying policies that took place in different countries, especially during the COVID-19 period.

In Table 8 we show the estimation results. We identify that banks with CET1 ratios below the median and below the 25th percentile at the end of 2019, granted on average less credit over the entire sample than banks with higher capital levels at the end of 2019, but that they increased more their lending during the pandemic than more capitalized banks. The former result is consistent with our findings in the previous section, while the latter confirms that banks with relatively low capital levels at the irruption of the pandemic benefitted the most from policies implemented as a response to the shock. This result is in line with recent studies identifying the effect of the pandemic on lending distinguishing by bank capitalization (Berrospide et al., 2021; Couaillier et al., 2022a). In particular, we observe that banks with CET1 ratios below either the 25th or the 50th percentile of the distribution in 2019 Q4 provided between 8% and 10% less credit during the pandemic.

We find consistent and stronger effects, when we use the distance to the CBR. Banks with lower distance to the CBR provided relatively less credit, on average, during the entire sample, but more credit during COVID-19. In particular, we find that the effects are increasingly stronger when we approach to the most capital-constrained banks in terms of headroom over requirements. In terms of economic significance, banks with a distance below the 25th percentile of the distribution in 2019 Q4, right before the outbreak of COVID-19, reduced credit by 7% during the COVID-19 period.

Since not only individually the magnitude of the CCyB release and the bank capital position might be relevant for lending during a crisis episode such as the outbreak of the COVID-19, but also their interaction, we re-estimate Equation (5) substituting the variable capturing the COVID-19 period ($Covid_t$) by banks' level of capital in 2019Q4 ($Capital_{i,2019Q4}$). Thus, we explicitly interact the size of the released CCyB rate ($\Delta CCyB_{c,t}$) with the dummy variables identifying those banks below the defined percentiles of CET1 ratio and of its distance to the CBR before the irruption of COVID-19 ($Capital_{i,2019Q4}$). This allows us to observe how the magnitude of the released CCyB affected credit provision in banks with different pre-COVID capital situation. The estimated specification is the following:

$$ln(Gross\ bank\ loans)_{i,t} = \beta_1\ Capital_{i,2019Q4} + \beta_2\ \Delta CCyB_{c,t} * Capital_{i,2019Q4} + \boldsymbol{\gamma}\,\boldsymbol{X}_{\mathrm{i,t-1}} + \theta_{tc} + \varphi_{\mathrm{c}} + \tau_{\mathrm{t}} + \epsilon_{it}. \quad (6)$$

In Table 9 we show the estimation results. As identified above, we observe that during the pandemic banks with low CET1 capital level or low distance to the CBR benefitted the most from the releases, increased lending more than banks in jurisdictions where the CCyB was not released. In particular, a 1 pp release of the CCyB rate increased lending by 7% in banks with a distance to the CBR below the 25th percentile of the distribution in 2019 Q4. Certainly, for these banks a CCyB release of the same amount represents, proportionally, a higher relief.

6.3. Accounting for fiscal support measures and dividend payout restriction policies

The challenges of the unexpected shock that represented the pandemic led governments to take extraordinary fiscal stimulus measures that might have had an impact on lending. Certainly, measures explicitly intended to support lending such as loan guarantees were among the most common measures adopted as a response to the shock. These measures were very relevant in Europe although there was important heterogeneity in their magnitude across countries, varying from representing around 4% in Bulgaria to more than 35% of GDP in Italy during the first quarter after the outbreak of the pandemic. Another relevant measure taken as a response to the COVID-19 shock in Europe that might had have an impact on lending was the ECB recommendation (ECB/2020/19) to restrict dividend pay-outs and share buybacks. In particular, the recommendation called banks to refrain from materializing capital distribution through dividend payments and share buybacks decisions. In this context, this restriction can be seen as an unexpected increase of capital, which banks could have used to increase lending.

Against this background, although in previous specifications we include country*time fixed effects, which would capture all unobserved measures taken in different countries during the pandemic, the explicit identification of these actions' effects can be important to properly identify CCyB releases' effect. Thus, we re-estimate Equation (5) to include both policies as controls. In this specification we are not able to include country*time fixed effects since it would absorb out the variable of interest. Thus, we add macroeconomic variables as controls instead, as follows:

$$ln(Gross\ bank\ loans)_{i,t} = \beta_1 Covid_t + \beta_2\ \Delta CCyB\_release_{c,t} + \beta_3\ \Delta CCyB\_release_{c,t} * Covid_t + \boldsymbol{\gamma}\ \boldsymbol{X}_{i,t-1} + \text{Fiscal\_aid}_{c,2020} + Dividend\_Res_{i,2020} + \delta_i + \varphi_c + \tau_t + \epsilon_{it}, \quad (7)$$

We present the estimation results in Table 10. Previous results regarding the impact of the release of the CCyB shown in Table 9 hold. That is, the release of the CCyB supported lending during the pandemic, and the higher the magnitude of the release the more credit was granted. These results confirm the importance of the CCyB on supporting lending even directly controlling for these two relevant measures during the pandemic.

6.3.1. The impact of the release on lending over time

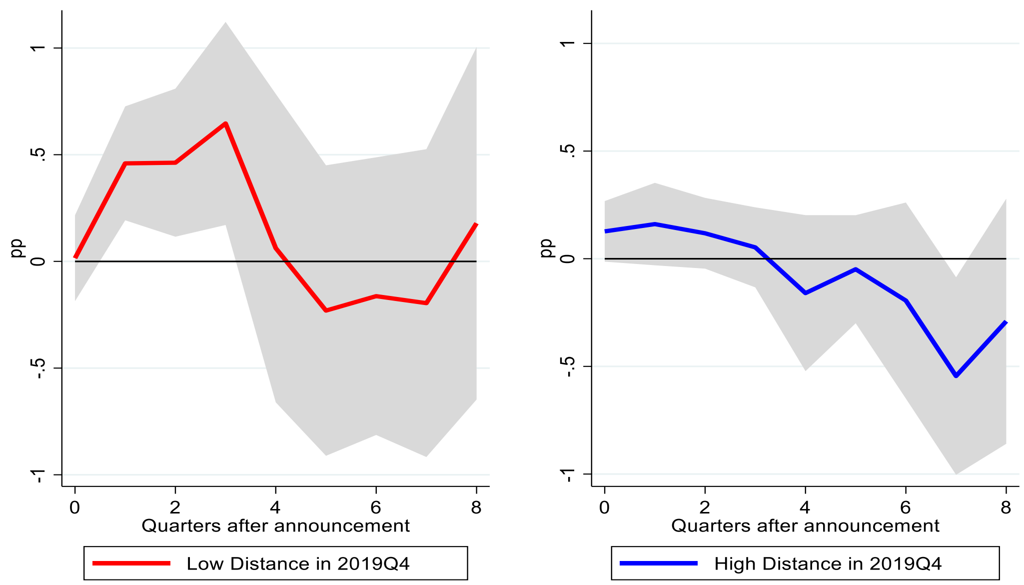
Although the effects of the release of the CCyB are expected to be more rapidly transmitted into banks' credit supply decisions than the announcement to increase it, there is no reason to think that the impact is only observed just, or as fast as, the next quarter after the release. Thus, we also estimate a local projection model of the effect of the release over an 8-quarters horizon, resembling the estimation carried out for the accumulation of the CCyB.

For this purpose, we use for this exercise our extended sample until 2023Q2. The estimated specification is the following:

$$\ln\left(\frac{Gross\ bank\ loans_{i,t+h}}{Gross\ bank\ loans_{i,t-1}}\right) = \beta^h CCyB_{release\,c,t} + \sum_{k=1}^{4}\theta_k^h \ln\left(\frac{Gross\ bank\ loans_{i,t-k}}{Gross\ bank\ loans_{i,t-k-1}}\right) + \boldsymbol{\gamma}^h \boldsymbol{X}_{i,t-1} + Fiscal\_aid_{c,2020} + Dividend\_Res_{i,2020} + \varphi_c^h + \delta_i^h + \epsilon_{i,t+h}\ ;\ h = 0 \dots 8, \quad (8)$$

where we explicitly control for fiscal support measures, the dividend restriction policies as well as for macrofinancial characteristics at the country level. Given our findings above on the heterogeneous effects in banks with low and high distance to the CBR at the irruption of the pandemic, we carry out these estimations by splitting the sample into banks below and above median values of this capital headroom over requirements in 2019Q4. The estimations for the coefficient of interest β^h are showed in Figure 6. These results confirm the heterogeneous effect of the release of the CCyB on lending depending on banks' capital headroom just before the pandemic shock. In particular, banks that were more constrained in terms of the distance between their CET1 ratio and the CBR increased lending the most after the release of the CCyB. The impulse response functions uncover that this effect was not only evident during the next quarter but that it spread over the following 3 quarters. The positive effect on lending for the most constrained banks represents a growth of credit of around 0.5 pp with respect to the pre-pandemic level. The average impact is also positive in banks with higher capital headroom before the pandemic in the first 2 quarters, but it is between 3 and 4 times lower and not clearly statistically significant.

Figure 6: Response of bank lending to the release of the CCyB over an 8-quarters horizon by banks' distance to the CBR.



Note: The graph plots the coefficients from a local projection model of the effect of the release of the CCyB on lending over a 2 years (8 quarters) horizon. The heterogeneous effect on banks with a low (below the median) and high (above the median) distance to the CBR in 2019Q4 is separately displayed.

6.3.2. The relationship between banks' capitalization, fiscal measures and dividend restrictions during the pandemic.

We complement our analysis by studying explicitly the direct effect of the fiscal measures and dividend restrictions on lending, and mainly their interaction with bank capital. Since low capitalized or more capital-constrained banks may have had higher incentives to make use of and profit from fiscal aid, the effect of these measures might be different depending on banks' capital level and their headroom over requirements. We first test this hypothesis by identifying the effect of the fiscal aid on bank credit, through the following equation:

$$ln(Gross\ bank\ loans)_{i,t} = \beta_1 Fiscal\_aid_{c,2020} + \beta_2 Capital_{i,t-1} + \beta_3 Fiscal\_aid_{c,2020} * Capital_{i,t-1} + \boldsymbol{\gamma}\, \boldsymbol{X}_{i,t-1} + \delta_i + \varphi_c + \theta_{t,c} + \epsilon_{it} \quad (9)$$

We show the estimation results in Table 11. As expected, we identify significant and positive effects of the fiscal aid granted during the COVID-19 period on bank credit. This is consistent with recent studies assessing the effect of fiscal support measures on lending (Jiménez et al., 2023). That is, the higher the fiscal aid in proportion to the country's GDP, the more credit was granted by banks during the pandemic. On average, a 1 pp of higher fiscal aid in proportion to the GDP increased bank lending on around 5%. Nonetheless, the most interesting results come from the interaction of fiscal measures with the CET1 level and the distance to the CBR. In this regard, we find similar results to those obtained with the benefits of the release of the CCyB. That is, the positive effects of the fiscal support measures on lending were decreasing with banks' capitalization level and their distance to the CBR. Thus, fiscal aid supported more lending by banks that were more capital-constrained at the irruption of the pandemic. This finding is consistent with the differential effects on lending during the pandemic associated to the degree of capital constraining of banks (see Berrospide et al., 2021; Couaillier et al., 2022a). These results are highly robust to the inclusion of bank and macro controls as well as to the inclusion of different types of fixed effects.

Similarly, we study the effect of the dividend restriction recommendation and its interaction with the level of capital of banks on lending. For that purpose, we re-estimate Equation (9) by replacing ($Fiscal\_aid_{c,2020}$) by a dummy variable capturing whether banks internalized ECB's capital's non-distribution recommendation ($DividendRestriction_{i,2020}$). Moreover, given that the COVID-19 shock might have affected banks differently depending on their capital level and the ECB's recommendation could benefit more capitally constrained banks during the pandemic, we add an interaction between the variable capturing the COVID-19 period and a dummy identifying capitally constrained banks. We show the estimation results in Table 12, where it can be seen that this policy had positive effects on lending but only for the most capital- constrained banks. Considering the most saturated specification (Column 5) where we include country*time fixed effects, it seems that those affected by the recommendation and below the median distance to the CBR, increased their lending around 25%. This suggest that this policy could effectively encourage lending for those banks that were more constrained in terms of capital. This result is robust to the inclusion of different controls and fixed effects, and is consistent with previous studies on the impact of this policy (Martínez-Miera and Vegas, 2021). Overall, this result provides additional evidence on that capital releases have positive effects on lending, mainly for the most capital-constrained banks.

7. Conclusions and policy implications

The short experience in the use of the CCyB limits the availability of empirical studies on its effects. On the one hand, most previous research either focus on the association between leverage ratios and credit or uses normative indicators of capital requirements, with mixed results on the impact on lending (Araujo, 2020). On the other hand, recent studies that assess the impact of the release of capital buffers on lending during the pandemic do not take into account the effects of the previous accumulation of these buffers. In this context, we provide a comprehensive analysis of the effects of the accumulation and the release of the CCyB on lending, taking into account heterogeneous effects depending on banks' capitalization and capital headroom over requirements. We also examine the relationship between the effects of the CCyB on lending and banks' reactions in terms of capital ratios and the amount of capital over requirements.

We find that the accumulation of the CCyB has, on average, a negative effect on lending. However, we identify that only the most capital-constrained banks restrict lending after an increase in the CCyB, and that this effect is observed only in the short term. Our results reconcile the two views of the mechanism through which an increase in capital requirements acts. That is, banks with low capital headroom face high costs of raising capital and react by cutting lending in the short run (Kopecky and VanHoose, 2006). However, in the medium-term, to the extent these banks comply with the new requirement, they face lower costs of equity, likely more similar to those of the highly capitalized banks, due to their improved solvency position, and are able to maintain unaltered lending (Heid et al, 2004; Gambacorta and Shin, 2018), thereby narrowing the differences in the response to an increase in requirements between lowly and highly capitalized banks (Rime, 2001; Stolz and Wedow, 2011).

Regarding the CCyB release, we exploit the COVID-19 shock, when almost all European countries with positive CCyB rates, released it partially or totally. We find strong evidence supporting that banks whose CCyB was released provided more credit during the pandemic. These results are consistent with recent studies (Couaillier et al., 2022a; Dursun-de Neef et al., 2023). Moreover, we find that lowly capitalized banks and. more importantly, those with low capital headroom over requirements benefitted significantly more from the release. In particular, we show that, following the release, the most capital-constrained banks at the irruption of the pandemic exhibited a lending growth rate up to 0.5 pp higher than before the shock and that this effect lasted for around 3 quarters. In contrast, the effect of the CCyB release in banks with high capital headroom over the CBR was about 0.2 pp in the first 2 quarters and not clearly statistically significant. This result corroborates recent findings on the relationship between lending during the pandemic and the size of voluntary buffers (Berrospide et al., 2021; Couaillier et al., 2022a). We also find that the fiscal support measures and the dividend distribution restriction recommendation, two of the main policy responses to the pandemic, had a positive impact on banks' lending decisions. Similarly to the CCyB release, these policies benefitted more weakly capitalized banks.

Overall, we find that the countercyclical effects of the CCyB are asymmetrical. The CCyB has important benefits in supporting the provision of credit when it is released after a negative shock, but the impact of its accumulation in good times is limited. It is unclear whether the effects of the CCyB on lending in good times can be seen as a cost or a benefit. On the one hand, the countercyclical design of the CCyB implies that curbing credit growth in expansions would be a benefit rather than a cost. Certainly, the few studies on the effects of the implementation of macroprudential policy have interpreted any negative effect on lending as a benefit (Claessens et al., 2013; Cerutti et al., 2017). On the other hand, reducing credit growth would dampen consumption and economic growth, which can be interpreted as a cost. Moreover, identifying the benefits of macroprudential tools can go beyond studying their impact on lending. In this context, recent literature has approached the cost and benefits of macroprudential policies by assessing their effects on the tail risk of GDP growth (Galán, 2020; Brandao-Marquez et al; 2020).

From a macroprudential policy perspective, our results contribute to recent policy discussions on the implementation of a positive neutral CCyB rate, which would be a part of the CCyB with a non-cyclical nature but with the aim to be released in the case of exogenous negative shocks. In particular, the clear benefits of the CCyB mitigating the negative consequences of financial stress events and the limited impact of its accumulation, would support the use of the tool in neutral phases of the financial cycle. Our results also highlight the importance of accounting for the individual capital position of banks when implementing this tool, given the significant heterogeneous effects of the CCyB among banks with different levels of capitalization and headroom over requirements.

List of Tables

Table 1: Descriptive statistics using the period 201309-202012

	Definition	Mean	SD	p5	p25	p50	p75	p95
Log Loans	Gross bank loans (tens of thousands euros, in logs)	12,86	2,2	9,7	11,1	12,6	14,6	16,5
CCyB Decrease	Dummy equal to 1 the quarter in which the announcement to decrease the CCyB occurs (0 otherwise).	0,03	0,2	0	0	0	0	0
CCyB Increase	Dummy equal to 1 the quarter in which the announcement to increase the CCyB occurs (0 otherwise).	0,08	0,3	0	0	0	0	1
CBR (lag)	Level of Combined Buffer Requirement (in pp)	2,55	2,4	0	0	2,5	3,5	7,5
CCyB rate (lag)	Level of CCyB rate (in pp)	0,26	0,6	0	0	0	0	2
CET1	Level of CET1 (in pp)	15,16	4,4	10,3	12,4	14,5	16,9	21,9
Distance	CET1 – CBR (in pp)	12,41	4,6	7,6	9,6	11,5	14,1	19,5
CET1 p25	Dummy equal to 1 if CET1 within the 25th percentile of the distribution, by quarter (0 otherwise)	0,25	0,4	0	0	0	1	1
Distance p25	Dummy equal to 1 if distance within the 25th percentile of the distribution, by quarter (0 otherwise)	0,25	0,4	0	0	0	1	1
CET1 p50	Dummy equal to 1 if CET1 within the 50th percentile of the distribution, by quarter (0 otherwise)	0,50	0,5	0	0	1	1	1
Distance p50	Dummy equal to 1 if distance within the 50th percentile of the distribution, by quarter (0 otherwise)	0,50	0,5	0	0	1	1	1
CCyB variation	Difference in the CCyB level from one quarter to the previous one (in pp)	0,01	0,2	0	0	0	0	0
CET1 variation	Difference in the CET1 level from one quarter to the previous one (in pp)	0,14	1,2	-1,4	-0,3	0,1	0,5	1,8
CBR variation	Difference in the CBR level from one quarter to the previous one (in pp)	0,12	0,6	0	0	0	0	0,9
Distance variation	Difference in the distance level from one quarter to the previous one (in pp)	0,02	1,3	-1,9	-0,5	0,0	0,5	1,8
Log Assets	Total assets (million euros, in logs)	9,66	2,3	6,1	7,8	9,5	11,2	13,9
ROAE	ROAE (in %)	6,97	18,9	-7,1	4,0	8,0	11,7	23,0
Log Equity	Total equity (million euros, in logs)	7,22	2,1	4,0	5,5	7,2	8,7	11,0
Cost/Income	Ratio operating cost over operating income (in %)	59,98	20,0	38,1	48,2	56,6	68,6	89,9
GDP (%)	GDP (%)	1,13	3,5	-5,8	0,6	1,8	2,9	4,8
Credit (%)	1 year credit growth, by country (%)	2,36	3,6	-3,3	-0,3	2,6	4,9	8,0
House Prices (%)	2 year house price growth, by country (%)	2,97	4,3	-4,9	-0,1	3,4	5,9	9,6
Credit/GDP (%)	Credit to GDP ratio (in %)	-0,36	3,3	-5,4	-2,3	-0,4	1,7	3,8
CCyB Released	Dummy equal to 1 if CCyB was released during COVID-19 (0 otherwise)	0,50	0,5	0	0	0	1	1
CET1 2019q4 p25	Dummy equal to 1 if CET1 in 2019 Q4 within the 25th percentile of the distribution (0 otherwise)	0,23	0,4	0	0	0	0	1
CET1 2019q4 p50	Dummy equal to 1 if CET1 in 2019 Q4 within the 50th percentile of the distribution (0 otherwise)	0,46	0,5	0	0	0	1	1
Fiscal Aid (%)	Fiscal aid in proportion to GDP over 2020 (in %) (0 otherwise)	1,58	5,5	0	0	0	0	15,2
Dividend temporary restricted banks	Dummy equal to 1 during the time a bank was affected by ECB's dividend restriction recommendation (0 otherwise)	0,02	0,15	0	0	0	0	1

Table 2: Effects of an increase of CCyB on CET1 and the distance to the CBR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dep vble:	CET1	CET1	CET1	CET1	CET1	CET1	distance	distance	distance	distance	distance	distance
CCyB Increase	-0.03	0.01	0.01	0.18	0.31	0.31	-0.64***	-0.55**	-0.55**	-0.08	0.08	0.08
	(0.39)	(0.25)	(0.25)	(0.13)	(0.20)	(0.20)	(0.24)	(0.22)	(0.22)	(0.19)	(0.22)	(0.22)
Observations	2,456	2,454	2,454	2,456	2,454	2,454	2,456	2,454	2,454	2,456	2,454	2,454
R-squared	0.18	0.87	0.87	0.22	0.89	0.89	0.29	0.85	0.85	0.31	0.88	0.88
N countries	25	25	25	25	25	25	25	25	25	25	25	25
N banks	170	170	170	170	170	170	170	170	170	170	170	170
FE	Country	Bank	Country Bank	Country Time	Bank Time	Country Bank Time	Country	Bank	Country Bank	Country Time	Bank Time	Country Bank Time

Note: The table shows the effect of the announcement to build up the CCyB on banks' CET1 capital ratio and on the distance to the CBR the following quarter during the period 2014-2020. The announcement dummy and the controls are lagged one period. Bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included in every specification. Specifications differ in the set of fixed effects used. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 3: Announcement of increase of CCyB on credit and its interaction with the CET1 level and the distance to CBR. Differential effects on the most constrained banks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dep. variable	Loans	Loans	Loans	Loans	Loans	Loans	Loans	Loans	Loans
CCyB Increase	0.12*	0.15**	0.21***	0.19**	0.29***	-0.57*	-0.47	-0.34**	-0.26
	(0.07)	(0.06)	(0.07)	(0.08)	(0.08)	(0.32)	(0.39)	(0.16)	(0.23)
CET1 p25		0.03							
		(0.12)							
CET1 p25 x CCyB Increase		-1.01**							
		(0.43)							
Distance p25			0.03						
			(0.06)						
Distance p25 x CCyB Increase			-0.28***						
			(0.10)						
CET1 p50				0.11					
				(0.10)					
CET1 p50 x CCyB Increase				-0.27*					
				(0.14)					
Distance p50					-0.10				
					(0.08)				
Distance p50 x CCyB Increase					-0.38***				
					(0.14)				
CET1						0.01	0.01		
						(0.02)	(0.02)		
CET1 x CCyB Increase						0.04**	0.04*		
						(0.02)	(0.02)		
Distance								0.00	0.02
								(0.02)	(0.02)
Distance x CCyB Increase								0.04***	0.03*
								(0.01)	(0.02)
Observations	1,462	1,389	1,389	1,389	1,389	1,398	1,398	1,398	1,398
R-squared	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
N countries	25	25	25	25	25	25	25	25	25
N banks	170	170	170	170	170	170	170	170	170
FE	Country Bank Time	Country Bank Time	Country Bank Time	Country Bank Time	Country Bank Time	Country Bank	Bank Time	Country Bank	Country Bank Time

Note: The table shows the effect of the announcement to build up the CCyB on banks' stock of loans (in logs) the following quarter during the period 2014-2020, distinguishing between the most and least constrained banks in terms of CET1 or distance to the CBR (below and above the 25th percentile and the median of the distribution for each quarter, respectively, for either the CET1 or distance). The announcement dummy, the CET1 ratio, the distance and the controls are lagged one period. Bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included in every specification. Specifications differ in the set of fixed effects used. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 4: Effects of a release of CCyB on CET1 and the distance to the CBR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dep vble:	CET1	CET1	CET1	CET1	CET1	CET1	distance	distance	distance	distance	distance	distance
CCyB Release	1.97***	1.40***	1.40***	0.88***	0.82*	0.82*	1.70***	1.40***	1.40***	0.99***	0.93**	0.93**
	(0.36)	(0.43)	(0.43)	(0.33)	(0.45)	(0.45)	(0.33)	(0.26)	(0.26)	(0.31)	(0.39)	(0.39)
Observations	2,456	2,454	2,454	2,456	2,454	2,454	2,456	2,454	2,454	2,456	2,454	2,454
R-squared	0.18	0.87	0.87	0.22	0.89	0.89	0.29	0.85	0.85	0.31	0.88	0.88
N countries	25	25	25	25	25	25	25	25	25	25	25	25
N banks	170	170	170	170	170	170	170	170	170	170	170	170
FE	Country	Bank	Country Bank	Country Time	Bank Time	Country Bank Time	Country	Bank	Country Bank	Country Time	Bank Time	Country Bank Time

Note: The table shows the effect of the announcement to release the CCyB on banks' CET1 capital ratio and on the distance to the CBR the following quarter during the period 2014-2020. The announcement dummy and the controls are lagged one period. Bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included in every specification. Specifications differ in the set of fixed effects used. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 5: Announcement of release of CCyB on credit and its interaction with the CET1 level

Dep vble:	(1) Loans	(2) Loans	(3) Loans	(4) Loans	(5) Loans	(6) Loans
CET1	0.03*	0.02	0.05	0.06***	0.05	0.06*
	(0.02)	(0.02)	(0.04)	(0.02)	(0.05)	(0.02)
CCyB Release	1.65**	1.20*	2.88***	0.87***		
	(0.73)	(0.71)	(0.80)	(0.26)		
CCyB Release x CET1	-0.08*	-0.05	-0.14***	-0.04***	-0.19***	-0.04***
	(0.04)	(0.04)	(0.03)	(0.01)	(0.01)	(0.03)
N. obs.	1,432	1,398	1,434	1,400	1,320	911
R-squared	0.96	0.96	0.47	0.87	0.46	0.89
Bank Controls	No	Yes	No	Yes	No	Yes
N countries	25	25	25	25	25	25
N banks	170	170	170	170	170	170
FE	Bank	Bank	Country	Country	Country*Time	Country*Time

Note: The table shows the effect of the announcement to release the CCyB on banks' stock of loans (in logs) the following quarter during the period 2014-2020, depending on their CET1 capital ratio levels. The announcement dummy, the CET1 ratio and the controls are lagged one period. Specifications differ in the set of fixed effects used and whether bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 6: Announcement of release of CCyB for the most constrained banks in terms of CET1 and distance to CBR

Dep vble:	(1) Loans	(2) Loans	(3) Loans	(4) Loans	(5) Loans
CET1 p50	-0.35**	-0.28*	-0.30*	-0.33*	
	(0.14)	(0.15)	(0.16)	(0.18)	
Distance p50					-0.18
					(0.16)
CCyB Release	0.09	0.12*			
	(0.06)	(0.06)			
CET1 p50 x CCyB Release	0.35***	0.33**	0.41*	0.41*	
	(0.13)	(0.14)	(0.25)	(0.24)	
Distance p50 x CCyB Release					0.43*
					(0.23)
N. obs.	1,393	1,393	904	904	904
R-squared	0.86	0.86	0.88	0.88	0.87
CET1 p50 x ROA	No	Yes	No	Yes	No
N countries	25	25	25	25	25
N banks	170	170	170	170	170
FE	Country	Country	Country*Time	Country*Time	Country*Time

Note: The table shows the effect of the announcement to release the CCyB on banks' stock of loans (in logs) the following quarter during the period 2014-2020, distinguishing between the most and least constrained banks in terms of CET1 or distance to the CBR (below and above the median of the distribution for each quarter, respectively, for either the CET1 or distance). The announcement dummy, the CET1 ratio, the distance and the controls are lagged one period. Bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included in every specification. Specifications differ in the set of fixed effects used. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 7: The CCyB release and its magnitude during COVID-19

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Vble	Loans	Loans	Loans	Loans	Loans	Loans
COVID	0.18***	0.10	0.65			
	(0.07)	(0.08)	(0.64)			
Δ CCyB	0.27***	0.15*	0.15	0.27***	0.18*	0.18
	(0.03)	(0.09)	(0.09)	(0.02)	(0.11)	(0.11)
COVID x Δ CCyB	-0.36***	-0.30*	-0.31**	-0.34***	-0.32	-0.34*
	(0.06)	(0.17)	(0.13)	(0.04)	(0.21)	(0.17)
N. obs.	2,321	2,223	2,223	2,321	2,223	2,223
R-squared	0.50	0.86	0.86	0.50	0.86	0.86
Bank controls	No	Yes	Yes	No	Yes	Yes
All controls interacted with COVID	No	No	Yes	No	No	Yes
N countries	25	25	25	25	25	25
N banks	170	170	170	170	170	170
FE	Country	Country	Country	Country Time	Country Time	Country Time

Note: The table shows the heterogeneous effect of COVID on banks which released or built up different magnitudes of CCyB on banks' stock of loans (in logs) the following quarter during the period 2014-2020. The controls are lagged one period. Specifications differ in the set of fixed effects used and whether bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 8: The level of capitalization and headroom over the CBR just before the irruption of the pandemic

	(1)	(2)	(3)	(4)
Dep vble:	Loans	Loans	Loans	Loans
CET1 2019q4 p25	-0.55***			
	(0.07)			
COVID x CET1 2019q4 p25	0.45**			
	(0.21)			
Distance 2019q4 p25		-0.43***		
		(0.06)		
COVID x Distance 2019q4 p25		0.36**		
		(0.16)		
CET1 2019q4 p50			-0.64***	
			(0.05)	
COVID x CET1 2019q4 p50			0.56***	
			(0.15)	
Distance 2019q4 p50				-0.35***
				(0.06)
COVID x Distance 2019q4 p50				0.02
				(0.15)
Observations	2,015	2,015	2,015	2,015
R-squared	0.87	0.87	0.88	0.87
N countries	25	25	25	25
N banks	170	170	170	170
FE	Country* Time	Country* Time	Country* Time	Country* Time

Note: The table shows the heterogeneous effect of COVID on banks with different CET1 and distance to CBR levels (percentile 10, 25 and 50 of the distribution) measured at 2019Q4 (pre-COVID) on banks' stock of loans (in logs) the following quarter during the period 2014-2020. The controls are lagged one period. Bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included in every specification. Specifications differ in the set of fixed effects used. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 9: Interaction between bank capitalization before COVID-19 and the release of the CCyB

	(1)	(2)	(3)	(4)
Dep vble:	Loans	Loans	Loans	Loans
CET1 2019q4 p25	-0.50***			
	(0.07)			
CET1 2019q4 p25 x Δ CCyB	0.00			
	(0.00)			
Distance 2019q4 p25		-0.37***		
		(0.05)		
Distance 2019q4 p25 x Δ CCyB		-0.44*		
		(0.24)		
CET1 2019q4 p50			-0.56***	
			(0.05)	
CET1 2019q4 p50 x Δ CCyB			-1.00***	
			(0.33)	
Distance 2019q4 p50				-0.34***
				(0.05)
Distance 2019q4 p50 x Δ CCyB				-0.27
				(0.29)
Observations	2,015	2,015	2,015	2,015
R-squared	0.87	0.87	0.88	0.87
N countries	25	25	25	25
N banks	170	170	170	170
FE	Country*Time	Country*Time	Country*Time	Country*Time

Note: The table shows the heterogeneous effect of the variation of different magnitudes of CCyB on banks with different CET1 and distance to CBR levels (percentile 10, 25 and 50 of the distribution) measured at 2019Q4 (pre-COVID) on banks' stock of loans (in logs) the following quarter during the period 2014-2020. The controls are lagged one period. Bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included in every specification. Specifications differ in the set of fixed effects used. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 10: The effect of CCyB releases accounting for fiscal support measures, dividend-payout restrictions and macrofinancial conditions

	(1)	(2)	(3)	(4)	(5)	(6)
Dep vble:	Loans	Loans	Loans	Loans	Loans	Loans
Δ CCyB	0.61***	0.42*	0.42*	0.42	0.40*	0.40*
	(0.09)	(0.22)	(0.23)	(0.00)	(0.22)	(0.23)
COVID	0.18	-0.18	1.41**			
	(0.22)	(0.19)	(0.70)			
COVID x Δ CCyB	-0.79***	-0.58**	-0.62***	-0.79	-0.59**	-0.66**
	(0.16)	(0.27)	(0.23)	(0.00)	(0.30)	(0.27)
Fiscal Aid (%)	0.00	0.02*	0.02	0.01	0.02*	0.02
	(0.02)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
Dividend temporary restricted banks	0.86**	0.32*	0.49**	1.03	0.35*	0.53**
	(0.39)	(0.19)	(0.21)	(0.00)	(0.20)	(0.22)
Observations	1,735	1,649	1,649	1,735	1,649	1,649
R-squared	0.44	0.85	0.85	0.45	0.85	0.85
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	No	Yes	Yes	No	Yes	Yes
All controls interacted with COVID			Yes			Yes
N countries	25	25	25	25	25	25
N banks	170	170	170	170	170	170
FE	Country	Country	Country	Country Time	Country Time	Country Time

Note: The table shows the effect of the announcement to release the CCyB on banks' stock of loans (in logs) the following quarter during the period 2014-2020, and the heterogeneous effect of COVID on banks which released different magnitudes of CCyB during COVID on banks' stock of loans (in logs) the following quarter. The "Dividend temporary restricted banks" variable takes value =1 for those banks which announced that would distribute dividends but could not do it for some months following the restrictions imposed by the BCE in 2020. The variable takes value =1 for those quarters following the announcement of the restriction (2020Q1) until the bank did distribute the dividend formerly announced. Specifications differ in the set of fixed effects used and whether bank controls (log of total assets, log of total equity, ROAE and cost to income ratio) are included, either as standalone or interacting with the COVID-19 variable. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

Table 11: The effects of fiscal support measures during COVID-19 and its interaction with banks' CET1 level and their distance to CBR

Dep vble:	(1) Loans	(2) Loans	(3) Loans	(4) Loans	(5) Loans	(6) Loans	(7) Loans
Fiscal Aid	0.04***	0.11***	0.05***	0.05***	0.04***	-	-
	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)		
CET1	-0.00	0.05	0.06***	0.07***		0.07***	0.10*
	(0.02)	(0.03)	(0.01)	(0.01)		(0.01)	(0.06)
Fiscal Aid (%) x CET1	-0.00***	-0.01***	-0.00***	-0.00***		-0.00***	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)
Distance					0.06***		
					(0.01)		
Fiscal Aid (%) x Distance					-0.00***		
					(0.00)		
N. obs.	1,534	2,168	2,098	1,536	1,536	1,906	240
R-squared	0.95	0.51	0.87	0.87	0.87	0.88	0.88
Bank Controls	Yes	No	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	No	No	Yes	Yes		
N countries	25	25	25	25	25	25	25
N banks	170	170	170	170	170	170	170
Date	201309-202012	201309-202012	201309-202012	201309-202012	201309-202012	201309-202012	202003-202012
FE	Bank	Country	Country	Country	Country	Country* Time	Country* Time

Note: The table shows the heterogeneous effect of the fiscal aid (in % of the country's GDP) on banks with different CET1 capital on banks' stock of loans (in logs) the following quarter. The controls, the capital and distance variables are one period lagged. Specifications differ in the set of fixed effects used and whether bank and macroeconomic controls are included. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

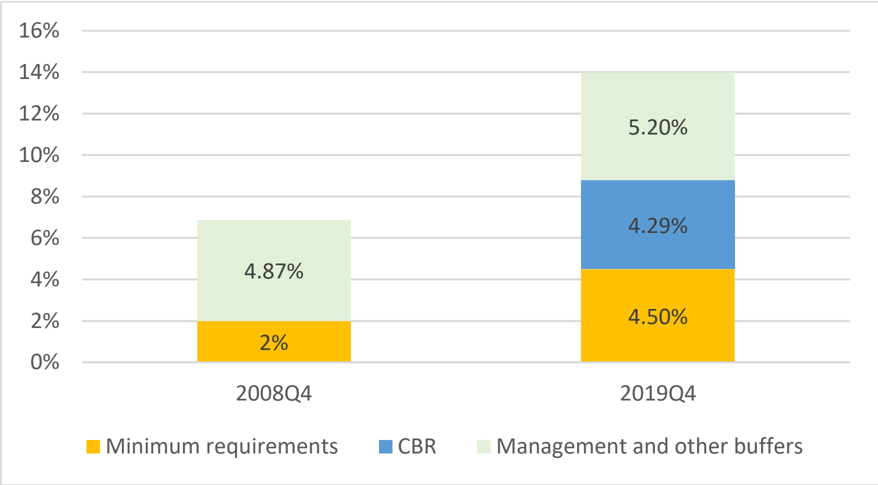
Table 12: Interaction of variable identifying banks affected by the dividend restriction and their distance to CBR

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	Loans	Loans	Loans	Loans	Loans	Loans
Distance p50	-0.53**	-0.35***	-0.54**	-0.37***	-0.41**	-0.39***
	(0.24)	(0.13)	(0.24)	(0.13)	(0.16)	(0.15)
COVID	0.12	0.08				
	(0.16)	(0.18)				
COVID x Distance p50	-0.03	-0.11	-0.01	-0.12	0.14	
	(0.23)	(0.19)	(0.23)	(0.20)	(0.21)	
Dividend temporary restricted banks	-0.15	0.02	-0.13	-0.05	0.16	0.05
	(0.50)	(0.30)	(0.52)	(0.31)	(0.37)	(0.32)
Distance p50 x Dividend temporary restricted banks	1.87***	0.61*	1.88***	0.66*	0.65**	0.79***
	(0.58)	(0.35)	(0.60)	(0.35)	(0.32)	(0.25)
Observations	2,178	1,539	2,178	1,539	1,909	1,909
R-squared	0.52	0.85	0.52	0.85	0.87	0.87
Bank controls	No	Yes	No	Yes	Yes	Yes
Macroeconomic controls	No	Yes	No	Yes	No	No
N countries	25	25	25	25	25	25
N banks	170	170	170	170	170	170
FE	Country	Country	Country Time	Country Time	Country *Time	Country *Time

Note: The table shows the effect of the dividend restriction imposed by the BCE in 2020 on banks' stock of loans (in logs) the following quarter during the period 2014-2020, distinguishing between the most and least constrained banks in terms of distance to the CBR (below and above the median of the distribution for each quarter, respectively). The "Dividend temporary restricted banks" variable takes value =1 for those banks which announced that would distribute dividends but could not do it for some months following the restrictions imposed by the BCE in 2020. The variable takes value =1 for those quarters following the announcement of the restriction (2020Q1) until the bank did distribute the dividend formerly announced. Column (6) displays results after estimation of same specification as in Column (5) but without including the interaction between COVID and the dummy identifying percentile 50 of the distribution of the distance by quarter. The controls and the distance variable are one period lagged. Specifications differ in the set of fixed effects used and whether bank and macroeconomic controls are included. Robust standard errors are shown in parentheses and ***, ** and * represent a statistical significance at 1%, 5% and 10%, respectively.

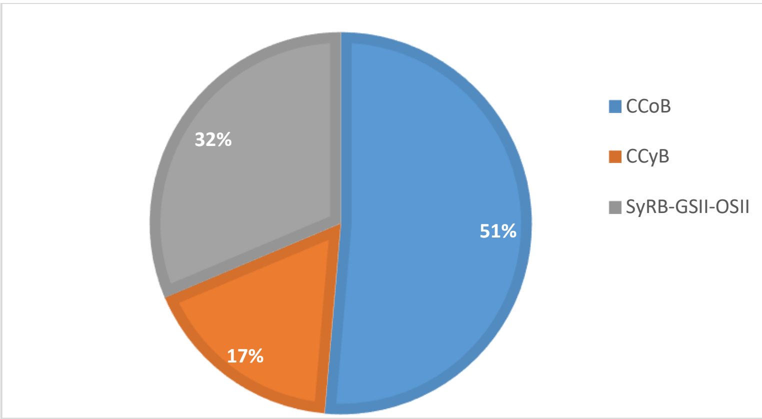
Annex 1.

Figure 1A. *Change in the ratio CET1 / RWA and its composition in EU banks between 2008 and 2019.*



Source: SNL. Own calculations.
Note: The CBR consists of the sum of the Capital Conservation Buffer (CCoB), the Systemic Risk Buffer (SyRB), the buffer for global systemically important institutions (G-SII), the buffer for domestic systemically important institutions (O-SII), and the CCyB. Following the EU CRR/CRD-V Directive, the highest of the SyRB, the G-SII, and the O-SII buffers is applicable.

Figure 1B. *Composition of the CBR in banks with positive CCyB rates in place at 2019Q4.*



Source: SNL. Own calculations.
Note: The CCoB is fixed at 2.5% of the CET1 ratio for all banks. The CCyB is the same rate for all banks in the same jurisdiction and ranges from 0.25% to 2.5% of the CET1 ratio. Following the EU CRR/CRD-V Directive, the maximum between the G-SII, the O-SII and the SyRB is applicable with a maximum of 5% of the CET1 ratio.

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