

# How to Release Capital Requirements during a Pandemic? Evidence from Euro Area Banks

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# Motivation

- Expected functioning of the **Basel III macroprudential framework**.
  - Bank capital buffers built up in **economic upturns** when vulnerabilities accumulate.
  - They can be employed to absorb losses and meet credit demand in **downturns**.
- But some concerns about **potential limitations of this framework**.
  - Are there constraints to the actual **usability of capital buffers**?
  - Is there adequate macroprudential space for **buffer releases**?
- **The pandemic** as ideal setting to **test the functioning of the framework**, due to exogenous nature of shock and different measures of capital relief
- **Euro area** provides attractive setting **to study effects of capital relief**.
  - **Institutional setting of** macro- and micro-prudential policy
  - **Data for multiple countries:** supervisory, credit register
  - **Prudential policy measures:** reduction of requirement; supervisory flexibility

# Research Questions and Preview of Results

- **Setting.** Bank capital relief by prudential authorities at onset of pandemic
  - **Analysis.** Loan-level study on the effects of capital relief on bank lending to firms, controlling for credit demand and concurrent policy measures
1. What is the **impact of bank capital relief on credit supply**?
    - Capital relief measures contribute to expand credit supply to firms
  2. Does the **nature of the capital relief** matter for its effectiveness?
    - **Releases of capital requirements** (permanent or temporary) raise lending.
    - **Supervisory flexibility** on capital expectations has no significant impact.
  3. Are the **effects different across banks**?
    - Requirement releases more effective for banks with smaller capital headroom
  4. Does **capital relief promote bank risk-taking** towards weaker firms?
    - The requirement releases does not promote lending towards insolvent firms

# Outline

- ***Related Literature and Contributions***
- ***Capital Relief Measures***
- ***Methodology & Data***
- ***Empirical Results***
- ***Conclusions***

# Related Literature and Contribution

## 1. The effect of changes in capital requirements on bank lending

- **Capital surcharges and structural buffers** [Gropp et al., 2019; De Jonghe et al., 2020; Behn and Schramm, 2020; Degryse et al. 2022; Cappelletti et al., 2022]
- **Dynamic requirements** [Aiyar et al 2014; Auer et al 2022; Imbierowicz et al 2018; Basten 2019]
- **Capital requirement releases during Global Financial Crisis** [Jimenez et al., 2017]
- *Analyse the effects of (different) capital releases during a pandemic.*

## 2. Rules vs. discretion in prudential policy

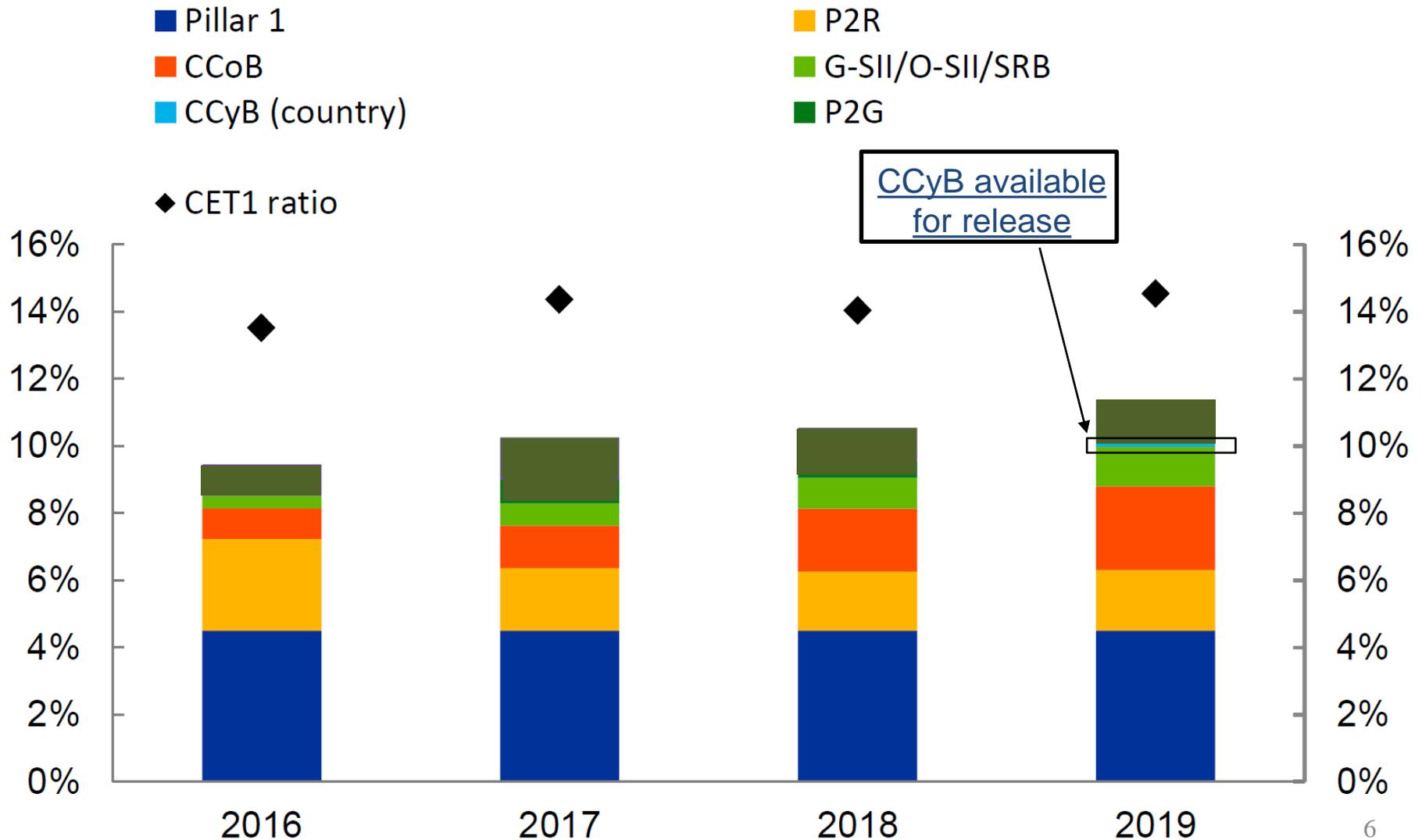
- **Microprudential regulation and supervision** [Walther and White, 2020; Elliott et al., 2013]
- **Macroprudential policy** [Agur and Sharma, 2013; Calem et al., 2020].
- *Predictability within known frameworks supports policy effectiveness.*

## 3. Basel III framework and bank lending during the pandemic

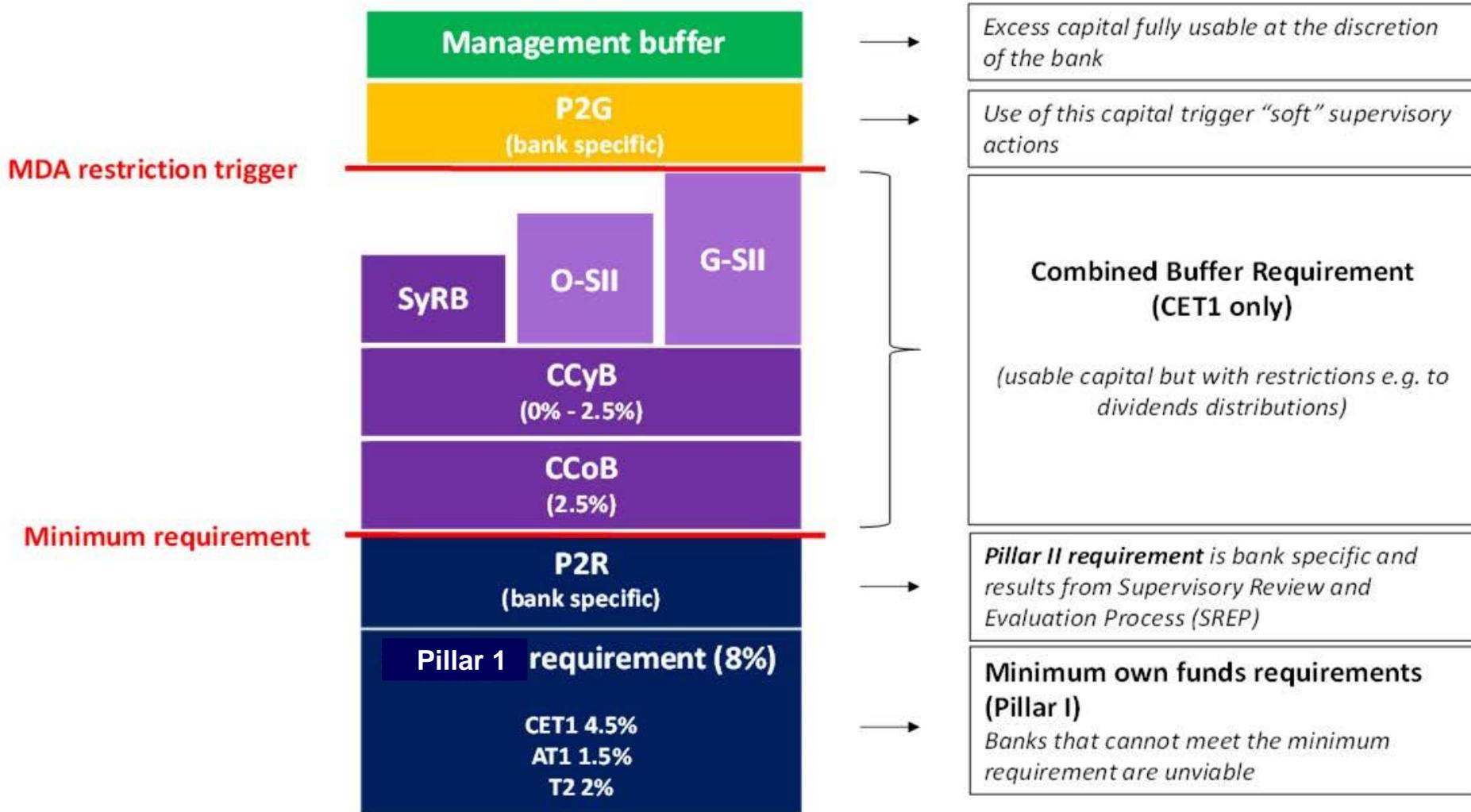
- **Capital buffers, internal models and bank lending** [Abad and Garcia, 2022; Berrospide et al., 2021; Couaillier et al., 2022; Mathur et al., 2022; Matyunina and Ongena, 2022; Fiordelisi et al., 2022]
- *Assess capital requirement releases under the Basel III framework.*

# Limited space from Countercyclical Capital Buffer (CCyB)

Capital requirements and CET1 ratios (percentages of risk-weighted assets)



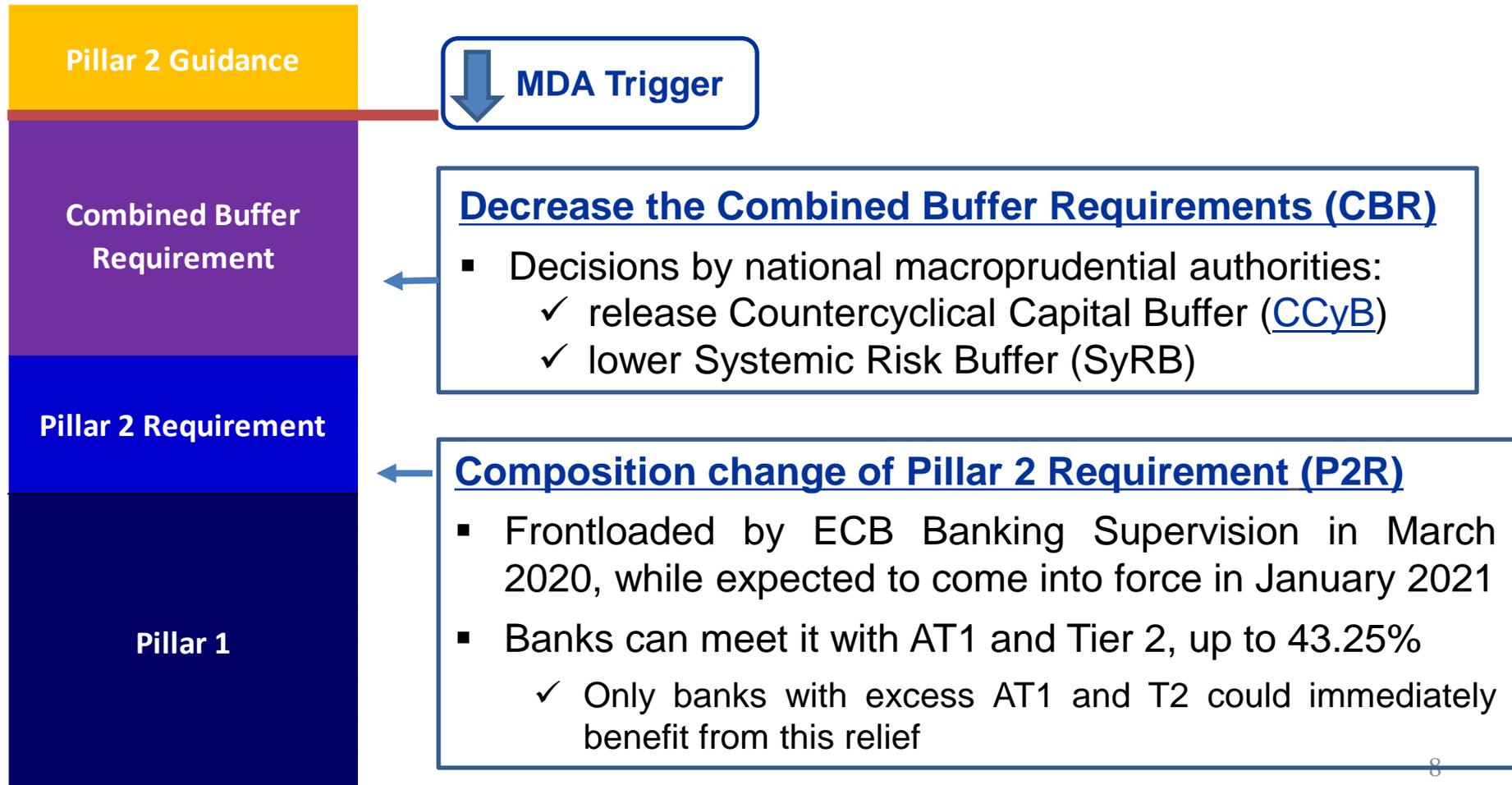
# The Capital Stack for EU Banks



# Capital Relief: Reduction of CET1 Requirements

- Starting on 12 March 2020, euro area prudential authorities adopted two types of measures, providing capital relief for overall EUR 140 bn:

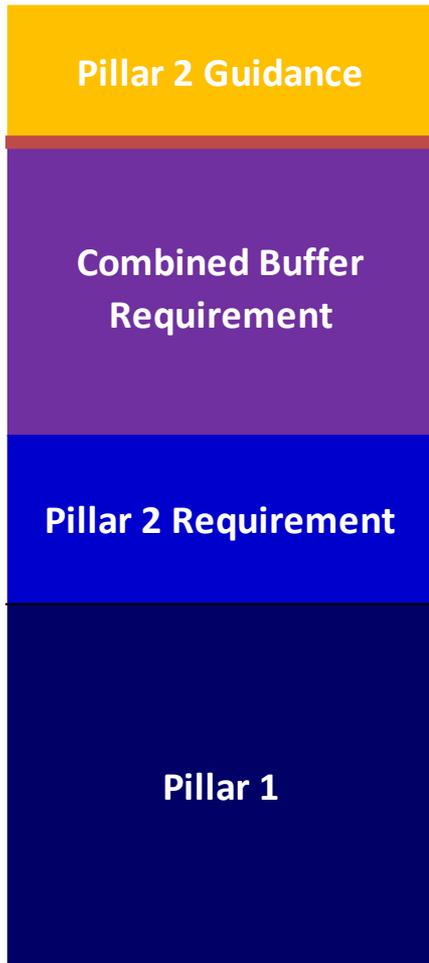
## 1. Reduced binding capital requirements (rule-based action)



# Capital Relief: P2G Usability

- Starting on 12 March 2020, euro area prudential authorities adopted two types of measures, providing capital relief for overall EUR 140 bn :

## 2. Granted flexibility on supervisory guidance (discretionary measure)

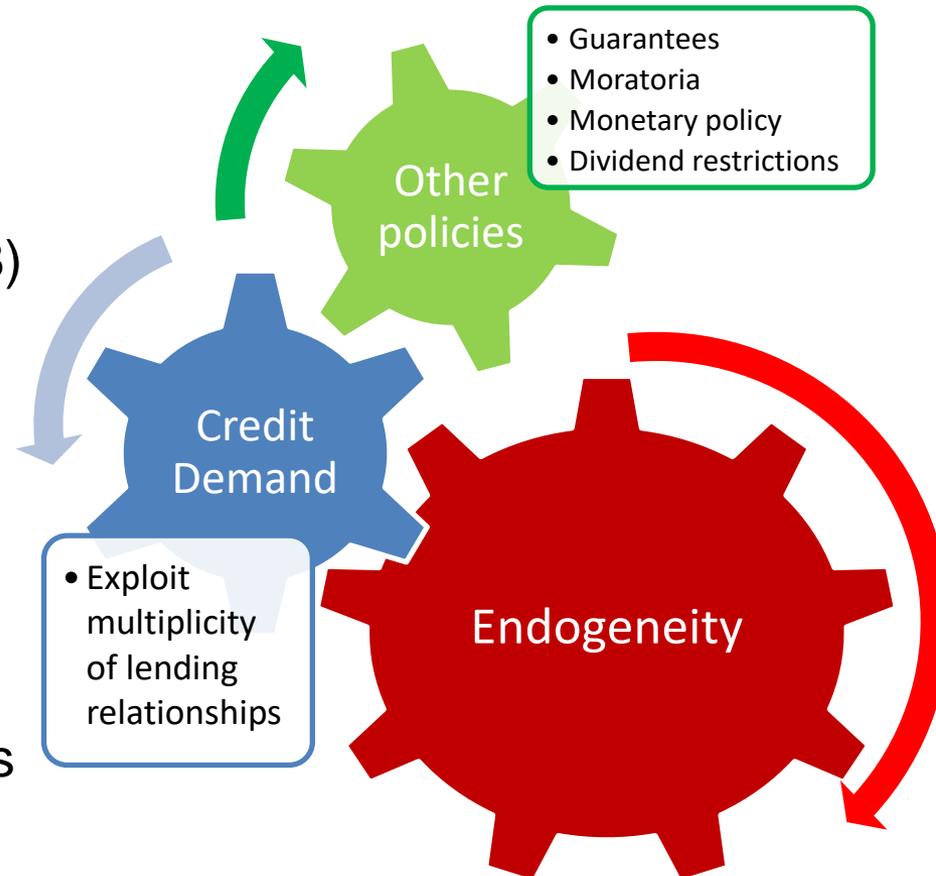


### ← Permission to operate below Pillar 2 Guidance (P2G)

- Decided by ECB Banking Supervision
- While supervisory expectation in place, temporary waiver on the potential consequences of a breach

# Empirical Strategy

- **Econometric identification:**
  - **Bank-firm loan-level data** to study the effects of capital relief measures on banks' credit supply
  - **Control for demand** through firm fixed effects (Khwaja and Mian, 2008)
  - **Supply** controlled for:
    - **bank characteristics** (time-variant balance sheet variables, bank FEs);
    - **policy interventions**
      - TLTRO III and dividend restrictions at bank level
      - credit guarantees and moratoria at bank-firm level



# Data

- Combine different micro confidential datasets with euro area coverage for a quarterly sample from 2019 Q3 to 2020 Q4.
- **Loan-level data from Anacredit**
  - All **bank-firm credit relations** with initially more than 25,000€
    - **Credit contract data: loan volumes, lender, borrower, guarantees, moratoria**
    - **Firm level information:** Industry (NACE), Location & Size information
- **Bank-level supervisory data**
  - Offer a vast variety of bank characteristics to control for
  - Information on **capital relief measures** and distance to the P2G
  - Focus on Significant Institutions due to P2G data availability
- **Pandemic-related policy measures**
  - **Central bank liquidity measures:** TLTRO-III allotment
  - **Suspension of dividend distribution** (decided by ECB Banking Supervision)

# Empirical Specification

- **Regression equation:**

$$\Delta Y_{f,b,c,t} = \alpha CAPREL_{b,t} * PostCOVID_t + \beta P2G_{b,t} * PostCOVID_t + \Phi X_{b,t-1} + \Psi Z_{f,b,t-1} + \eta_{f,t} + \mu_{c,t} + \rho_b + \epsilon_{f,b,c,t}$$

f is the firm, b is the lender bank, c is the country of the bank, t is the quarter

- **Dependent variable** for credit at the firm-bank level:

- $\Delta$  log of lending stocks

- **Key regressors** expressed as continuous variables:

- $CAPREL_{b,t}$  is the size of **capital requirement decreases** (from P2R & CBR)
- $P2G_{b,t}$  is the pre-Covid level of the **Pillar 2 Guidance**

- **Fixed effects:** firm-quarter, country-quarter and bank (or firm-bank)

- **Errors clustered** at the firm-quarter, bank-quarter, firm-bank levels.

- **Bank controls:** bank size, NPL ratio, provisions/tot assets, net interest margin, cost to income ratio, deposits/tot assets, liquid assets/tot assets, loans/tot assets, average risk weight, lagged CET1 ratio

# Table 1. Effects of Different Capital Relief Measures

- The **reduction in capital requirements increased banks' credit supply to firms** (as able to affect banks' dividend policy and capital planning)
- The **flexibility on supervisory guidance had no significant impact** on banks' lending behaviour

|                         | (1)                      | (2)                       | (3)                      | (4)                       |
|-------------------------|--------------------------|---------------------------|--------------------------|---------------------------|
|                         | Δ Log (loans)            | Δ Log (loans)             | Δ Log (loans)            | Δ Log (loans)             |
| CAPREL*PostCOVID        | <b>1.247*</b><br>(0.665) | <b>1.744**</b><br>(0.734) | <b>2.723**</b><br>(1.19) | <b>2.773**</b><br>(1.169) |
| P2G*PostCOVID           | <b>-1.046</b><br>(0.963) | <b>-0.975</b><br>(0.992)  | <b>-1.240</b><br>(1.081) | <b>-0.358</b><br>(0.960)  |
| Obs.                    | 5,480,013                | 5,480,013                 | 5,480,013                | 5,480,013                 |
| Firm*Quarter FE         | YES                      | YES                       | YES                      | YES                       |
| Bank country*Quarter FE | NO                       | YES                       | YES                      | YES                       |
| Bank FE                 | NO                       | NO                        | YES                      | NO                        |
| Firm-bank FE            | NO                       | NO                        | NO                       | YES                       |

**Bank controls:** log of bank total asset, non-performing loans ratio, provisions-to-total-assets, net interest margin, cost to income ratio, deposits-to-total assets, liquid-assets-to-total-assets, loans-to-total-assets, average risk weight, lagged CET1 ratio. **Policy controls:** (at the bank-level) TLTRO-to-total assets, dividend restrictions; (at the bank-firm level) share of loans under moratoria, share of loans under guarantee schemes, dividend restriction policy. [Capital relief measures](#)

# Effectiveness of Different Relief Measures

- **The design of the capital relief measure is key for its effectiveness.**

What are the main differences?

|                               | Decrease in Requirements  | Usability of P2 Guidance   |
|-------------------------------|---|--|
| Benefits from change?         | <b>Reduction of binding requirements</b><br>→ Reduce MDA trigger (breach implies automatic restrictions)                        | Supervisory <b>expectation still in place</b><br>→ Temporary waiver on supervisory actions (already discretionary)                                 |
| Replenishment rules/timeline? | - P2R permanent<br>- CBR temporary but <b>set within established framework</b> (clear rules for future rate increase decisions) | - Temporary usability, on <b>discretionary</b> basis <b>outside scope of the framework</b><br>- Timeline communicated only at the end of July 2020 |

**Predictability** of measures for replenishment and sanctions enhance policy effectiveness

**Uncertainty** on replenishment or breach consequences may hamper relief effectiveness

# Table 2. Bank Heterogeneity and Capital Headroom

- **Expansionary effects** stronger for **banks closer to P2G** pre-pandemic
  - Dist. P2G PreCOVID= CET1 ratio - P2G level (as of 2019 Q4).
  - The reduction of capital requirements **released buffer usability constraints** particularly for banks with smaller capital headroom (Couaillier et al., 2022)

|   | (1)                         | (2)                         | (3)                         | (4)                         |
|---|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|   | $\Delta \text{Log (loans)}$ | $\Delta \text{Log (loans)}$ | $\Delta \text{Log (loans)}$ | $\Delta \text{Log (loans)}$ |
| CAPREL*PostCOVID                        | <b>3.33***</b><br>(1.05)    | <b>3.36***</b><br>(1.11)    | <b>4.18***</b><br>(1.60)    | <b>4.32***</b><br>(1.51)    |
| P2G*PostCOVID                           | -1.51<br>(1.43)             | -0.52<br>(1.50)             | -1.89<br>(1.75)             | -0.51<br>(1.63)             |
| Dist. P2G PreCOVID                      | 0.08<br>(0.20)              | 0.14<br>(0.20)              |                             | -14.09<br>(39.38)           |
| CAPREL*PostCOVID* Dist. P2G<br>PreCOVID | <b>-0.62**</b><br>(0.27)    | <b>-0.41</b><br>(0.28)      | <b>-0.70*</b><br>(0.39)     | <b>-0.72**</b><br>(0.34)    |
| Obs.                                    | 5,308,638                   | 5,308,638                   | 5,308,638                   | 5,308,638                   |
| Firm*Quarter FE                         | YES                         | YES                         | YES                         | YES                         |
| Bank country*Quarter FE                 | NO                          | YES                         | YES                         | YES                         |
| Bank FE                                 | NO                          | NO                          | YES                         | NO                          |
| Bank-firm FE                            | NO                          | NO                          | NO                          | YES                         |

**Bank controls:** log of bank total asset, non-performing loans ratio, provisions-to-total-assets, net interest margin, cost to income ratio, deposits-to-total assets, liquid-assets-to-total-assets, loans-to-total-assets, average risk weight, lagged CET1 ratio. **Policy controls:** (at the bank-level) TLTRO-to-total assets, dividend restrictions; (at the bank-firm level) share of loans under moratoria, share of loans under guarantee schemes, dividend restriction policy.

# Table 3. Firm Heterogeneity and Riskiness

## ➤ Requirement releases did not promote risk-taking towards insolvent firms

- L.IMPAIRMENT=1 if bank *b* has recognized **impairments** in credit relationships with firm *f* in quarter *t-1* (private info available to the lender; Jimenez et al. 2014)
- Releases supported a considerably **lower lending growth for riskier firms**

|                                   | (1)                        | (2)                         | (3)                          | (4)                        |
|-----------------------------------|----------------------------|-----------------------------|------------------------------|----------------------------|
|                                   | Δ Log (loans)              | Δ Log (loans)               | Δ Log (loans)                | Δ Log (loans)              |
| CAPREL*PostCOVID                  | <b>1.291*</b><br>(0.6841)  | <b>1.842**</b><br>(0.7610)  | <b>3.169***</b><br>(1.220)   | <b>3.073***</b><br>(1.188) |
| P2G*PostCOVID                     | -1.063<br>(0.9981)         | -1.005<br>(1.031)           | -1.620<br>(1.143)            | -0.5618<br>(1.014)         |
| L.IMPAIRMENT                      | 0.0257***<br>(0.0050)      | 0.0247***<br>(0.0051)       | 0.0259***<br>(0.0052)        | 0.1005***<br>(0.0077)      |
| CAPREL*PostCOVID*<br>L.IMPAIRMENT | <b>-1.773*</b><br>(0.9172) | <b>-2.098**</b><br>(0.9395) | <b>-2.747***</b><br>(0.9075) | <b>0.6275</b><br>(0.8477)  |
| Obs.                              | 5,180,712                  | 5,180,712                   | 5,180,712                    | 5,180,712                  |
| Firm FE                           | YES                        | YES                         | YES                          | YES                        |
| Bank country*Quarter FE           | NO                         | YES                         | YES                          | YES                        |
| Bank FE                           | NO                         | NO                          | YES                          | NO                         |
| Bank-firm FE                      | NO                         | NO                          | NO                           | YES                        |

**Bank controls:** log of bank total asset, non-performing loans ratio, provisions-to-total-assets, net interest margin, cost to income ratio, deposits-to-total assets, liquid-assets-to-total-assets, loans-to-total-assets, average risk weight, lagged CET1 ratio. **Policy controls:** (at the bank-level) TLTRO-to-total assets, dividend restrictions; (at the bank-firm level) share of loans under moratoria, share of loans under guarantee schemes, dividend restriction policy.

# Robustness Analysis

## ➤ Definition of the dependent variable

- ✓ Investigate increase in loan volumes in lending relationships ([table](#))
  - Define a binary dependent variable for the increase in credit and estimate a logit regression

## ➤ Potential endogeneity of the P2G

- ✓ P2G set by banking supervisors based on the risk of banks ([table](#))
  - Two stage approach:
    - Estimate the P2G as function of expected capital depletion from 2018 Stress Tests under adverse scenario
    - Use residuals from the P2G estimation as regressors in the main estimation

## ➤ Disentangle the decrease of different capital requirements

- ✓ Estimate separately the effects of the release of P2R and CBR ([table](#))

# Conclusions

- **COVID-19 pandemic** provides ideal setting to study the functioning of capital buffer framework and the design of capital releases in crisis times
- **Capital relief measures support banks' credit supply to firms, but not all measures are equally successful.**
  - Banks adjust their credit supply only if the **capital relief is permanent or implemented within rule-based processes** (which foresee long release periods or define clear rules on replenishment and sanctions)
  - **Discretionary relief measures** show limited success, possibly for the uncertainty in capital replenishment or as not affecting dividend policy.
- The effectiveness of countercyclical capital relief measures in crisis times depends not only on the relief size, but also on the **design of measures**.
  - Focus on **rules setting clear policy reactions**.
  - Tilting the balance **from usable to releasable buffers**

Thank you!

# APPENDIX

# Countercyclical Capital Buffer Rates

## Countercyclical Capital Buffer rate applicable in euro area countries

(2019-2024, as of January, percent of Risk Weighted Assets)

| Country     | Jan-19 | Jan-20 | Jan-21 | Jan-22 | Jan-23 | Jan-24 |
|-------------|--------|--------|--------|--------|--------|--------|
| Austria     | 0      | 0      | 0      | 0      | 0      | 0      |
| Belgium     | 0      | 0      | 0      | 0      | 0      | 0      |
| Croatia     | 0      | 0      | 0      | 0      | 0      | 0.5    |
| Cyprus      | 0      | 0      | 0      | 0      | 0      | 0      |
| Estonia     | 0      | 0      | 0      | 0      | 1      | 1.5    |
| Finland     | 0      | 0      | 0      | 0      | 0      | 0      |
| France      | 0      | 0.25   | 0      | 0      | 0      | 0.5    |
| Germany     | 0      | 0      | 0      | 0      | 0      | 0.75   |
| Greece      | 0      | 0      | 0      | 0      | 0      | 0      |
| Ireland     | 0      | 1      | 0      | 0      | 0      | 1      |
| Italy       | 0      | 0      | 0      | 0      | 0      | 0      |
| Latvia      | 0      | 0      | 0      | 0      | 0      | 0      |
| Lithuania   | 0.5    | 1      | 0      | 0      | 0      | 1      |
| Luxembourg  | 0      | 0.25   | 0.5    | 0.5    | 0.5    | 0.5    |
| Malta       | 0      | 0      | 0      | 0      | 0      | 0      |
| Netherlands | 0      | 0      | 0      | 0      | 0      | 1      |
| Portugal    | 0      | 0      | 0      | 0      | 0      | 0      |
| Slovakia    | 1.25   | 1.5    | 1      | 1      | 1      | 1.5    |
| Slovenia    | 0      | 0      | 0      | 0      | 0      | 0      |
| Spain       | 0      | 0      | 0      | 0      | 0      | 0      |

At the beginning of 2020, among euro area countries:

- 5 had activated a positive CCyB rate;
- 2 (BE, DE) had announced a positive CCyB (under phase-in).

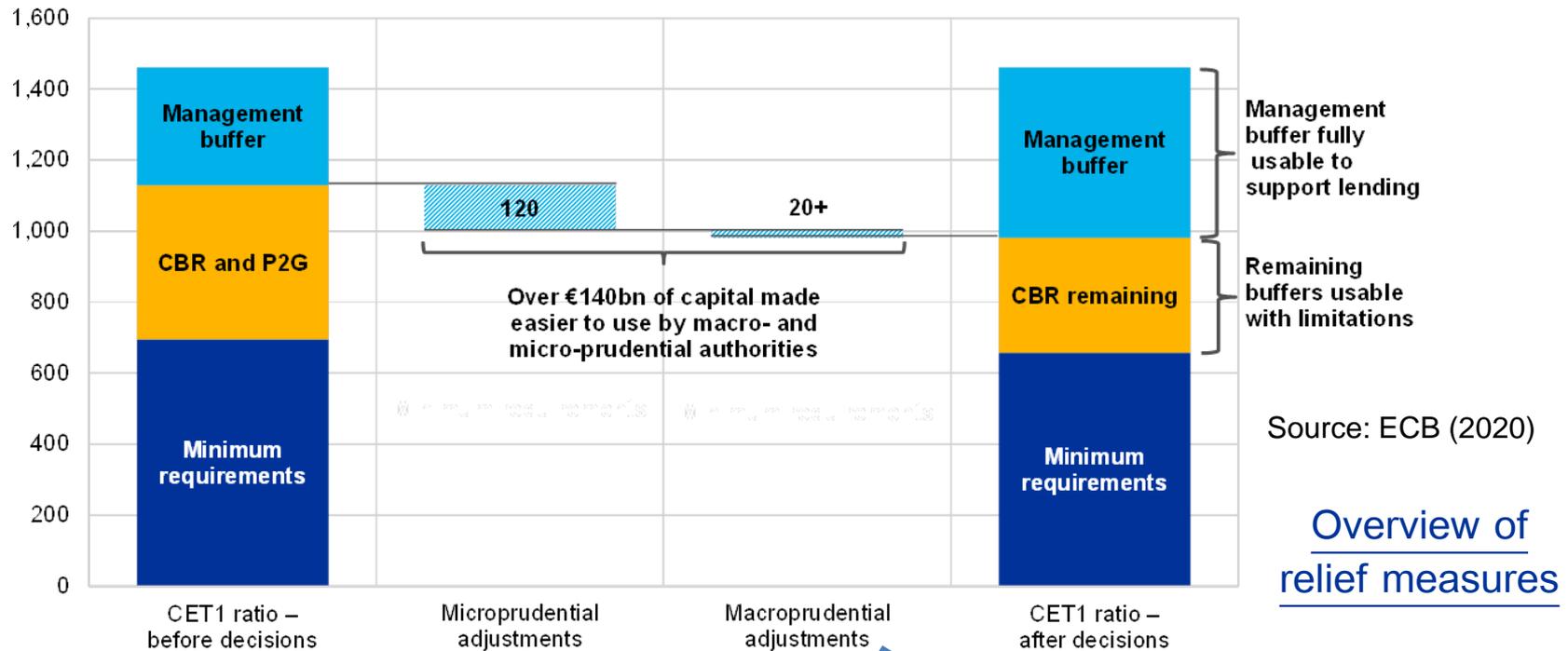
The activation or the increase of the CCyB rate requires a 12-month phase-in implementation period

Capital ratios  
before pandemic

Source: ESRB (2022)

# Capital Relief Measures

Capital relief measures by euro area prudential authorities for overall EUR 140 bn at the onset of the pandemic



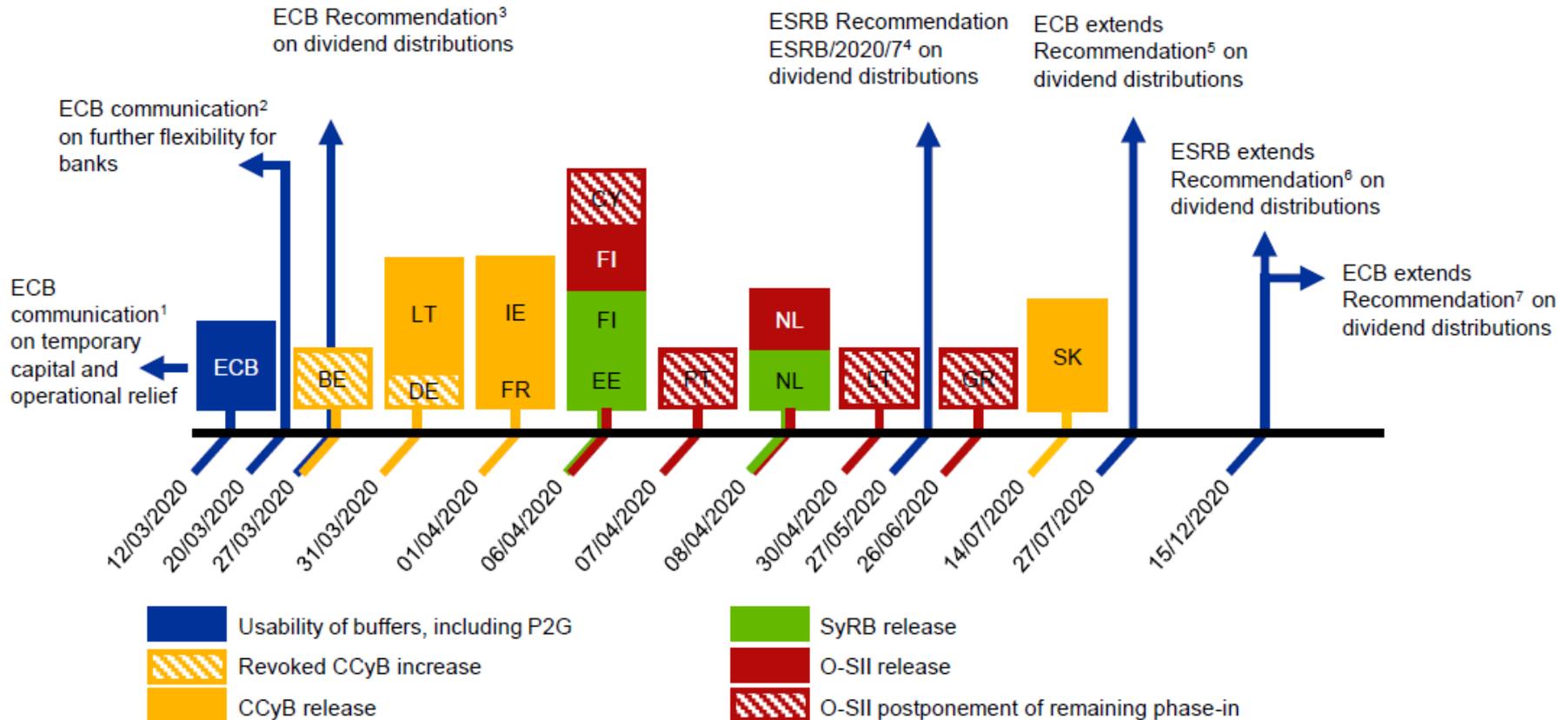
## Microprudential adjustments include:

- the composition change of P2R: approx. € 30 bn
- the temporary usability of P2G: approx. € 90 bn

## Macroprudential adjustments include the releases of:

- the CCyB buffer: € 13.7 bn
- the SyRB buffer: € 7.5 bn
- the O-SII buffer: € 0.6 bn

# Timeline of Capital Relief Measures

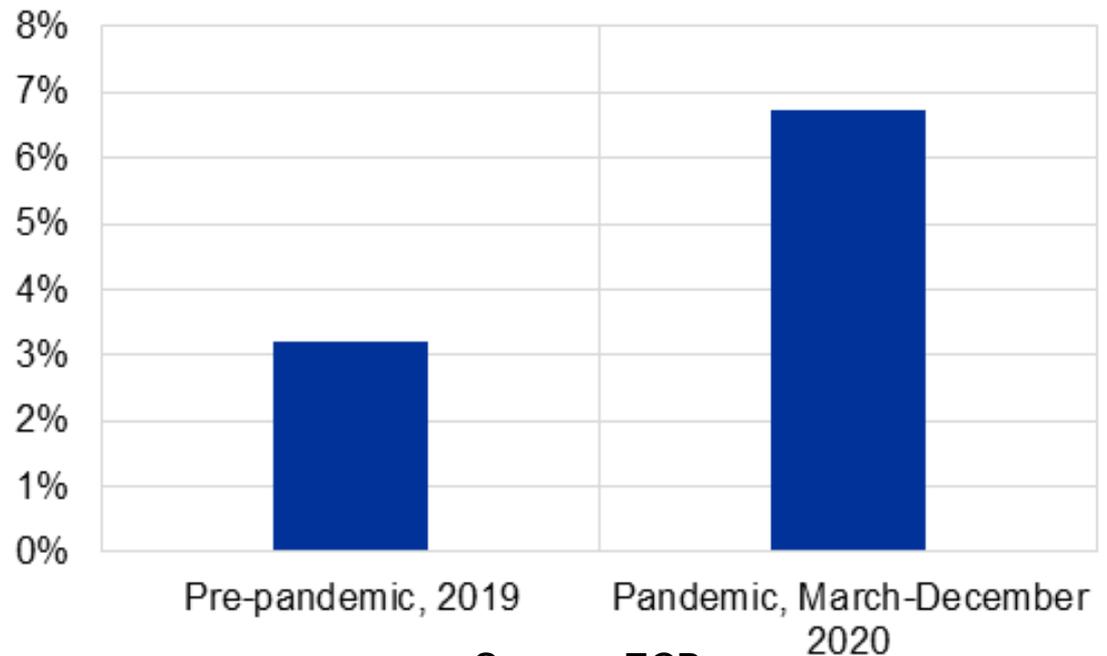


Source: ECB (2022)

# Credit Developments

On aggregate **euro area banks were able to meet credit demand during the pandemic.**

Growth rate of loans to non-financial corporations



Source: ECB

But **the aggregate perspective** does not explain the functioning of the buffer framework nor the effects of capital releases in the lending behaviour of banks with borrowers

# Capital Relief Measures

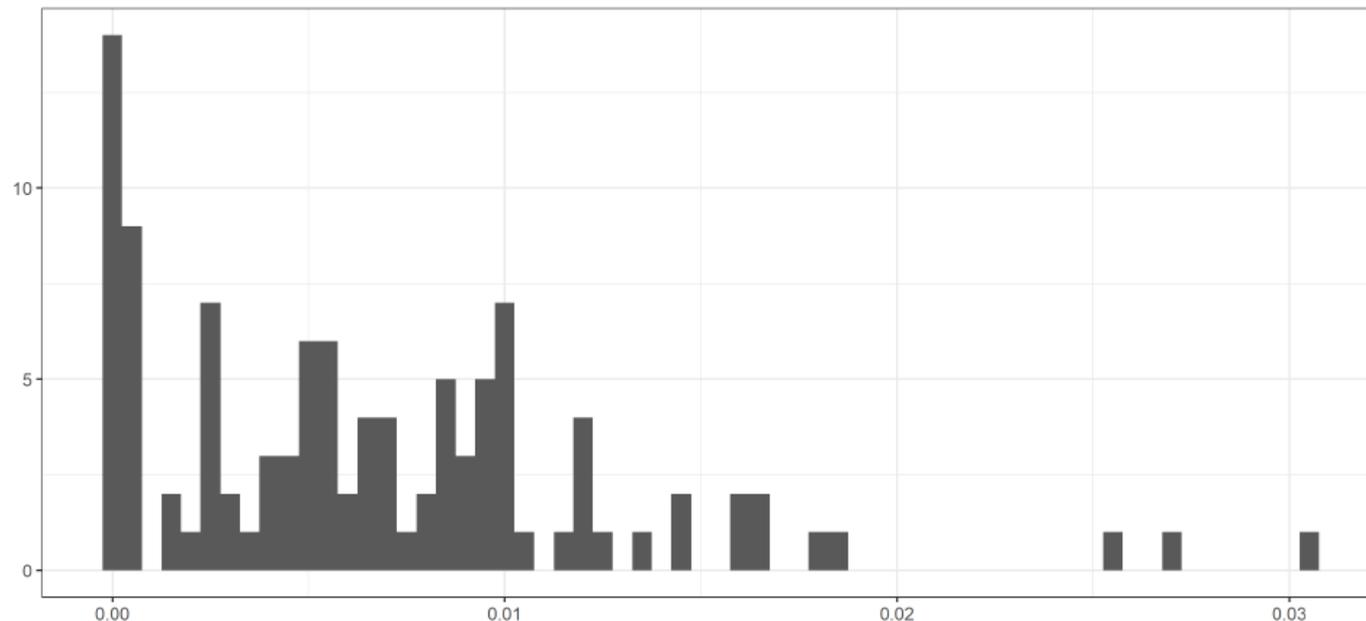
## Summary Statistics on Bank-Level Capital Relief Measures

| Statistic | N   | Mean  | St. Dev. | Min   | Pctl(25) | Pctl(75) | Max   |
|-----------|-----|-------|----------|-------|----------|----------|-------|
| CAP REL   | 106 | 0.007 | 0.006    | 0.000 | 0.002    | 0.010    | 0.030 |
| CBR REL   | 106 | 0.004 | 0.004    | 0.000 | 0.0003   | 0.005    | 0.023 |
| P2R REL   | 106 | 0.003 | 0.003    | 0.000 | 0.000    | 0.006    | 0.013 |
| P2G 2020  | 106 | 0.014 | 0.007    | 0.010 | 0.010    | 0.018    | 0.060 |

[Data](#)

## Distribution of the reduction in capital requirements

[Table 1](#)



# Table A.1. Loan Volumes in Existing Relationships

- **Definition of the dependent variable**
- Define a dummy equal to 1 when the credit volume in lending relationships increased between t-1 and t and run a logit regression

|                  | (1)<br>I( $\Delta$ credit > 0) |
|------------------|--------------------------------|
| CAPREL*PostCOVID | 32.69***<br>(9.927)            |
| P2G*PostCOVID    | -42.34**<br>(17.11)            |
| Bank Controls    | YES                            |
| Policy Controls  | YES                            |
| Obs.             | 2,216,490                      |
| Firm*Quarter FE  | YES                            |

The expansionary impact of **requirement releases** is confirmed also in supporting the **increase of lending volumes in existing relationships**

The possibility to operate below the P2G did not support credit expansion

**Bank controls:** log of bank total asset, non-performing loans ratio, provisions-to-total-assets, net interest margin, cost to income ratio, deposits-to-total assets, liquid-assets-to-total-assets, loans-to-total-assets, average risk weight, lagged CET1 ratio. **Policy controls:** (at the bank-level) TLTRO-to-total assets, dividend restrictions; (at the bank-firm level) share of loans under moratoria, share of loans under guarantee schemes, dividend restriction policy.

Robustness

# Table A.2. Robustness Analysis for the P2G

- Concern: P2G may be endogenous, set by the supervisor based on bank's riskiness, which could potentially drive bank's behavior in crisis times
- Solution: use Expected Capital depletion from 2018 Stress Tests under adverse scenario to calibrate P2G and use residuals as regressors in the main estimation
- Two steps:  $P2G_b = \alpha + \beta \text{Stress test capital depletion}_b + \epsilon_b \rightarrow$  Define  $\widetilde{P2G}_b \equiv P2G_b - \widehat{P2G}_b$

$$\Delta Y_{f,b,t} = \alpha + \beta \text{CAPREL}_{b,t} * \text{PostCOVID} + \gamma \widetilde{P2G}_{b,t} \text{PostCOVID} + \sum \delta X_{b,t-1} + \epsilon_{f,b,t}$$

|                              | (1)                         | (2)                         | (3)                         | (4)                         |
|------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                              | $\Delta \text{Log (loans)}$ | $\Delta \text{Log (loans)}$ | $\Delta \text{Log (loans)}$ | $\Delta \text{Log (loans)}$ |
| CAPREL*PostCOVID             | 1.933**<br>(0.8074)         | 2.564***<br>(0.9718)        | 3.093***<br>(1.181)         | 2.542**<br>(1.132)          |
| $\widetilde{P2G}$ *PostCOVID | -0.3245<br>(1.043)          | 0.0730<br>(1.211)           | -0.4038<br>(1.404)          | -0.4323<br>(1.383)          |
| Obs.                         | 3,526,437                   | 3,526,437                   | 3,526,437                   | 3,526,437                   |
| Firm*time FE                 | YES                         | YES                         | YES                         | YES                         |
| Lender country FE            | NO                          | YES                         | YES                         | YES                         |
| Bank FE                      | NO                          | NO                          | YES                         | NO                          |
| Bank-firm FE                 | NO                          | NO                          | NO                          | YES                         |

Results confirm:

- expansionary impact of **requirement releases**
- no significant effect of P2G usability

Robustness

**Bank controls:** log of bank total asset, non-performing loans ratio, provisions-to-total-assets, net interest margin, cost to income ratio, deposits-to-total assets, liquid-assets-to-total-assets, loans-to-total-assets, average risk weight, lagged CET1 ratio. **Policy controls:** (at the bank-level) TLTRO-to-total assets, dividend restrictions; (at the bank-firm level) share of loans under moratoria, share of loans under guarantee schemes, dividend restriction policy.

# Table A.3. Disentangling different capital requirements

|                   | (1)                 | (2)                 | (3)                 | (4)                 |
|-------------------|---------------------|---------------------|---------------------|---------------------|
|                   | Δ Log (loans)       | Δ Log (loans)       | Δ Log (loans)       | Δ Log (loans)       |
| P2R REL*PostCOVID | 2.012**<br>(0.9094) | 1.725*<br>(0.9376)  | 2.086*<br>(1.194)   | 2.455**<br>(1.194)  |
| CBR REL*PostCOVID | -0.5674<br>(1.123)  | 1.811<br>(1.671)    | 9.751***<br>(3.689) | 5.966*<br>(3.502)   |
| P2G*PostCOVID     | -1.208<br>(0.9735)  | -0.9702<br>(0.9988) | -0.7386<br>(1.036)  | -0.1425<br>(0.9391) |
| Obs.              | 5,480,013           | 5,480,013           | 5,480,013           | 5,480,013           |
| Firm*time FE      | YES                 | YES                 | YES                 | YES                 |
| Lender country FE | NO                  | YES                 | YES                 | YES                 |
| Bank FE           | NO                  | NO                  | YES                 | NO                  |
| Bank-firm FE      | NO                  | NO                  | NO                  | YES                 |

**Frontload P2R composition change:**  
1.72-2.45% increase in credit volume

**Decrease in Combined Buffer Requirement:**  
effect positive but not always significant

**Bank controls:** log of bank total asset, non-performing loans ratio, provisions-to-total-assets, net interest margin, cost to income ratio, deposits-to-total assets, liquid-assets-to-total-assets, loans-to-total-assets, average risk weight, lagged CET1 ratio. **Policy controls:** (at the bank-level) TLTRO-to-total assets, dividend restrictions; (at the bank-firm level) share of loans under moratoria, share of loans under guarantee schemes, dividend restriction policy. Standard errors clustered at the bank and firm levels.

Robustness