From Losses to Buffer – Calibrating the Positive Neutral CCyB Rate in the Euro Area

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Motivation

Since the pandemic, an increasing number of EU jurisdictions have introduced a framework with a Positive Neutral Rate (PNR) for the CCyB.

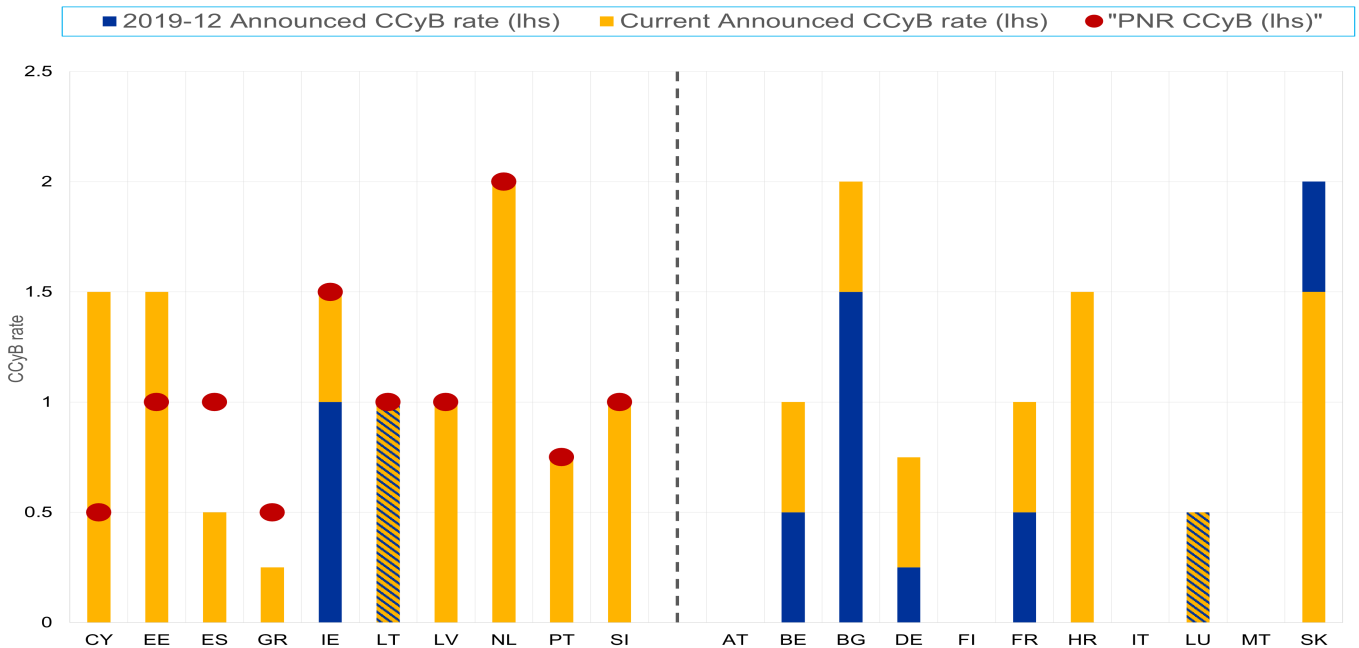


Figure 1: Positive Neutral CCyB Rates in EU countries

Literature Review on CCyB Calibration

- Risk indicators. Basel Rule and Early Contributions: Basel Committee (2010), Drehmann et al. (2011), Repullo and Saurina (2011). Expanding Risk Indicators: Behn et al. (2013), Detken et al. (2014), Ferrari and Pirovano (2016), Castro et al. (2016), Tölö et al. (2018), Anundsen et al. (2016), Coudert and Idier (2018), Lang and Welz (May 2017)
- Structural Macroeconomic Approaches. DSGE Models and Optimal Rules: Clerc et al. (2015), Bennani et al. (2016), Lozej et al. (2018), Aguilar et al. (2019), Munoz and Smets (2024)
- Stress Testing and Bank Losses. Panel Data Models and Stress Test: Dees et al. (2017), Couailler and Scalone (2021), Van Oordt (2023), **Lang & Forletta, (2020)** and **Passinhas & Pereira (2023)**
- Emerging Literature on Positive Neutral CCyB Rate New Methodologies in Various Countries: Morell et al. (2022), Plašil (2019), Hájek et al. (2017), Lietuvos Bankas (2017)

This Paper

- Novel framework based on **Lang & Forletta, (2020)** and **Passinhas & Pereira (2023)**.
- *Contribution:* Intergrate PNR calibration in the framework. Panel quantile using an estimator Captures heterogeneity across quantiles, address fixed-effects bias; prevents quantile-crossing in estimates.

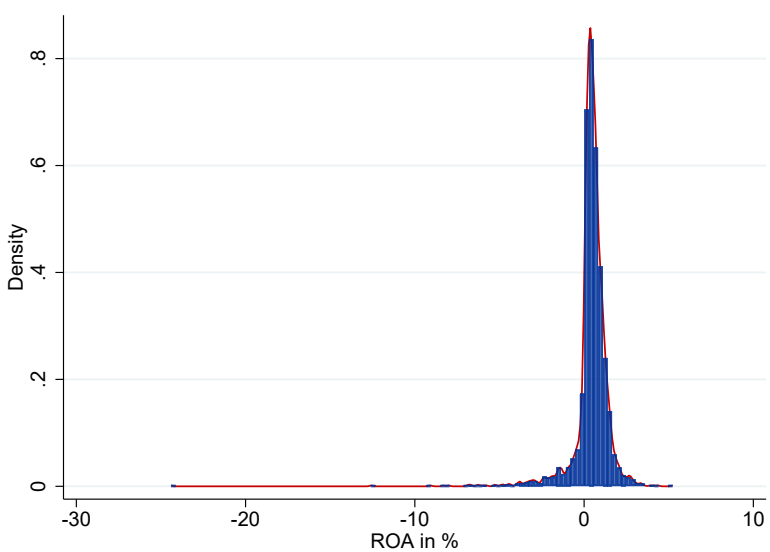
Losses-to-Buffer in a Nutshell

- Main idea is disentangling the impact of ROA and map into CCyB calibrations:
  - Cyclical systemic risks $\rightarrow$ CCyB, cyclical risks elevated
  - Unobserved systemic risk factors $\rightarrow$ CCyB, cyclical risks not elevated
  - Bank- and country-specific risk factors $\rightarrow$ Other capital buffers
- Ultimate goal: unified framework to calibrate the overall CCyB over the cycle, including when cyclical systemic risks are not elevated.

Preview of Results

PN rate ranges for the Euro area as a whole between 1% and 1.8%, depending on policy maker preferences.

The Model I



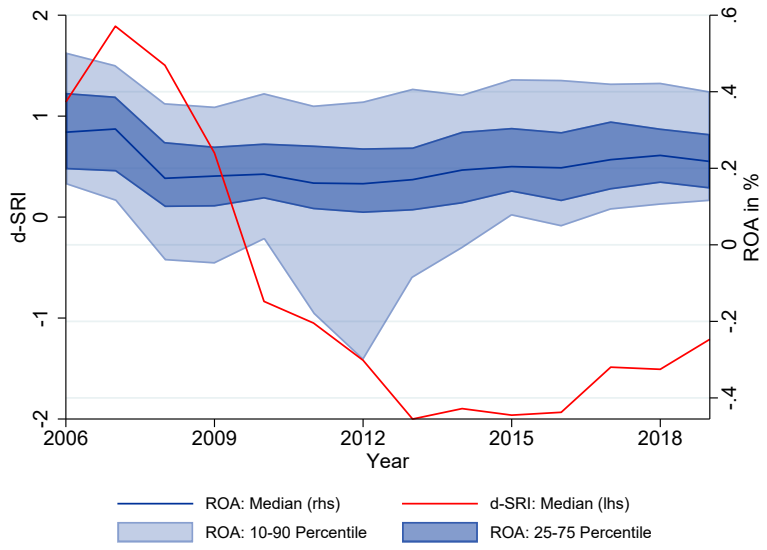


Figure 2: Left tail of the return on assets distribution (left) and systemic risk (d-SRI) and bank profitability (right).

- Distribution of return on assets is left skewed.
- Systemic risk predicts shifts in the distribution of the return on assets.

The Model II

- **Quantile location-scale** model combined with **local projections** (Lang and Forletta (2020) and Passinhas and Pereira (2023))

$$Q_{\pi_{i,j,t+h}}(\tau|\Omega_{i,j,t}) = \theta^{h,\tau} dSRI_{j,t} + \eta^{h,\tau} T1R_{i,j,t} + \nu^{h,\tau}(dSRI_{j,t} \times T1R_{i,j,t}) + \beta^{h,\tau} X'_{i,t} + \delta^{h,\tau} Y'_{j,t} + \alpha_i^{h,\tau} + \lambda_t^h,$$

Where:

- $\theta^{h,\tau} dSRI_{j,t}$ and $\nu^{h,\tau}(dSRI_{j,t} \times T1R_{i,j,t})$: Systemic risk and interaction term between systemic risk and Tier1 capital ratio
- $X_{i,j,t}$: bank-level controls
- $Y_{j,t}$: country-level controls
- $\alpha_i^{h,\tau}$ and $\lambda_t^{h,\tau}$: bank and time fixed effects

Benefits of the Model

- Captures potential non-linear responses of losses across percentiles.
- Local projections allow to study the impact of the variables of interest over different time horizons, including those most relevant for policy making.
- Flexible to reflect different preferences of policymakers.
- Quantile location-scale model avoids incidental parameter problem and quantile crossing.

Data

- **Source:** SNL Financials
- **Sample:**
  - Annual frequency from 2005-2019.
  - Highest level of consolidation.
  - Only banks for which data is available in 2008 and 2009.

Table 1: Variables included in the analysis. Source SNL and ECB.

Variable	Mean	P10	P50
Bank-level Variables			
Pre-tax RoA (%)	0.42	-1.14	0.48
Net Interest Income (%)	1.56	0.59	1.49
Cost-to-Income Ratio (%)	62.90	44.45	62.30
Impairments/Total Assets (%)	0.43	-0.01	0.20
Net Loans/Assets (%)	58.93	29.95	63.55
Risk-weighted Assets/Total Assets (%)	48.68	23.99	48.42
Tangible Capital/Tangible Assets (%)	7.10	2.98	6.31
Tier 1 Ratio (%)	14.09	7.66	13.11
Log of Total Assets	3.31	1.37	3.07
Macrofinancial Variables			
GDP Growth Rate	1.33	-2.67	1.51
d-SRI	-0.21	-0.79	-0.28
Yield Slope	1.78	0.12	1.28

Data Coverage

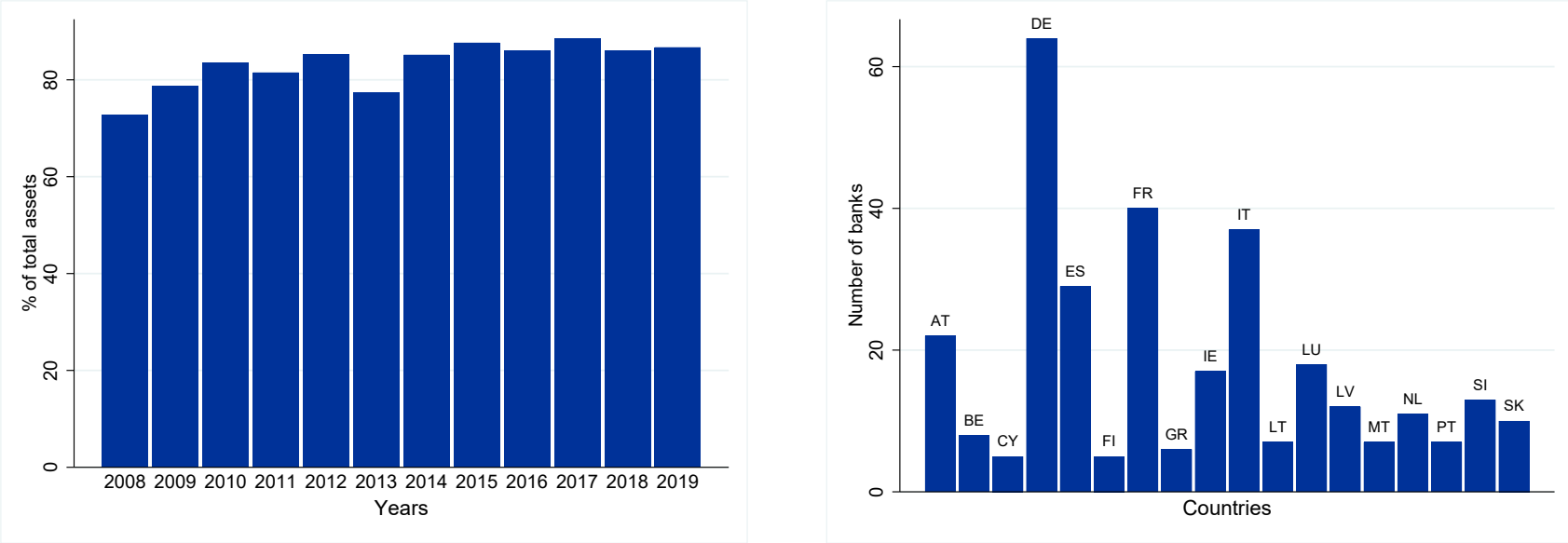


Figure 3: Total coverage of assets per year (left) and included banks per country in the sample (right).

- Data covers 318 euro area banks at the highest level of consolidation.
- Covers around 80% of total assets in the consolidated euro area banking sector (2008-2019)

Estimation: Split-Sample Jackknife Procedure

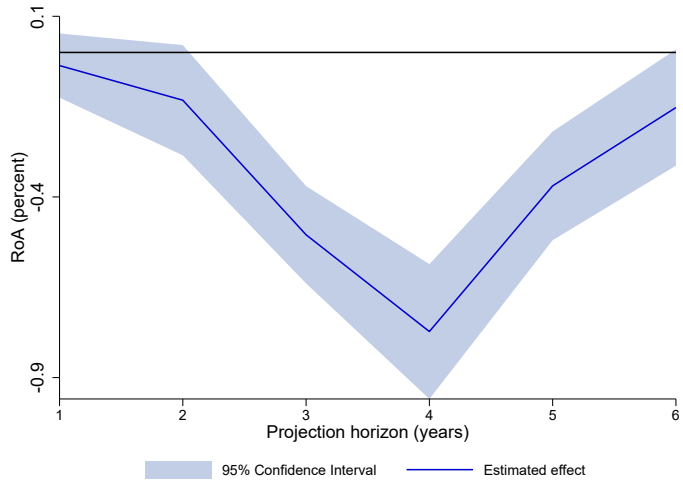
- T small and N/T> 10 yields biased parameters and poor intervals coverage.
- Bias correction with split-sample jackknife procedure and re-center the confidence intervals around the bias-corrected estimates (Machado and Santos Silva, 2019)

Steps:

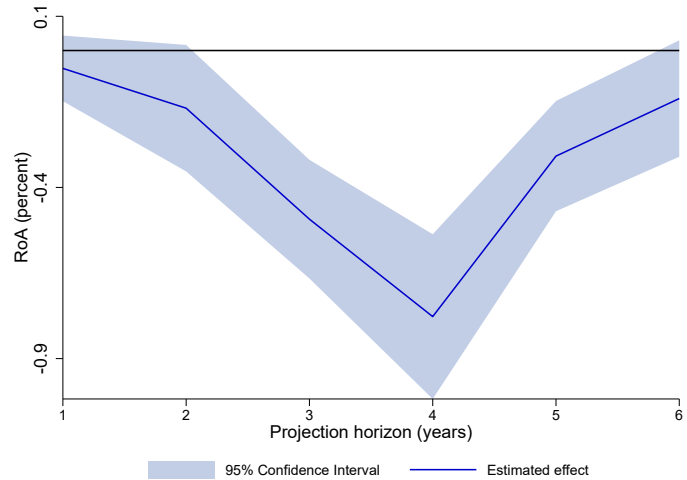
1. **Split the Sample:** Divide data into two subsets, S_1 and S_2.
2. **Estimate Parameters:** Obtain estimates $\hat{\theta}_{S_1}$ and $\hat{\theta}_{S_2}$ from each subset.
3. **Average Estimate:** Compute the average: $\hat{\theta}_{\text{avg}} = \frac{\hat{\theta}_{S_1} + \hat{\theta}_{S_2}}{2}$.
4. **Full Sample Estimate:** Re-estimate parameters on the full sample: $\hat{\theta}_{\text{full}}$.
5. **Bias Correction:** Adjust $\hat{\theta}_{\text{full}}$ by:

$$\hat{\theta}_{\text{jackknife}} = 2\hat{\theta}_{\text{full}} - \hat{\theta}_{\text{avg}}$$

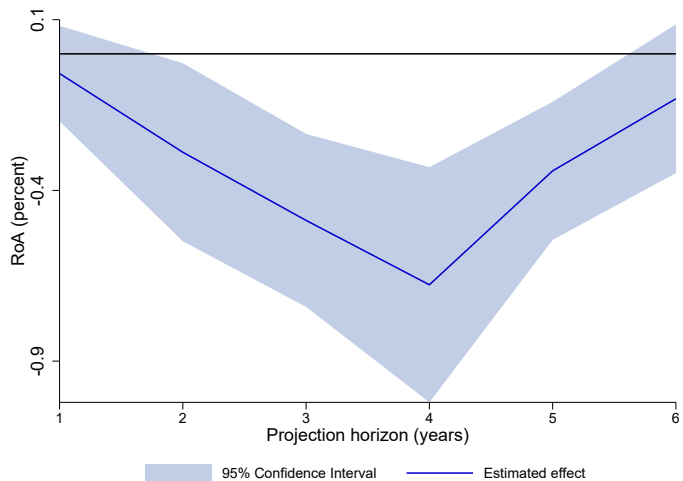
Results: Marginal Effects of the d-SRI



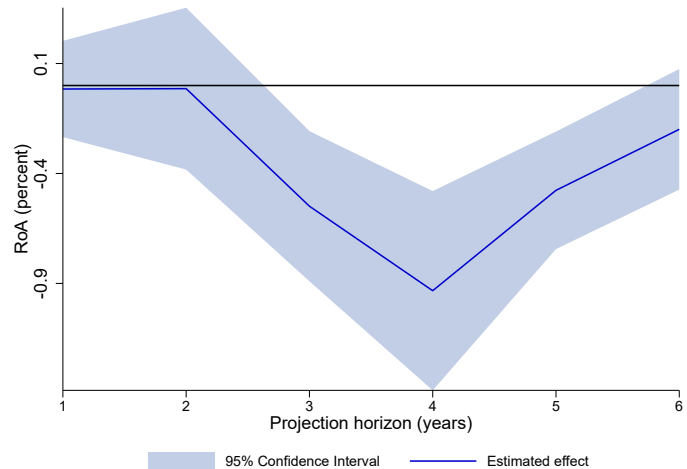
(a) 75th Percentile



(b) 50th Percentile



(c) 25th Percentile



(d) 10th Percentile

Figure 4: Impact of Systemic Risk on Future Bank Profitability

Calibration Rule

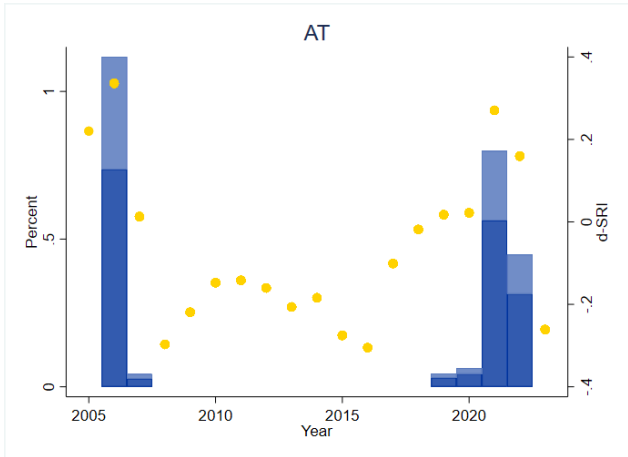
- We use the estimated impact of d-SRI on bank losses, at relevant horizons to calibrate the CCyB, according to the following rule

$$\text{CCyB}_{t,j} = \max\left\{0, \frac{-(\sum_{h=3}^{5} \hat{\theta}^{h}_{\text{sri}} + \hat{\nu}^{h}_{\text{sri}\times\text{T1R}}(h, \tau, \overline{T1R_t}))}{\text{arw}_{t,j}} \times \text{SRI}_{t,j}\right\} \quad (1)$$

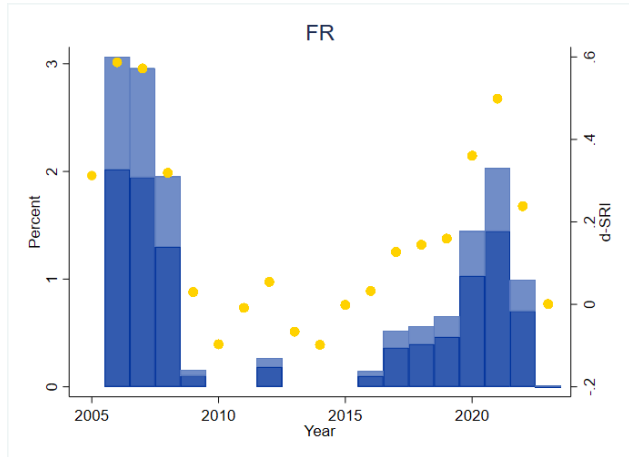
Where:

- $\hat{\theta}_{\text{sri}} \rightarrow$ marginal impact of the d-SRI at horizon h and percentile p of the conditional RoA distribution.
- $\hat{\nu}_{\text{sri}\times\text{T1R}}(h, p, \overline{T1R_{t,j}}) \rightarrow$ marginal impact of the interaction term between the d-SRI and the T1R, evaluated at the average T1R in country j at time t.
- $\text{arw}_{t,j} \rightarrow$ average risk-weighted assets in country j.

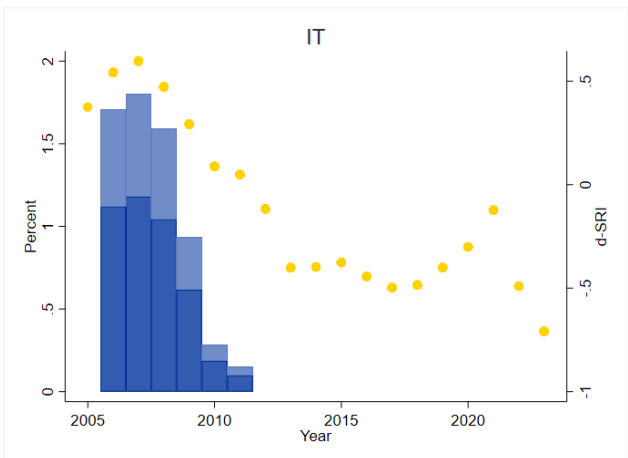
Results: Mapping Cyclical Risk into the CCyB



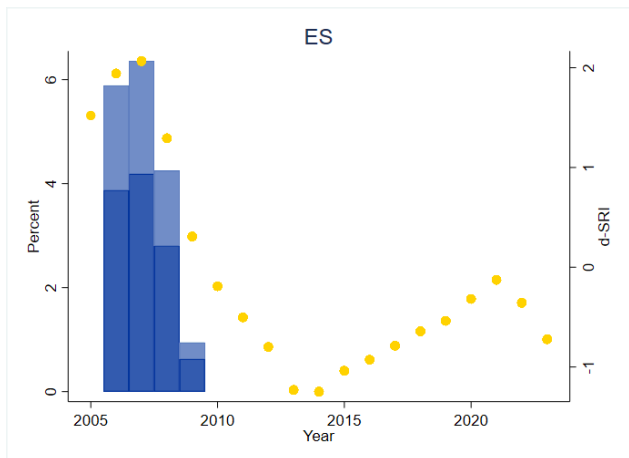
(a) Austria



(b) France



(c) Italy



(d) Spain

Figure 5: Light blue buffer rates: 10th pct. Dark blue buffer rates: 50th pct. Yellow dots: d-SRI .

Calibration of the Positive Neutral Rate I

Calibration of the Positive Neutral Rate has two elements:

Target Rate

- Goal: ensure enough **loss absorption capacity**.
- Unique across EA countries and time.
- Allows to incorporate policy maker preferences: range of buffer rates, depending on the severity of losses to target (percentile)

Build-up Rule

- Goal: ensure gradual implementation and minimize the possible negative impact on the lending capacity of banks.
- Determines the speed at which the chosen target rate should be built-up (**time-varying rate**).
- Varies across countries and time, depending on the prevailing conditions in the banking sector of a given country.

Calibration of the Positive Neutral Rate II

- We use the estimated time-specific effect in each year, at relevant horizons to calibrate the positive neutral rates, according to the following rule:

$$\text{PN Target Rate}_{\tau} = \sum_{t=1}^{T} \max \left\{ 0, \frac{-\hat{\lambda}_t^{h,\tau}}{arw_t} \right\} / T,$$

Where

- $\lambda_t^{h,\tau} \rightarrow$ marginal impact of the time-specific effects at horizon h and percentile τ of the conditional ROA distribution.
- $\text{arw}_{t,j} \rightarrow$ average risk-weighted assets in country j.

Percentile selection: 25th and 10th. Towards the left of the c. distribution but avoiding the tails: i) to avoid overlaps with P2G; ii) less precise estimates due ot higher data sparsity.

Horizon selection: 1 year. Account for implementation lag of the CCyB.

Calibration of the Positive Neutral Rate III

Desirable feature of the time-fixed effects coefficients

- Invariant across banks (opposed to bank-specific), aligning with the goal of capturing unobserved factors that simultaneously affect all banks in each period and that are not otherwise accounted for in the regression.

PNR CCyB:

- Macroprudential in nature, and hence set to address systemic, rather than to bank idiosyncratic, risks;
- Aims to increase banking sector resilience by covering those losses which are:
  1. left uncovered by other capital buffers,
  2. either because of the uncertainty on measuring cyclical systemic risk or
  3. because they stem from risks of different nature that are not envisaged to be covered by other policy instruments.

Results: Target Positive Neutral Rates for the Euro area

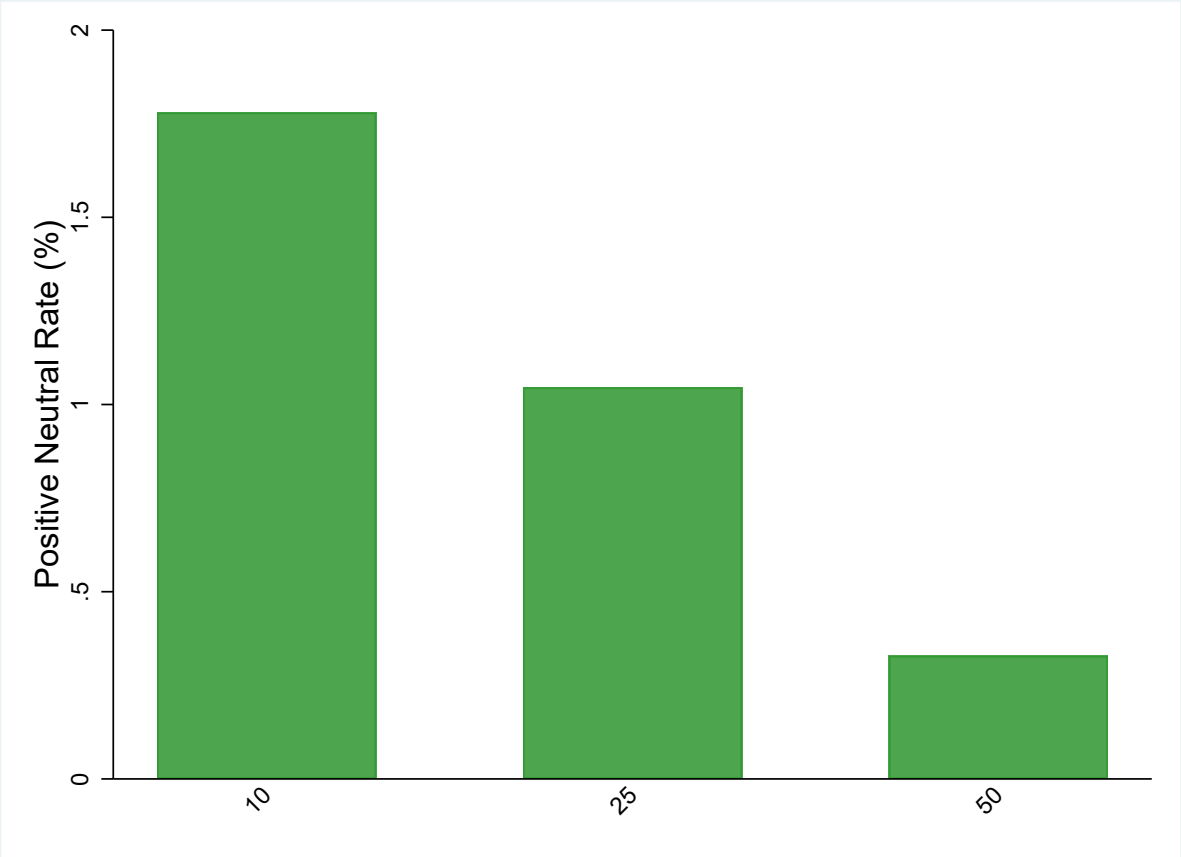


Figure 6: Positive Neutral CCyB Rates for the Euro Area

- Rates range from 1% to 1.8% depending on the percentile targeted by the policy maker.

The Positive Neutral Rate: Stylised Build-up and Release Rule

Example of a stylised build-up rule (purely illustrative)

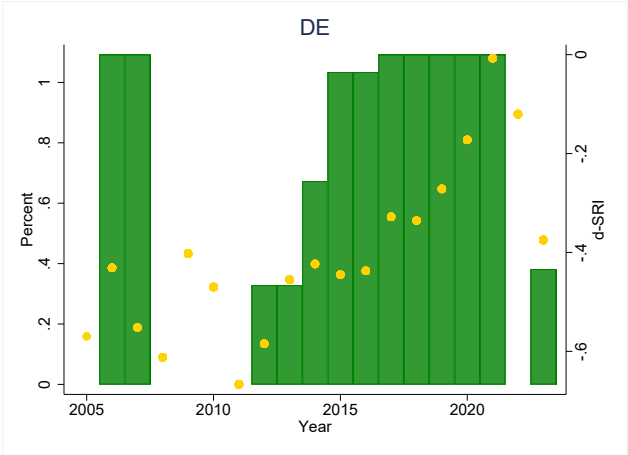
$$\text{PNR}_{j,t} = \begin{cases} \text{buildup} = PNR_{t-1} + f(ROA_{j,t})^1 \\ \text{maintain} = PNR_{t-1} \\ \text{release} = 0 \end{cases}$$

Conditions for build-up, maintenance and release

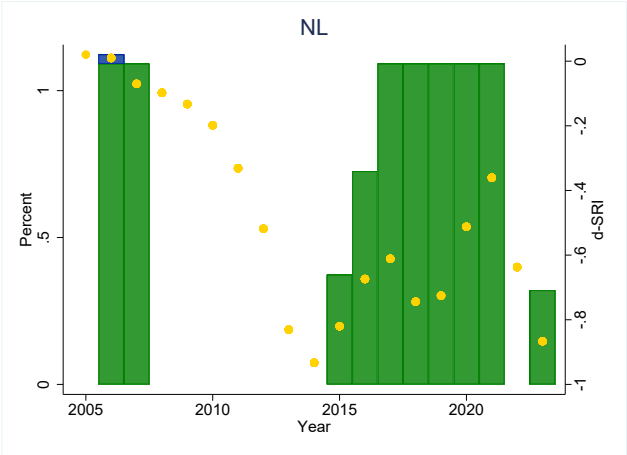
Build-up	**Maintain**	**Release**
High profitability $\text{ROA}_{t,j} > medianROA$	Medium profitability $0 < \text{ROA}_{t,j} < medianROA$	Negative profitability $\text{ROA}_{t,j} < medianROA$
Low dispersion $\text{sdROA}_{t,j} < medianSD$	Low dispersion $\text{sdROA}_{t,j} < medianSD$	
Low financial distress $\text{CISS}_t < medianCISS + 2sd$	Low financial distress $\text{CISS}_t < medianCISS + 2sd$	High financial distress $\text{CISS}_t > medianCISS + 2sd$

[1] 25% of RoA ⇒ Approx 50% of 2022 profits distributed in dividends and buybacks (44% in 2017-2018) with considerable differences across banks, particularly regarding share buybacks.

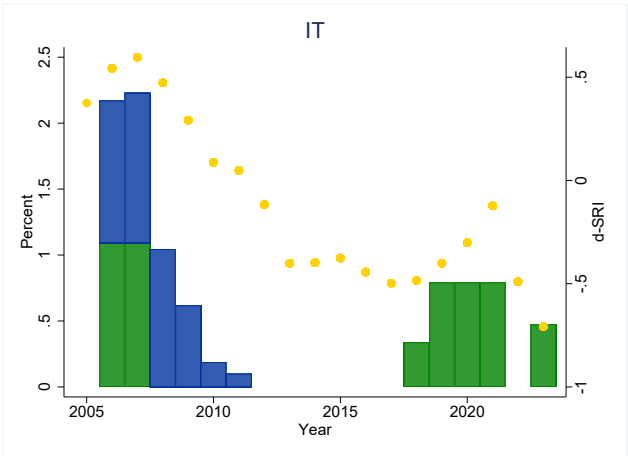
Calibration of the overall CCyB through the cycle



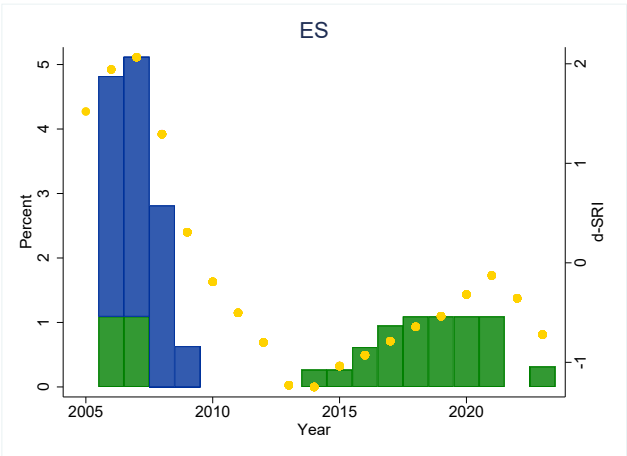
(a) Germany



(b) Netherlands



(c) Italy



(d) Spain

Figure 7: Combined buffer rates for selected countries. Blue bars: 50th-pct CCyB, green bars: 25-pct PNR CCyB.

Robustness checks

1. Alternative specification to address potential endogeneity concerns between cyclical systemic risk and ROA

2. PNR Calibration - including non-significant coefficients (more information versus less precision)

3. PNR Calibration - sensitivity of the calibration to changes of the base year for the extraction of the time-coefficients

4. Sample split - small versus large countries.

5. Further interactions - other variables to be interacted with the dSRI such as liquidity and asset quality
6. Further macro variables to capture other country specific dynamics, e.g. market uncertainty

- Overall, **results are robust** to the above tests.

Conclusions

- We propose a novel framework for the calibration of the overall CCyB through the cycle.
- Our approach allows to disentangle losses associated with the financial cycle from those not related to the financial cycle.
- Our framework propose a harmonized calibration for the positive neutral rate, while accounting for country specific conditions.
- The framework delivers calibration for the overall CCyB through the cycle for each country and time considered, while accommodating policy maker preferences.

Thank you

Appendix

Motivation II

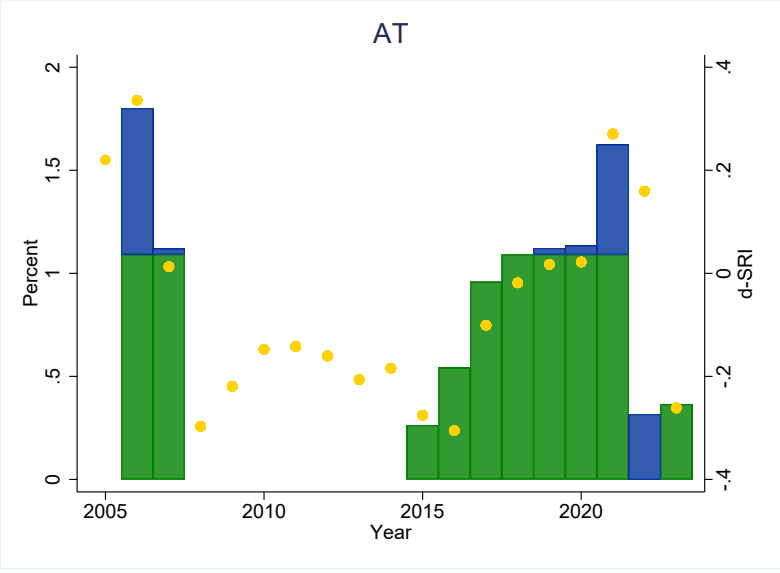
- What is the Positive Neutral CCyB? Early build-up of the CCyB when cyclical systemic risks are not yet elevated.
- Main motivations:
  - Build-up the CCyB in a timely manner, to have higher availability of releaseble buffer;
  - Increasing resilience against a wider spectrum of (systemic) shocks, beyond those stemming from domestic cyclical risks.
  - Address potential undercalibration from measurement of domestic cyclical risks.
- Despite the increasing number of adopting countries, the analytical toolkit to inform the calibration of the positive neutral CCyB is still under development.
- What this paper does: it proposes a methodology to calibrate the PNR in EA countries, based on analysis of banks losses.

Quantile Model for Bank Profitability - Extensive Notation

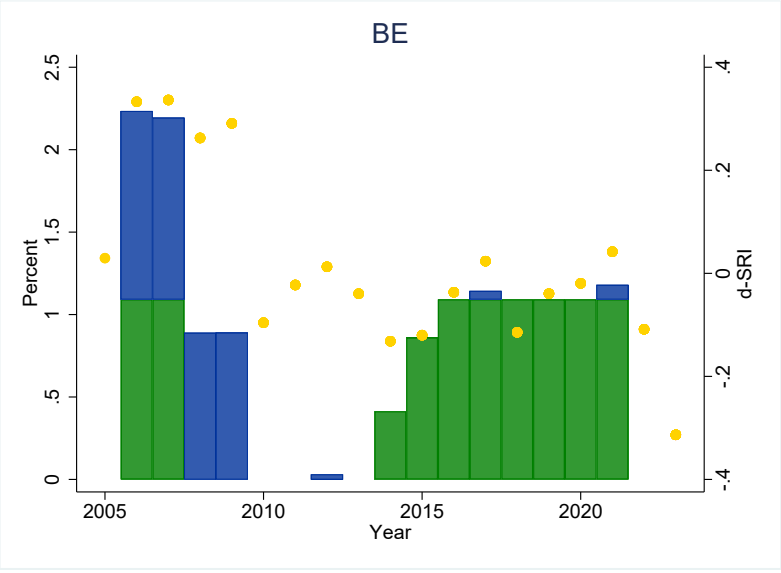
Our conditional quantile model for bank profitability takes the following form:

$$
\begin{aligned}
Q_{\pi_{i,t+h}}(\tau|X_{i,t}) &= [\theta_l^{h,\tau} + \theta_s^{h,\tau} q(\tau,h)] dSRI_{j,t} + [\eta_l^{h,\tau} + \eta_s^{h,\tau} q(\tau,h)] T1R_{i,j,t} \\
&\quad + X'_{i,t}[\beta_l^h + \beta_s^h q(\tau,h)] \\
&\quad + [\nu_l^{h,\tau} + \nu_s^{h,\tau} q(\tau,h)](dSRI_{j,t} \times T1R_{i,j,t}) \\
&\quad + [\alpha_{i,l}^h + \alpha_{i,s}^h q(\tau,h)] + [\lambda_{t,l}^h + \lambda_{t,s}^h q(\tau,h)] \\
&= \theta^{h,\tau}(\tau,h) dSRI_{j,t} + \eta^{h,\tau}(\tau,h) T1R_{i,j,t} + \\
&\quad \nu^{h,\tau}(\tau,h)(dSRI_{j,t} \times T1R_{i,j,t}) + X'_{i,t}\beta(\tau,h) \\
&\quad \alpha_i(\tau,h) + \lambda_t^h(\tau,h) +,
\end{aligned}
$$

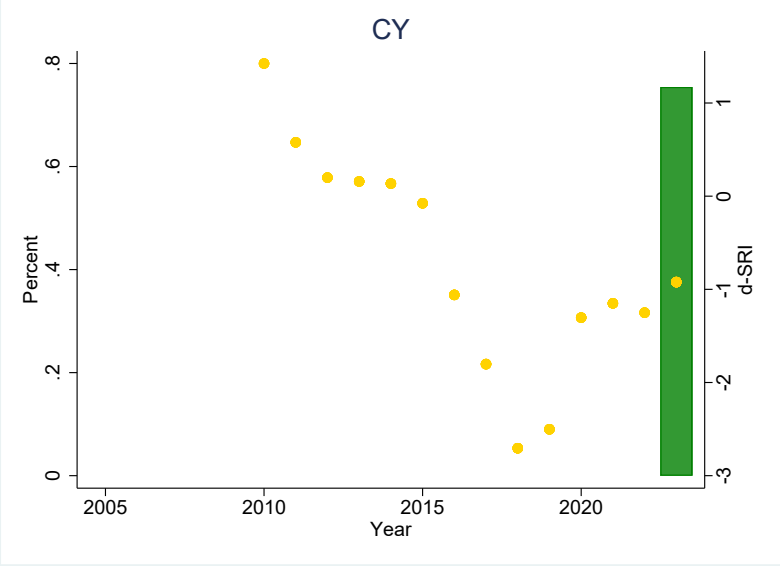
Joint Calibration I - Appendix



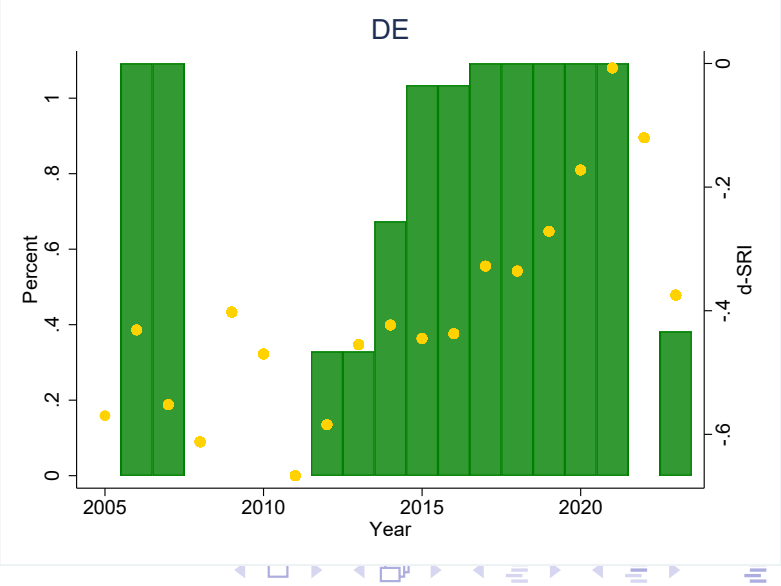
(a) Austria



(b) Belgium

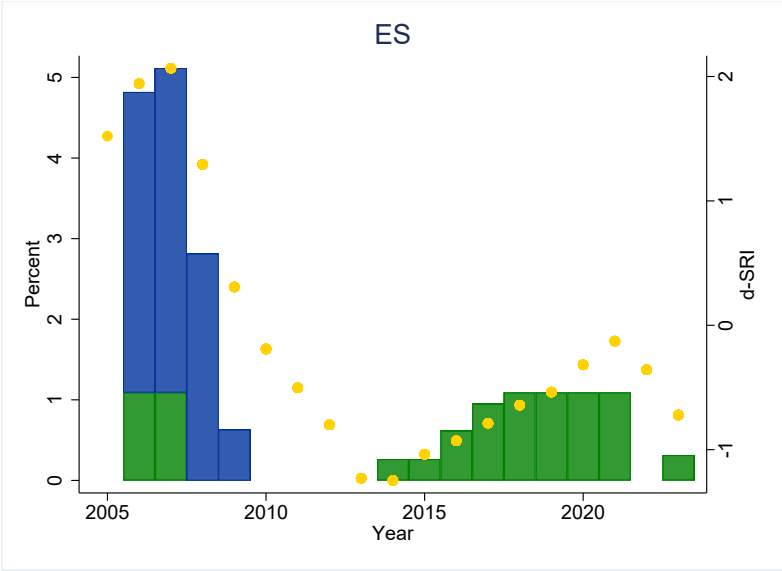


(c) Cyprus

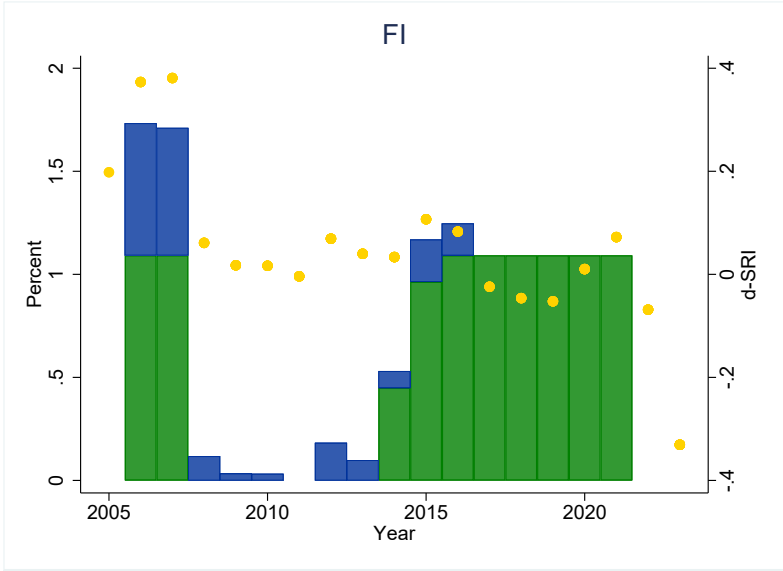


(d) Germany

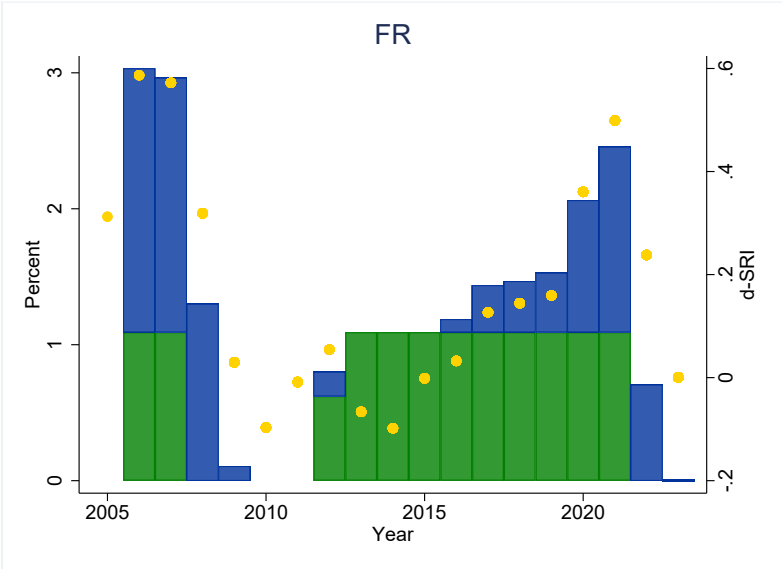
Joint Calibration II - Appendix



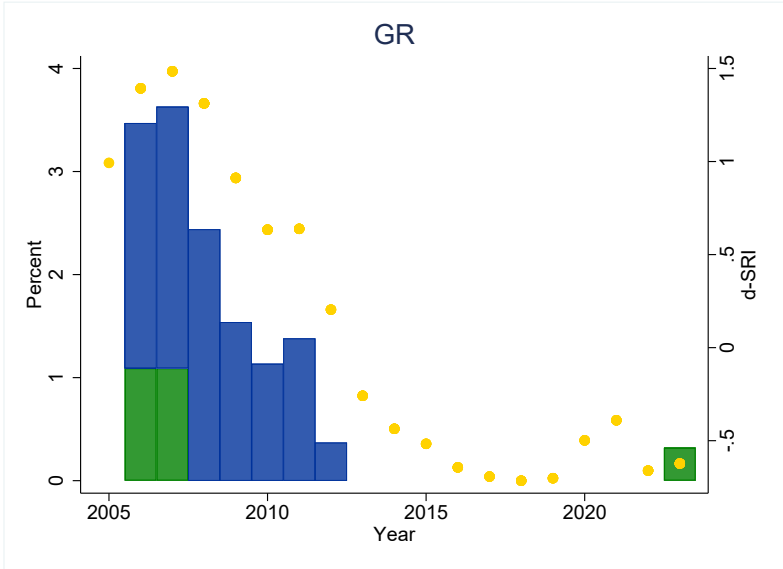
(e) Spain



(f) Finland

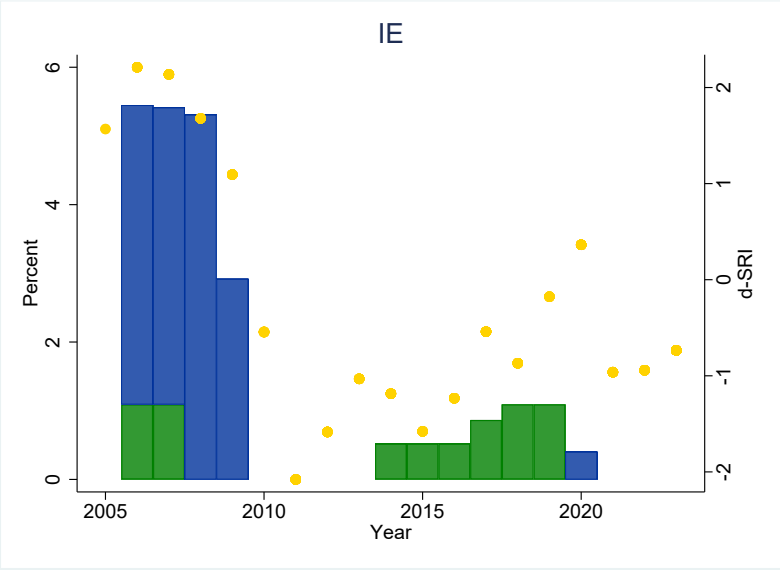


(g) France

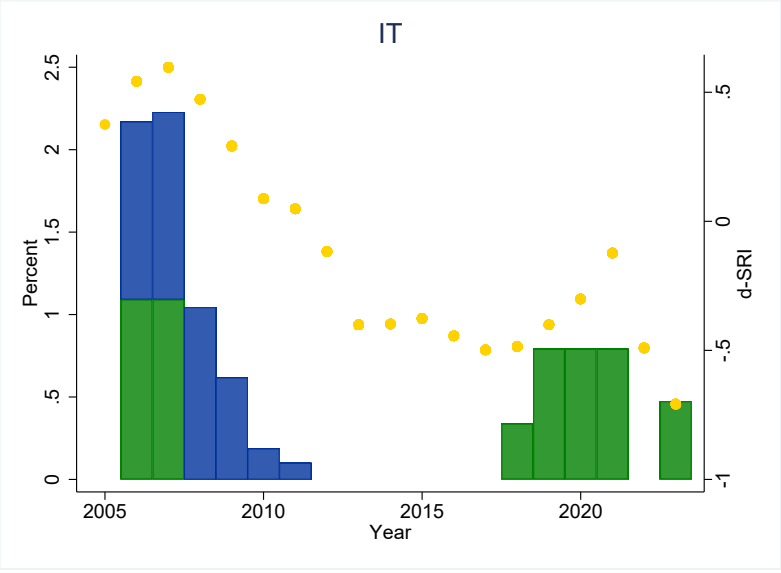


(h) Greece

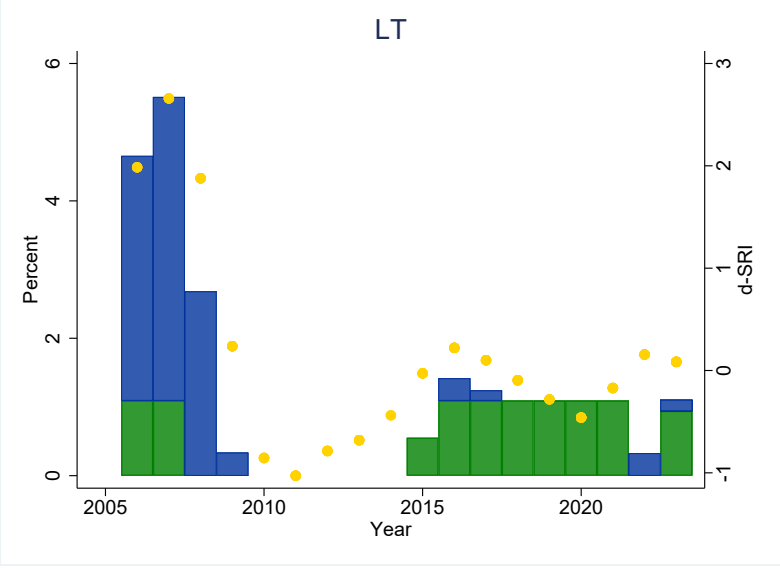
Joint Calibration III - Appendix



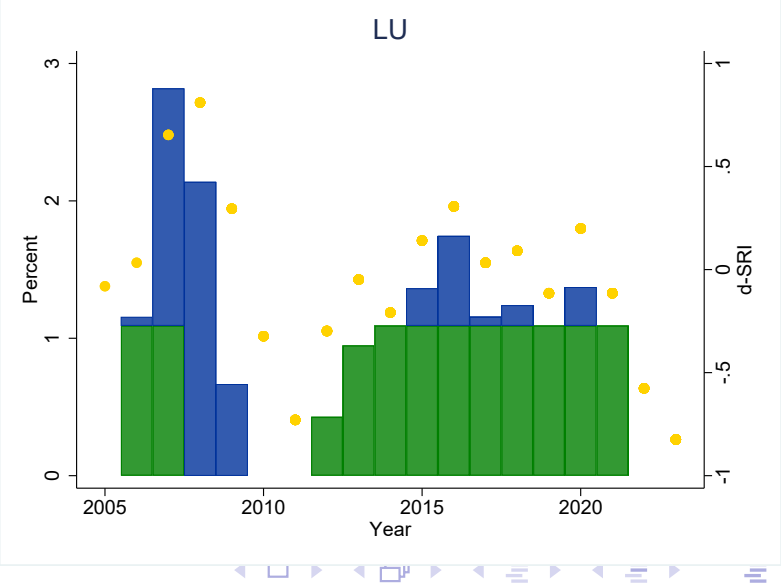
(i) Ireland



(j) Italy

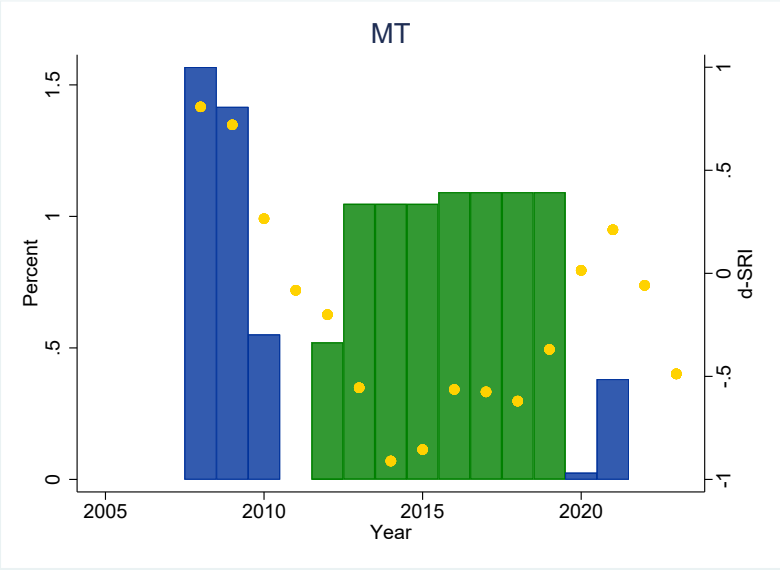


(k) Lithuania

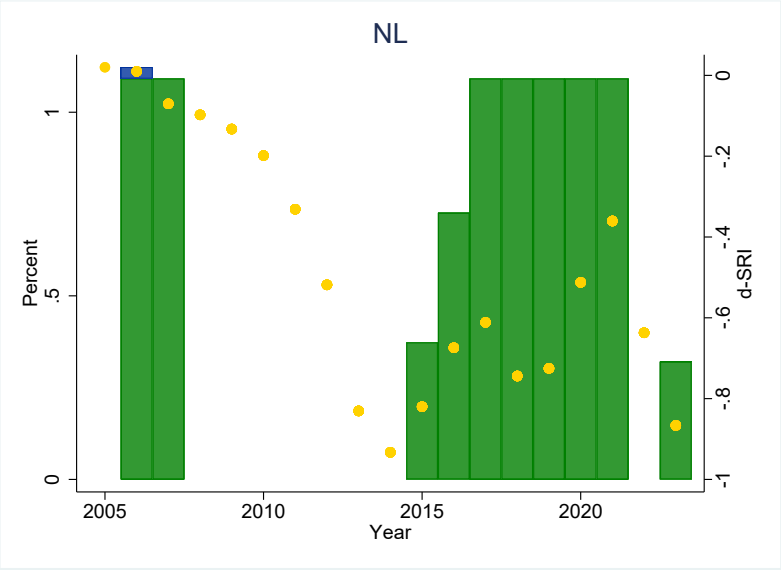


(l) Luxembourg

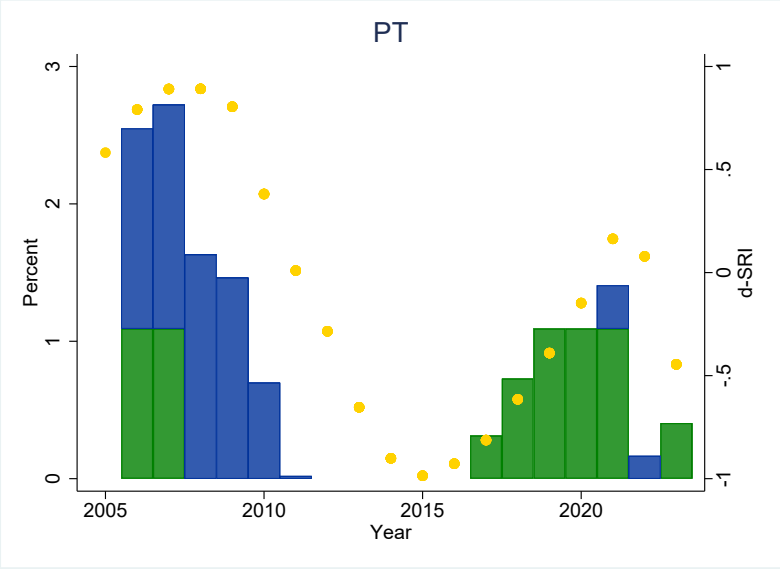
Joint Calibration IV - Appendix



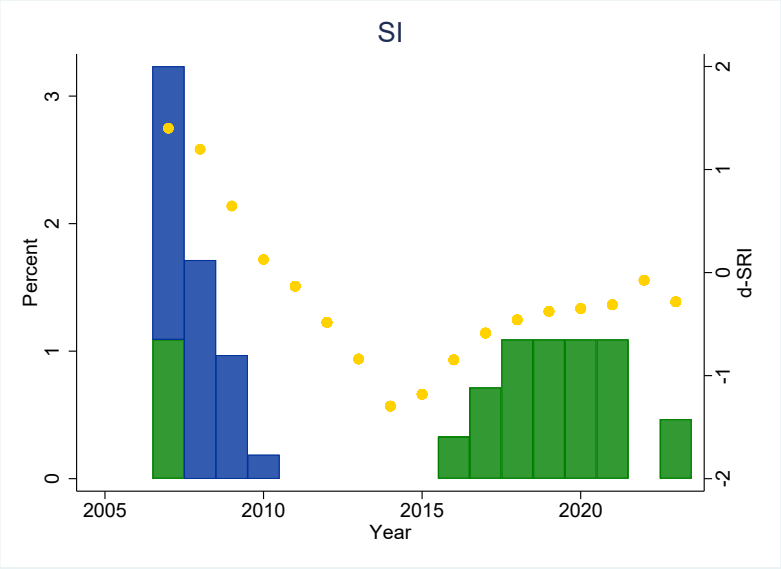
(m) Malta



(n) Netherlands

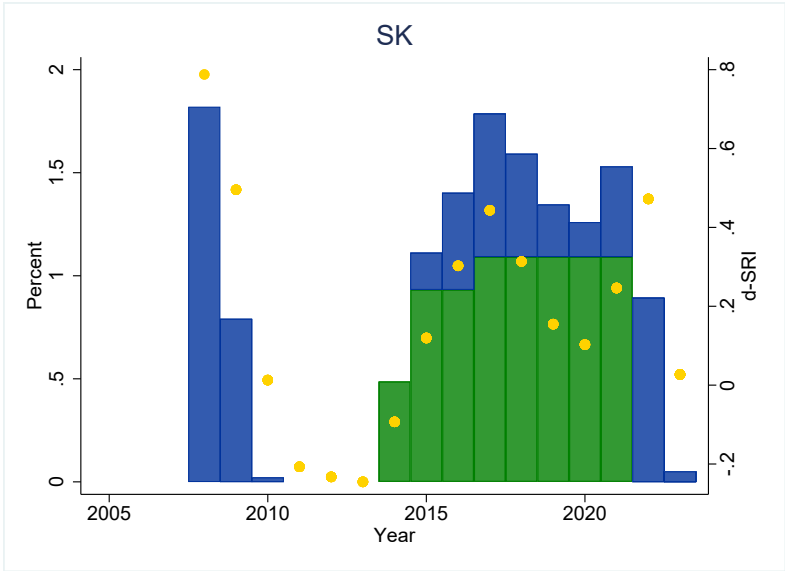


(o) Portugal



(p) Slovenia

Joint Calibration V - Appendix



(q) Slovakia

The Positive Neutral Rate: Build-up rule - Appendix

$$PNR_{j,t} = \begin{cases} \text{buildup} = PNR_{t-1} + 25\% \text{ of } RoA_{j,t} \\ \text{maintain} = PNR_{t-1} \\ \text{release} = 0 \end{cases}$$

Build-up

1. **High RoA** $\Rightarrow RoA_{j,t} >$ median **&**
2. **Low RoA dispersion** $\Rightarrow sd\ RoA_{j,t} <$ median **&**
3. **Low market stress** $\Rightarrow CISS\ EA_t <$ median + 1sd

Maintenance

1. **Medium RoA &** $\Rightarrow 0 < RoA_{j,t} <$ median **&**
2. **Low RoA dispersion &** $\Rightarrow sd\ RoA_{j,t} <$ median **&**
3. **Low market stress** $\Rightarrow CISS\ EA_t <$ median + 1sd
4. **Target rate is achieved** $\Rightarrow PNR_{j,t} =$ Target Rate

Release

1. **Negative RoA or** $\Rightarrow RoA_{j,t} < 0$ **or**
2. **High market stress** $\Rightarrow CISS\ EA_t >$ median + 1sd

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