TOPICAL BRIEFING

TB/04.1/2025

SOUTH AFRICAN RESERVE BANK

Financial Stability Department

File ref. no.: 9/2/3

June 2025

Gideon du Rand, Ayanda Sikhosana, Dawie van Lill

Authorised for distribution by: Dr Nicola Brink
Nicola.Brink@resbank.co.za

The economic impact of changes in bank capital requirements in South Africa: A bank-level econometric approach

1. Introduction

In this paper, we analyse the bank-level impact of capital requirements in terms of several channels of adjustment - lending, capital structure and interest rates. This is specifically applied to the introduction of the 1% positive cycle-neutral (PCN) countercyclical capital buffer (CCyB) on 1 January 2025 (with phase in period up to 1 January 2026). The 1% PCN CCyB is an additional buffer added to the existing capital requirements on each bank.

The total required capital adequacy ratio (*required CAR*) is a minimum on the ratio of qualifying capital (equity) and reserves to risk weighted assets (RWA) that banks must maintain to comply with Basel III regulations. Figure 1 shows the distribution of required CAR across all banks present at the end of the sample period (January 2013 to July 2025).

We use the term *reported CAR* for the values of this ratio as reported by each bank, and *excess CAR* as the difference between reported CAR and required CAR. In South Africa, most banks choose to maintain a reported CAR in excess of required CAR, as is shown in Figure 2 for the six largest banks.

When there is a regulatory increase in the required CAR that a bank must hold, there are several possible responses that any model must consider. If a bank already maintains a CAR above the new regulatory minimum (as is representative of the SA banking system), one possibility is that no reaction is required. If, instead, a bank chooses to increase its CAR in response to a regulatory increase, it may either increase its qualifying capital and reserves (the numerator of the ratio) or reduce its risk weighted assets (the denominator). The numerator can be increased by issuing new equity, building up reserves, retaining earnings or appropriating previously unappropriated profits as capital. The denominator can be decreased by reducing total lending, or by changing the portfolio of assets towards lower risk-weighted options, e.g. by substituting unsecured lending with secured lending (Sibande and Milne, 2025).

Any change in the optimal balance sheet structure of a bank in response to a policy change, may also have further impacts on its business model, such as adjustments to lending or deposit rates (Bichsel, Lambertini, Mukherjee and Wunderli, 2022), or a change in risk appetite (Borio and Zhu, 2012).

In this paper, we present several analyses of potential channels of impact on individual bank outcomes (changes in asset structure, capital structure and rates), with all results presented in aggregate for the banking sector.

First, we provide a simple event analysis in several variables that shows no clear impact other than on excess CAR as well as on the growth rate in capital held in excess of regulatory requirements.

Second, we present the results from a bank-level Bayesian vector autoregression (VAR) analysis from three models. The first model focuses on three regulatory measures (risk-weighted assets, total qualifying capital and reserve, and capital in excess of regulatory minima). The second model considers four disaggregated lending channels and two capital channels. The third model considers two lending channels, two capital channels and two interest rate channels.

Focussing on the most direct channel to real economic impacts: we find no statistically significant negative impact of required capital changes on any bank-level lending outcome. Taken at the weighted average impact derived from these estimates, the strongest negative impacts are capital in excess of requirements. This is the channel of adjustment that is likely to have the least real impact on the broader economy. In models that disaggregate between different types of credit, the strongest statistical impact on lending behaviour seems to that of a substitution towards lower risk lending (i.e. increased secured lending), however, the impacts are so imprecisely estimated that these positive impacts are likely to be spurious.

What are the policy implications of our results? Does the lack of statistical significance imply that capital regulation is ineffective? Do the positive mean impacts on some lending variables in some of the models imply that capital regulation may fuel the credit cycle? We argue that the answer to both these questions is no.

First, most of the changes to capital regulation in the sample at hand were progressive implementations of different components of Basel III regulation during many years of consistently low economic growth. These policy changes were mostly intended to be permanent regulations (conditional on the assessment of bank risk levels) and announced well in advance with the explicit intention to allow time for banks to adjust to the policy changes without major adjustments to operations. This is our interpretation of the results based on the period under study.

We argue that the estimated impacts of changes to bank-level capital requirements are statistically imprecise because the size of the changes to capital regulation were simply not large enough relative to other important economic events that affected bank behaviour during the period under study, such as monetary policy changes or shocks originating outside the domestic financial sector.

Second, the intent of the policy change matters to expected response of banks. Similar to the permanent nature of previously implemented Basel III regulations, the PCN-CCyB was implemented with the intention of building resilience in the banking sector during “normal” times, with long periods between announcement, initiation and effective dates to limit the impact on bank operations. The CCyB is the first capital regulation that is explicitly cyclical in design, but the PCN level is intended to be the (permanent) baseline policy for normal times. We expect that an increase in CCyB (*above* the PCN level) that is explicitly intended to build additional resilience during times of high credit growth (and is announced as such) is likely to have a very different effect on bank behaviour to that of the implementation of the PCN-CCyB. However, we cannot empirically assess such potential impacts, as this has not happened in the South African experience.

Taken together, we feel that our results show that there is no evidence that the implementation of the PCN-CCyB as communicated by the policy maker will have a notably deleterious impact on bank lending or, by implication, the broader economy in the near future.

The rest of the paper is organized as follows. We discuss some related literature in section 2 and provide a summary of the capital regulation landscape in section 3. Our empirical results are from an event analysis presented in section 4 and econometric analysis in section 5. Section 6 concludes with a discussion on the robustness of results.

2. Related literature

International cross-country analysis suggests that higher capital requirements tend to limit credit growth, with stronger effects on smaller and less well capitalized banks (see e.g. Aiyar, Calomiris and Wieladek (2016)).

The closest study on the South African banking system is by Sibande and Milne (2025). They apply a panel estimation approach using the four largest banks in South Africa. They estimate six independent models of disaggregated credit categories as a function of capital requirements, capital buffers, interest rate margins and a set of bank level controls. As with the results in this paper, they find no evidence of a significant impact of capital requirements on lending.

They use panel methods to control for endogeneity and a single equation approach. While this is a more parsimonious approach than the one used in this paper, it is subject to concerns as to the choice of variables that can have feedback (i.e. endogeneity). If economic feedback mechanisms are not adequately controlled for, the estimated effects can be biased and give misleading results. While there are valid approaches to attempt to address such endogeneity concerns in single equation settings (see also Pillay and Makrelov, 2025), there is no way to be absolutely certain that instruments or fixed effects are sufficient. This paper presents an alternative way to deal with potential endogeneity, by directly allowing all endogenous feedback channels via a system of unrestricted joint dynamic equations. As such, our paper can be seen as a complementary approach to their analysis, which also confirms their findings.

The other large difference with the specification in Sibande and Milne (2025) is how capital requirements enter the model. They consider only the impact of *changes* in capital requirements – i.e. they study the evolution of lending growth rates after an increase or decrease of capital requirements. This approach neglects the level effect: An increase of 1% from a low base is likely to have a different impact to that of a 1% increase from an already high base level of capital requirements. In this paper, we use the *level* of the required CAR in all empirical specifications. For each bank, the required capital adequacy ratio behaves like a step function, where successive increases in requirements represent a build-up of the tightness of the requirements.

Other papers focussed on the South African banking sector have somewhat different foci, which we briefly review.[1]

Merrino, Lesame and Chondrogiannis (2024) study the impact of Basel III liquidity and capital adequacy requirements on the *allocation* of lending. They find a redistribution effect in favour of (large) firms with reduced lending to (poor) households. This is in line with one channel of adjustment. When lending shifts from higher to lower risk types, this tends to lower risk-weighted assets, which improves the capital adequacy of a bank.

Pillay and Makrelov (2025) focus on the excess capital that banks in South Africa hold above regulatory minima in conjunction with changes to capital requirements *and* monetary policy actions. They find that, while increases in excess capital have strong negative impacts on lending, there is less strong evidence that capital requirements have an additional negative impact (except for a subset of loans). They employ a panel fixed effects model with lending as the dependent variable and *changes* in capital requirements as an explanatory variable. A valuable addition of this paper is that the authors consider effects while using some of the smaller banks that are typically excluded in such studies in South Africa.[2]

Thus, as with Sibande and Milne (2025), our approach can be seen as a complementary alternative. We allow all variables (e.g. growth rates in lending categories *and* excess capital) to be jointly endogenous and evaluate the explanatory power of the *level* of the required capital adequacy ratio as an exogenous variable. The other difference is that they use GDP as a macroeconomic control, so are constrained to work with quarterly data. We use monthly data and use four macroeconomic rate variables that are available monthly as macroeconomic controls.

1 We refer the reader to the two companion papers. See Du Rand, Sikhosana and van Lill (2025) for a macro-econometric analysis and Hollander (2025) for a theoretical macroeconomic model analysis of the impact of the PCN CCyB.

2 As all our results are insignificant, we focus on the five largest banks across all models for consistency, as they are the only ones with balance sheets structures that allow all models to be estimated.

3. The capital buffer policy landscape

We present a brief coverage of aspects directly related to the analysis in this paper and refer the reader to the detailed accounts of the implementation of Basel III regulations in Sibande and Milne (2025) and Pillay and Makrelov (2025). These regulations were published in the South African Government Gazette in 2012 (Government of South Africa, 2012) with initial measures in effect from 1 January 2013. This is also the date from which we have the full set of Basel III regulatory data collected by the Prudential Authority.

Since 2013, there have been many changes to the CAR at individual bank level. This provides a rich set of changes to capital policies that may aid in identifying the short-run impacts on bank behaviour. However, the periods between policy changes are relatively short, which implies that long-run impacts will be difficult to pin down with empirical approaches. Figure 1 shows the evolution of the distribution of required CARs for all 27 banks that are present at the end of the dataset.

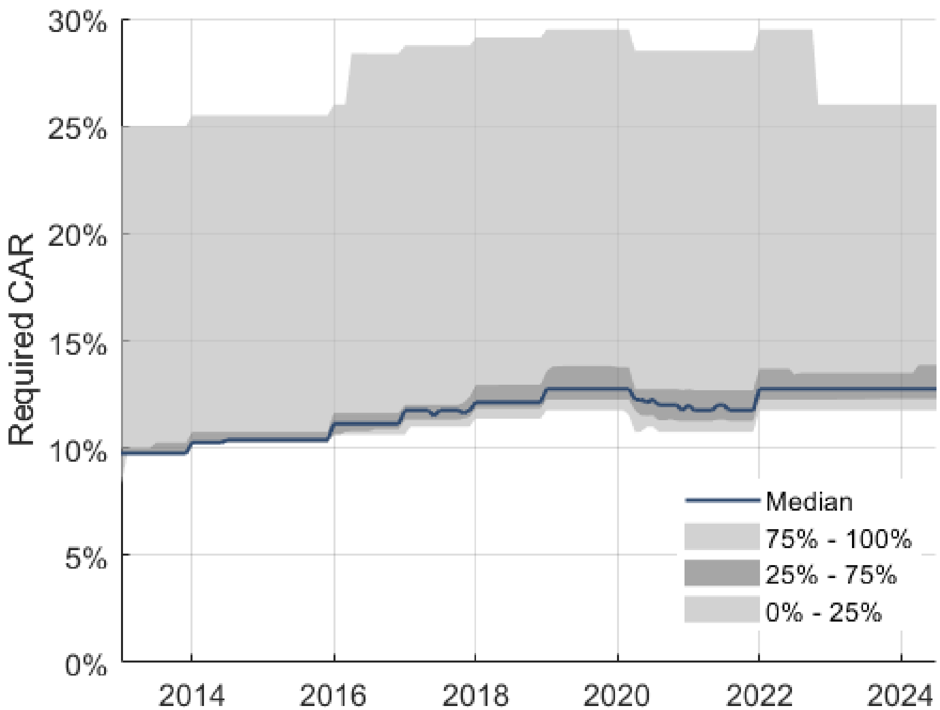

Figure 1: The distribution of total required capital adequacy ratios for all South African banks that reported in the last data point

Source: Authors' calculations based on SARB data.

Most banks maintain a buffer over the required CAR in excess of 1% as shown in Figure 2 for the six largest banks, which represent about 92% of the sector by total assets.[3] There is thus sufficient slack in the constraint that banks could absorb the increase due to CCyB without material adjustment. However, banks maintain such buffers above the required minimum for business reasons, and hence the increase in requirement may well induce an increase in reported CAR or other adjustments.

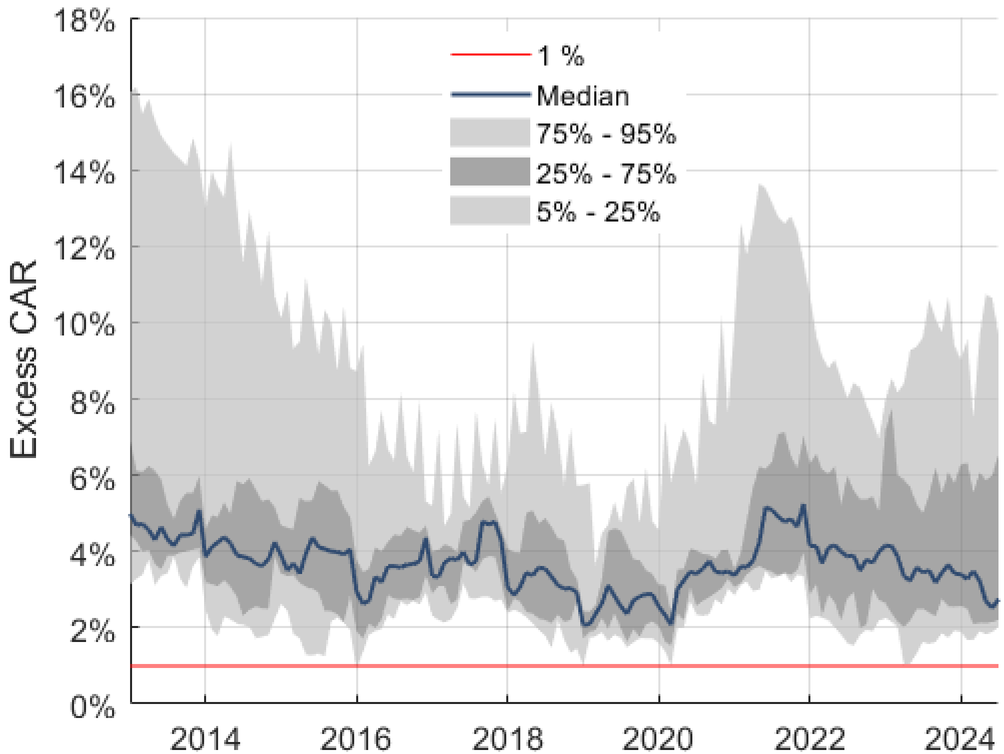

Figure 2: The distribution of reported capital adequacy ratios in excess of the regulatory minimum for the six largest South African banks.

Source: Authors' calculations based on SARB data.

[3] The excess CAR of some smaller banks exceed 100% for portions of the sample, which makes a figure with all banks hard to read.

The evolution and composition of aggregate capital in the banking sector over the sample period is shown in Figure 3. Total capital has grown quite stably over the period, with a notable decrease in growth rate (lower slope) after 2018. The largest component is common equity tier 1, with the proportion of additional tier 1 capital increasing over the recent past. Most of the build-up of capital is in the form of retained earnings (green line), which is shown net of unappropriated profits (purple line, which does not qualify as capital until appropriated by a board decision). This is a potential avenue by which banks may increase their capital – appropriating profits as capital rather than paying out dividends (regular dividend payments explain some of the jagged nature of this series).

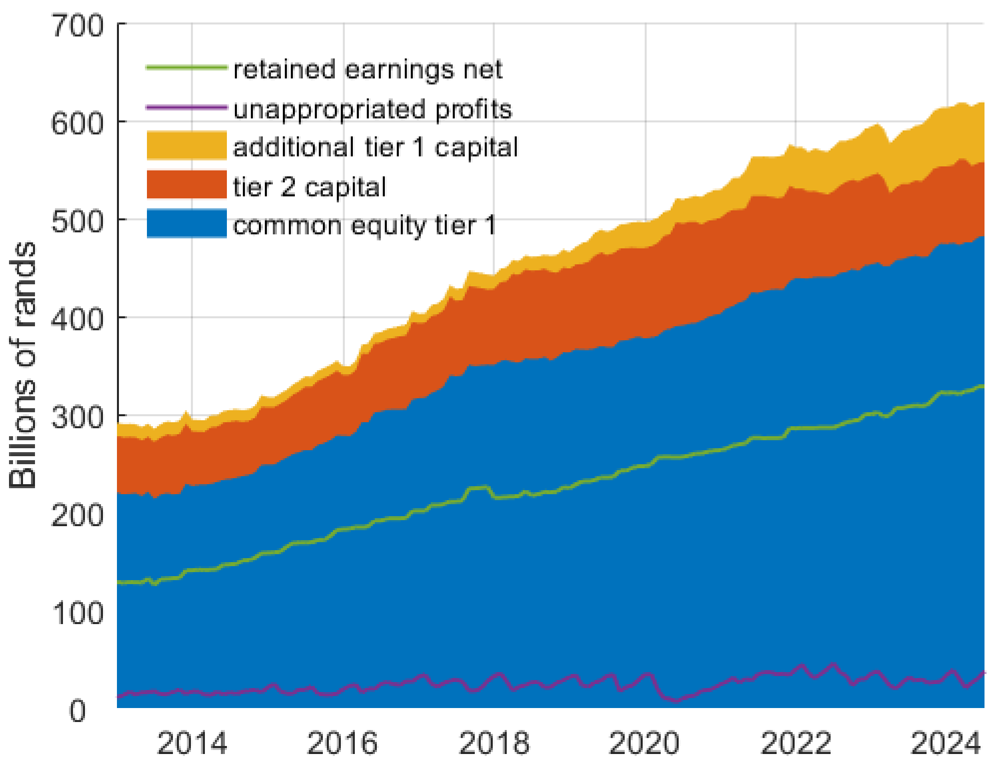

Figure 3: Aggregate total qualifying capital and reserved in the entire banking sector in billions of rands, subdivided into components.

Source: Authors' calculations based on SARB data.

The distribution of required CAR in Figure 1 masks the fact that there are a large number of changes in required CAR across banks in the period studied. Figure 4 shows the number of banks impacted by increases (top panel) and decreases (bottom panel) in required CAR.

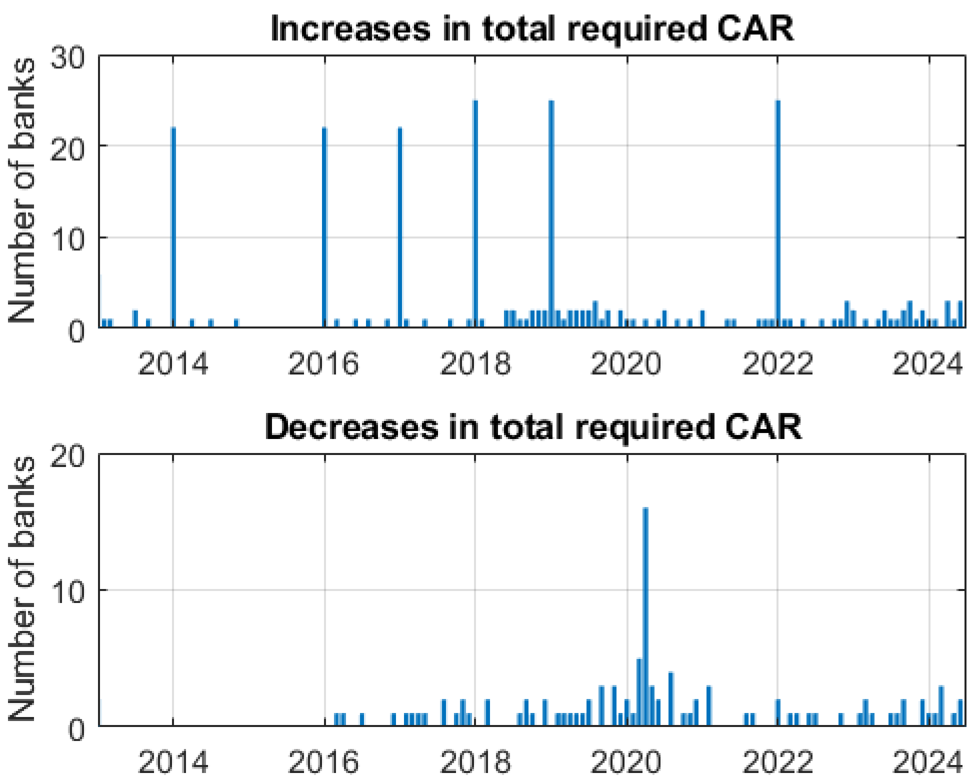

Figure 4: The number of banks affected by increases (top panel) and decreases (bottom panel) in total required capital adequacy ratio over time.

Source: Authors' calculations based on SARB data.

4. Event Analysis

The simplest approach to assessing the impact of changes in the policy instrument is an event analysis. This approach standardises the variable of interest to zero at the time of each change and assesses the paths of the variables in a window before and after the event for any apparent patterns.

The many changes to required CAR are somewhat of a drawback for event analysis, as this approach relies on observing the adjustment to changes over time. Many changes in a short time frame makes it impossible to reliably detect consistent behaviour over time caused by a typical change. To overcome this, we focus on the six dates of required CAR increases that affected more than 20 banks. We omit the broad reduction of requirements in 2020, as the COVID-19 period was unusual in many ways.[4]

[4] As the results are mostly inconclusive, we show only a selection of results here. For instance, there was no discernible effect on any of the modelled assets or liability growth rates that can be identified by event analysis.

4.1 Capital components

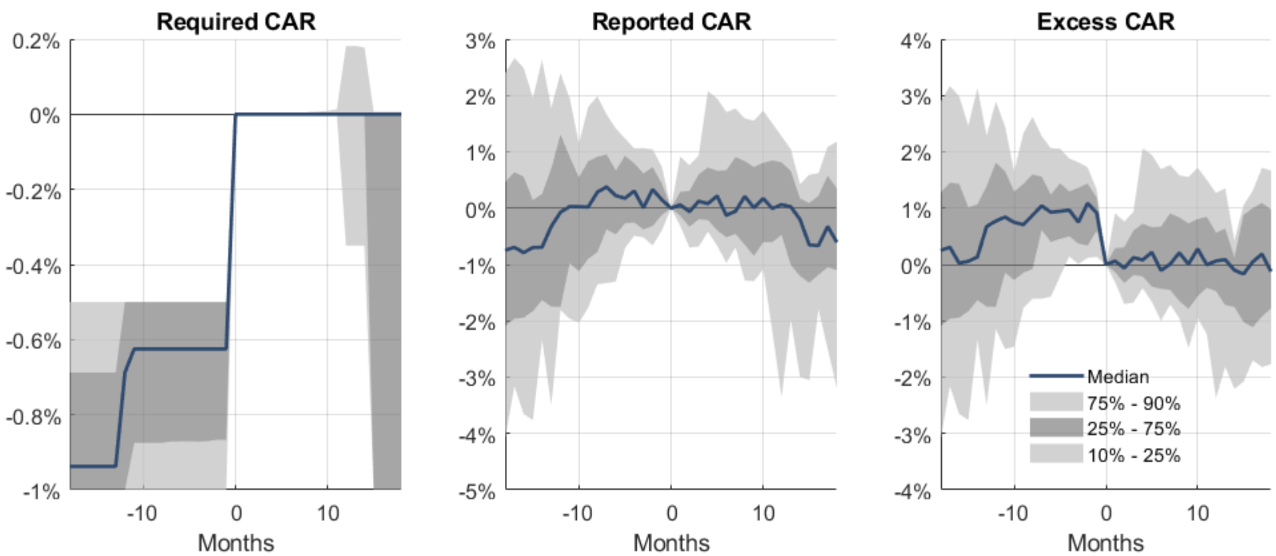

Figure 5: Event analysis of capital adequacy variables for eighteen months before and after the six most universal increases in required capital adequacy ratios. The left panel shows the policy impulse and its distribution across banks over time: the increase in the required capital adequacy ratio. The middle panel shows the distribution of reported capital adequacy ratios, and the right panel shows the distribution of capital adequacy ratios in excess of the required minimum.

Source: Authors' calculations based on SARB data.

Figure 5 shows the event analysis of the six most widespread change events pooled across the six largest banks for a window of eighteen months before and after the change. The left panel represents the policy shock in required CAR, where the median increase across events is 0.625 percentage points and most banks experiencing no subsequent change for 10 months. After 10 months, the distribution diverges with some banks experiencing further increases, others decreases.

There is no clear impact on reported CAR (middle panel) but some evidence that banks build up excess CAR in anticipation of the increase (right panel). This seems uncontroversial, as changes to required CAR are typically announced well in advance of their effective date. This is done with the explicit intention of allowing banks time to adapt without requiring sharp adjustments to their operations.

Figure 6 shows the event analysis graphs for the year-on-year growth rates in three capital components: total qualifying capital and reserves, unappropriated profits and retained earnings net of unappropriated profits. The medians show some evidence of higher growth rates before and lower growth rates after an increase in required CAR, but the distribution includes zero effect for the full window.[5]

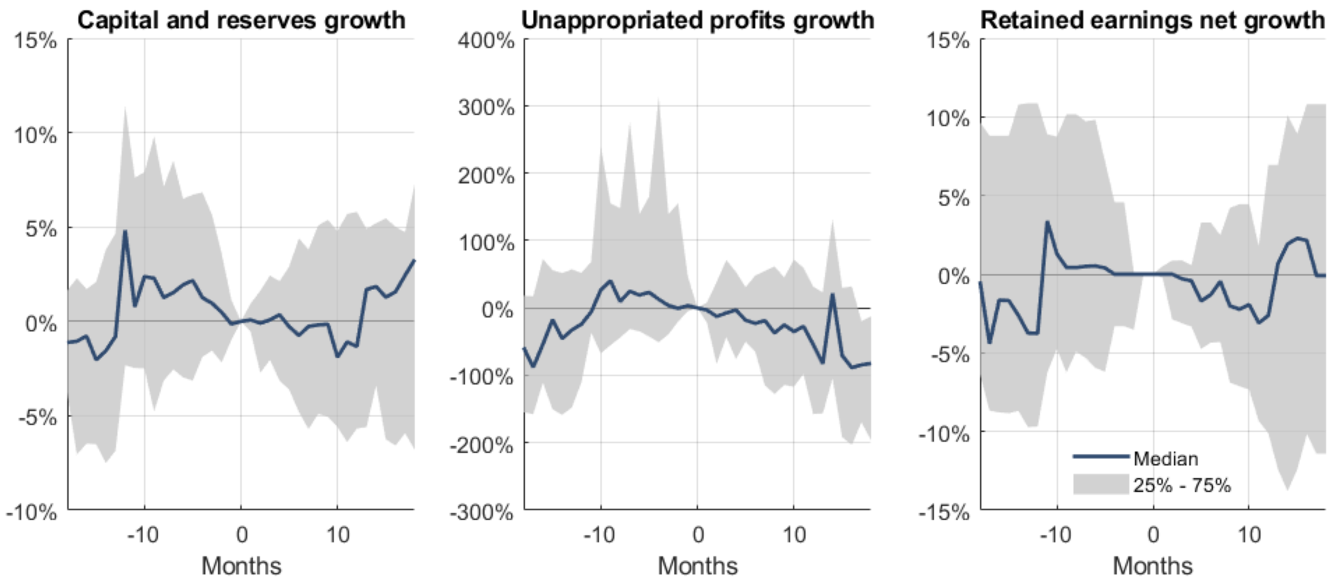

Figure 6: Event analysis of year-on-year growth rates in capital variables for eighteen months before and after the six most universal increases in required capital adequacy ratios. The left panel shows the impact on the distribution of the growth rates of total capital and qualifying reserves (across banks, over time). The middle panel shows the same for the growth rates in unappropriated profits, and the right panel for the growth rates in retained earnings net of unappropriated profits.

Source: Authors' calculations based on SARB data.

[5] We show only the interquartile range for this set of results, as the distribution is so wide that median effects would be indiscernible if the full distribution were shown.

4.2 Rates

Figure 7 shows that there is no clear impact on the return on assets, return on equity, the weighted average interest rate on private sector deposits or the weighted average interest rate on lending to the private sector. At the ends of the window some effects may be discerned, but given the variability of other determinants of bank decisions, it is impossible to convincingly assign the apparent impact to the change in required CAR using this simple method.

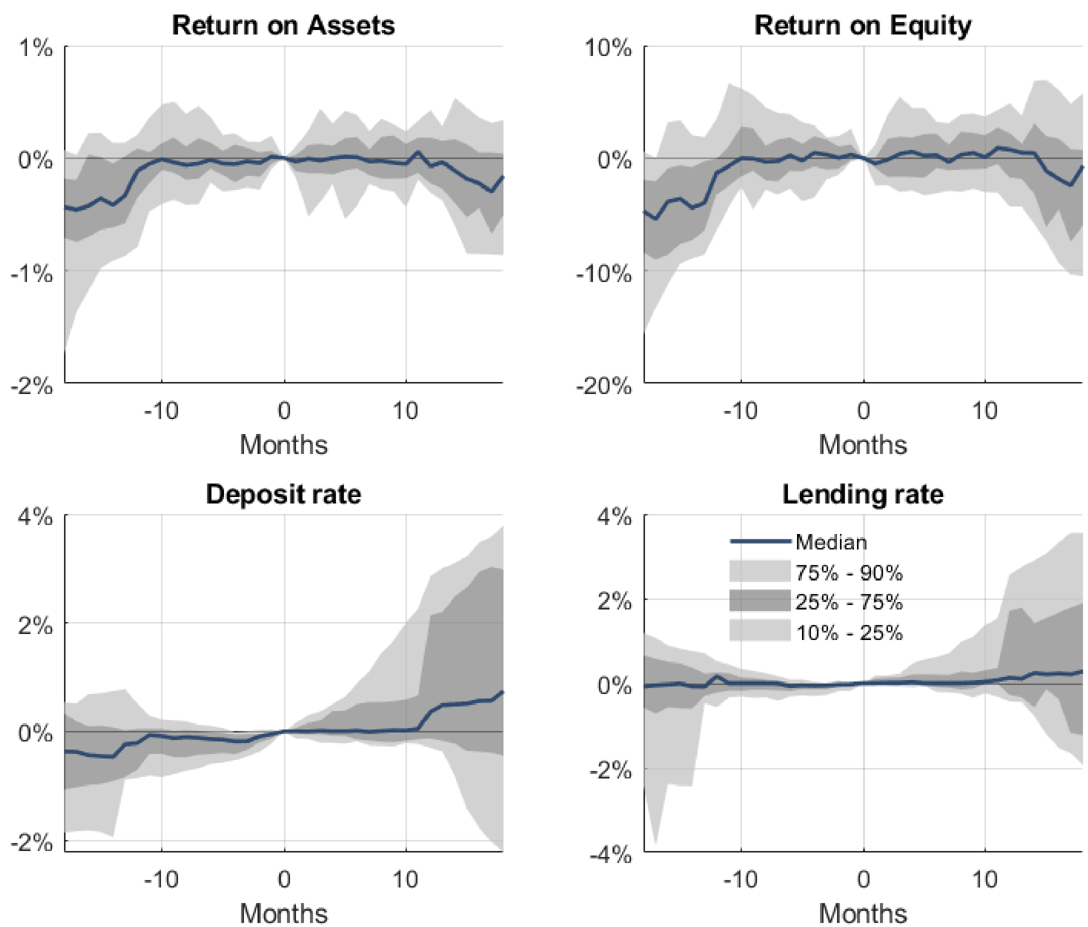

Figure 7: Event analysis of rate variables for eighteen months before and after the six most universal increases in required capital adequacy ratios. The top-left panel shows the impact on the distribution of the return on assets (across banks, over time). The top-right panel shows the same for the return on equity, the bottom-left panel for the weighted average interest rate on deposits from the private sector and the bottom-right panel for the weighted average interest rate on lending to the private sector.

Source: Authors' calculations based on SARB data.

5. Econometric analysis

In this section we present our econometric analysis of the impact of changes in required CAR on bank level outcomes. We use a common methodology of estimating an independent, agnostic Bayesian vector autoregression (VAR) in a selection of bank outcome variables. Each set of variables constitutes a different model, described in the subsections below. Data on bank-level variables were collected by the Prudential Authority, and details on exact sources are provided in Table A in the appendix.

The available data constitutes a panel dataset across banks, and hence we could have considered either a panel VAR or other panel econometric approaches. A key requirement for a panel VAR is called *dynamic homogeneity*, which requires that the dynamic responses of different units in the panel should be similar. Our results show that individual bank models imply very different dynamics across banks, hence a panel approach would not be appropriate. Therefore, we estimate independent models for each bank and aggregate the predicted impacts by weighted average based on the total asset size of each bank relative to that of the total banking sector. The approaches of Sibande and Milne (2025) and Pillay and Makrelov (2025) employ panel methods that impose that the impacts of all variables are identical across all banks in the panel.

5.1 Bank-level model specification

For each bank i and each model independently, we estimate a Bayesian VAR of the following form:

$$\mathbf{y}_{it} = A_{i0} + \sum_{s=1}^{p} A_{is}\,\mathbf{y}_{it-s} + B_i\mathbf{x}_{it} + C_i\mathbf{car}_{it} + \boldsymbol{\varepsilon}_{it}$$

In this specification, $\mathbf{y}_{it}$ is a vector of modelled bank level variables that depend on their mutual past values $\mathbf{y}_{it-s}$ up to lag p via the auto-regressive coefficient matrices A_{is} and vector of constants A_{i0}. $\mathbf{x}_{it}$ is a vector of macroeconomic variables added to control for the impact of economic conditions on bank outcomes via the coefficient matrix B_i. To model the impact of policy, $\mathbf{car}_{it}$ represents the time-varying bank-specific level of the required CAR, with impact vector C_i. Finally, $\boldsymbol{\varepsilon}_{it}$ is a vector of residuals.

Identification assumptions: In contrast to typical macroeconomic applications, our purpose is not to identify structural bank-level shocks, but rather the impact of the level of the required CAR which is modelled as an exogenous variable from the perspective of an individual bank. This means that we do not require strong identification assumptions and can leave the model unrestricted to allow for different banks to have different response patterns across variables (Hamilton, 1994).

The only identification assumption we impose is that the estimated system is stable. This is implemented in similar ways to sign restrictions (Uhlig, 2005) by discarding draws from the posterior that imply explosive or unit-root behaviour.

Impact of the CCyB implementation: We model the impact of the CCyB by employing the fundamental definition of an impulse response function, i.e. for each bank-level model, and each accepted coefficient draw from the posterior, we generate two forecasts: one without the increase in CAR due to the CCyB, and one with the increase. The impact of the CCyB addition is then measured by the difference in the forecasted paths, which is aggregated across banks according to their relative weights in terms of total assets.

VAR specification: We use a monthly VAR with three lags of endogenous variables. All bank-level stock and flow variables enter as year-on-year growth rates, while interest rates enter as actual percentage point levels.[6] We use relatively uninformative conjugate normal priors, centred at zero with large variance. The exogenous macroeconomic variables enter the bank specific models with a one-month lag and include indicator variables for the COVID-19 period.

5.2 Macroeconomic model specification

Since we condition bank-level variables on macroeconomic variables to control for the impact of economic conditions, we require forecasts of the macroeconomic variables in order to generate bank-level forecasts. For this purpose, we estimate a small VAR model in four selected variables that should reasonably reflect business cycle conditions.

Again, since we require no identified structural macroeconomic shocks, we leave the macro-VAR model unrestricted, use four lags and the same priors as for the bank-level models.[7] The macroeconomic components of all bank-level models are identical.

The macroeconomic variables are summarised in Table 1 and the forecasts obtained are shown in Figure 8.

---

[6] The policy relevance and implications of results are not sensitive to either the lag length or the choice of growth rate (e.g. year-on-year vs quarter-on-quarter). See section 6 for a complete discussion of the robustness of results and alternative specifications attempted.

[7] As with the bank-level models, the results are not sensitive to the specification of the macroeconomic model. The model with four lags was marginally better than other choices according to standard specification tests.

Variable name	Description	Source and code
Short rate	90-day interbank rates for South Africa.	FRED (IR3TIB01ZAM156N)
Inflation	Year-on-year growth in total CPI.	SARB QB (KPB7170A)
Bond 10y	Nominal yield on government bonds 10 – 15 years.	SARB QB (KPB2003M)
Sovereign spread	Difference between Bond 10y and the 10-year US government bond.	FRED (IRLTLT01USM156N)
Covid indicators	Indicators for the COVID-19 period:[8] Contraction: Feb 2020 to Jan 2021. Recovery: Feb 2021 to Aug 2021.	Authors' construction

Table 1: Details on variables used in the macro-economic model. FRED refers to the database of the St Louis Federal Reserve (fred.stlouisfed.org) and SARB QB refers to data from the Quarterly Bulletin of the South African Reserve Bank (resbank.co.za).

[8] As the empirical specifications are in growth rates, we employ two indicators. In the first part of the COVID-19 period, many macroeconomics series showed large negative growth rates. Once the recovery began, the low base induced by the initial COVID-19 period yielded abnormally large growth rates.

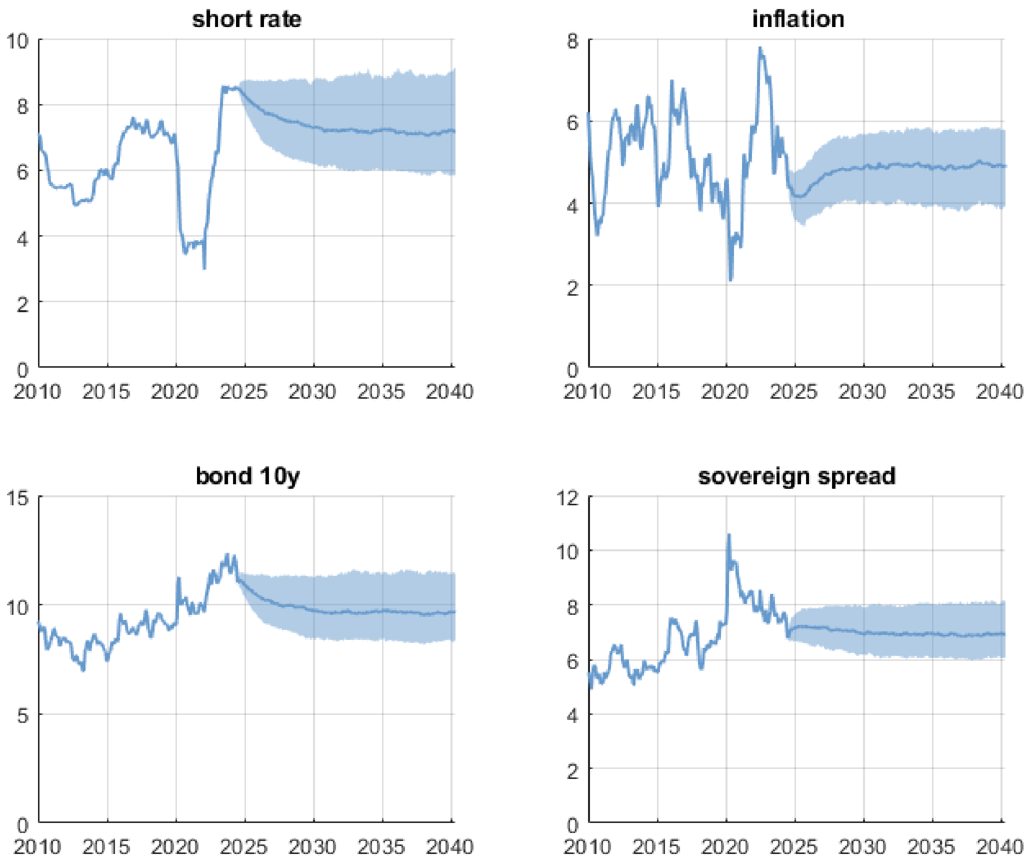

Figure 8: Macro-economic variables used in bank-level models and their forecasts from a four-lag unrestricted vector autoregression. The shaded areas represent 95% confidence sets for the forecasts.

Source: SARB data and authors' calculations.

5.3 Bank-level results

The selection of bank-level variables for the model is not trivial. Smaller models may yield more significant results but limit the generality of the channels of adjustment that can be uncovered empirically, while larger models may not have enough degrees of freedom to identify significant results. As such, we present three versions of the bank level models: model 1 contains only three of the core variables related to capital adequacy, model 2 focusses on four specific lending channels (disaggregated between households and corporates, as well as secured and unsecured credit) while allowing for two capital channels of adjustment (total capital and excess capital). Model 3 allows for two pricing channels (deposit and lending rates), two lending channels (secured and unsecured), and two capital channels (total capital and reserves as well as excess capital).

In all models, all bank-level variables are in year-on-year growth rates.

The impact of required CAR on each individual variable is similar across all models investigated in the following sense: whenever, for example, *excess capital* enters into a model, the predicted impact of the CCyB is similar to when it enters in a different model. Crucially, no statistically significant or economically large effects are found. The conclusion in section 6 contains additional discussion on the robustness of these insignificant results.

5.3.1 *Model 1: Three core capital adequacy variables*

In this model, we use the following bank level variables: risk weighted assets (RWA, the denominator of the CAR), total qualifying capital and reserves (the numerator of the CAR) and excess capital (which can be viewed as the buffer component of total qualifying capital and reserves). The distribution of these growth rates over time across the five largest banks are shown in Figure 9.[9]

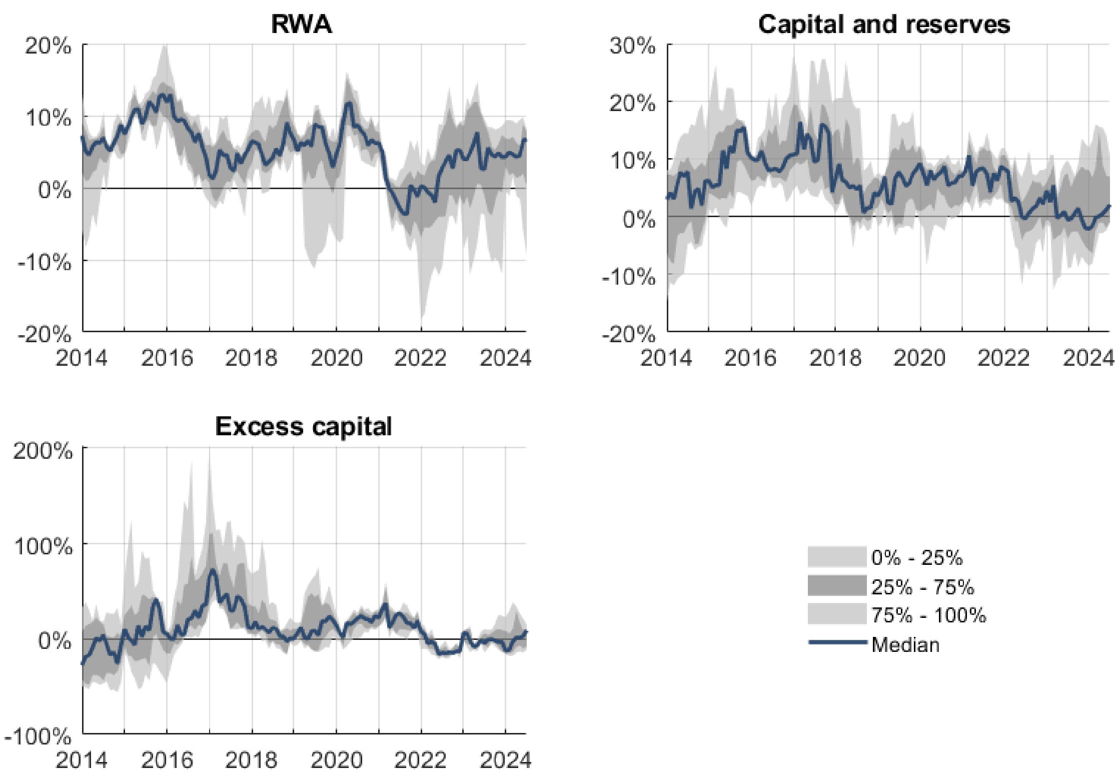

Figure 9: Distribution of variables in model 1 (across banks, over time). All variables are in year-on-year growth rates.

9 For comparability across models, we present only results on the five largest banks. These are the only banks in the dataset with complete data on all levels of disaggregation considered in the empirical models.

Figure 10 shows the modelled impact of the imposition of the PCN CCyB, where the date of the shock is normalised to zero. For each bank and each parameter draw from the posterior, we compute a pair of conditional forecasts, one with and one without the change to CCyB. The estimated impact (and its distribution across parameter draws) is constructed as the difference between these forecasted paths, and then aggregated across banks with weights equal to their relative size in the market (in terms of total assets).

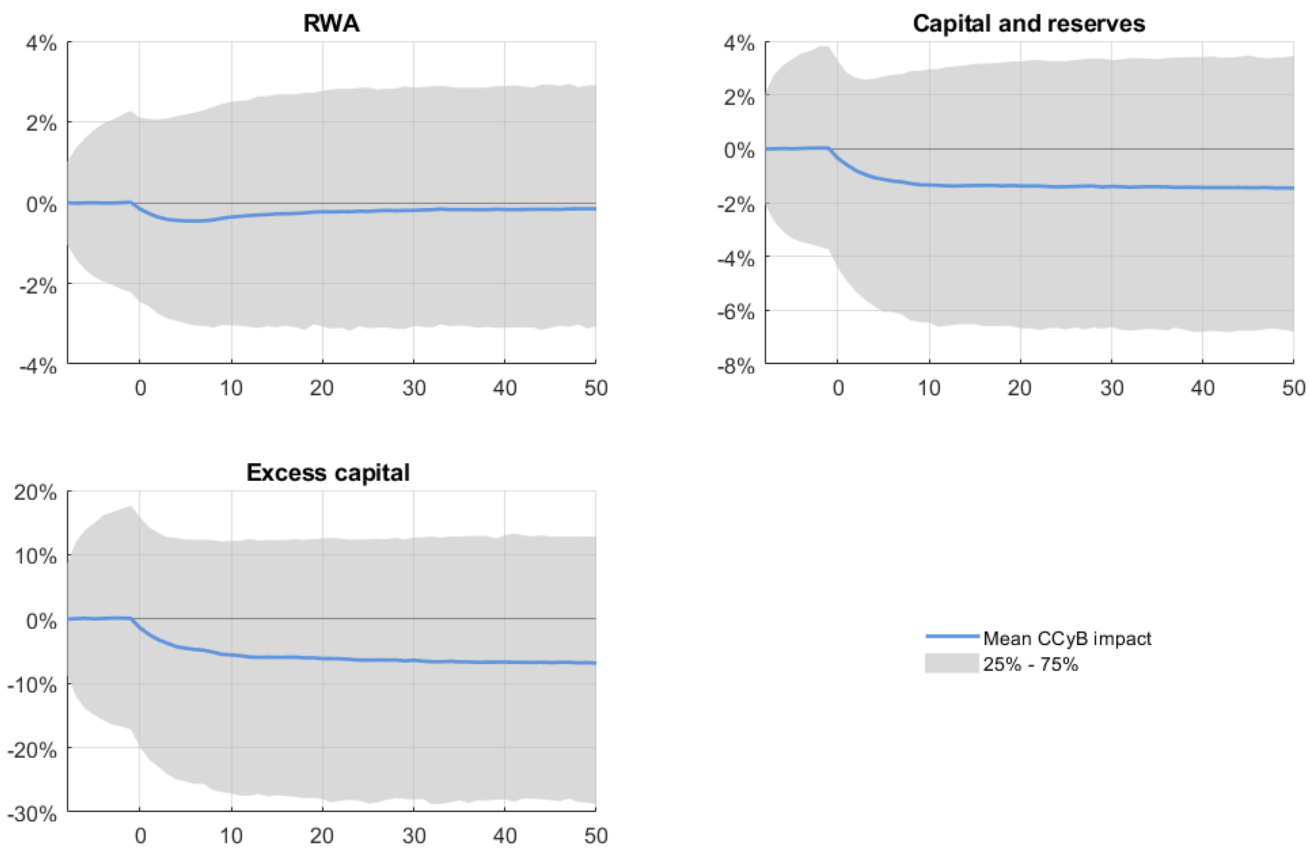

Figure 10: Distribution of the impact of the imposition of the 1% PCN-CCyB in model 1. The blue line represents the weighted average impact across the five largest banks and the shaded area, the 50% confidence set (the range between the 25th and 75th percentiles of the predicted impact distribution).

Source: Authors' calculations.

The estimated effect is clearly insignificant, as even the interquartile range (the set of predicted impacts between the 25th and 75th percentiles of all predicted impacts) includes zero. Evaluated at the mean, the impact is strongest on excess capital, which is an anticipated result, suggesting that banks use the adjustment margin with the least impact on operations. Figure 11 shows a box plot of the variation over time of each variable (in weighted average form across banks) against the weighted average impact of imposing the CCyB (relative to a zero effect). Table 2 shows the long run impact in comparison to the mean and standard deviation of each variable over the last 12 months of data, to provide a comparison to the most recent behaviour of each variable.

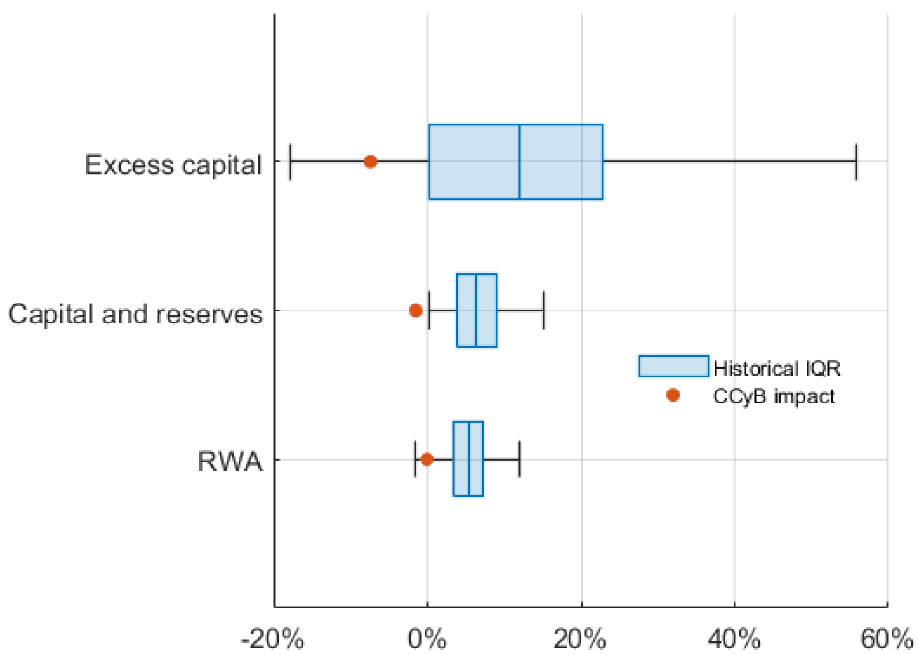

Figure 11: Box plots of the long run impact of the imposition of the 1% PCN-CCyB. The orange dots represent the weighted average impact (relative to zero impact), whereas the box-and-whisker plot represents the distribution of the historical variation of each variable (in terms of the weighted average across banks). The blue box represents the interquartile range (IQR), and the black whisker endpoints the 5th and 95th percentiles.

Source: Authors' calculations.

	Historical Variability			Estimated CCyB impact		
Variable	**Mean**	**Std Dev**	**CoV**	**Mean**	**Std Dev**	**CoV**
RWA	4.51	0.90	0.20	-0.05	9.30	191.51
Capital and reserves	3.72	1.34	0.36	-1.51	12.34	8.20
Excess capital	3.18	3.28	1.03	-7.39	66.32	8.98

Table 2: Estimated long run impact (and measures of precision) of the imposition of the 1% PCN-CCyB in model 1, relative to the mean and standard deviation (Std Dev) and Coefficient of Variation (CoV) of the respective variables over the last 12 months of data.

Source: Authors' calculations.

Summary of results for model 1: the model predicts no significant impact of the imposition of the PCN CCyB on the variables modelled. The standard deviation of the estimated impact of the CCyB is very large relative to the mean impact. Evaluated at the mean, the strongest impact is on the growth rate of excess capital, which suggests a natural adjustment mechanism: the degree to which the desired buffer over regulatory minimum recovers is allowed to attenuate after an increase. We place little reliance on the mean effects, however, as the precision of the estimated impact is so low.

5.3.2 Model 2: Four lending and two capital adequacy variables

In this model, we use the following six bank level variables. To model the lending behaviour of banks, we use four categories: credit to households (secured and unsecured), credit to corporates (secured and unsecured). To model adjustment via capital variables, we use two categories: total qualifying capital and reserves and excess capital above requirements. Figure 12 shows the year-on-year growth rates in these variables.

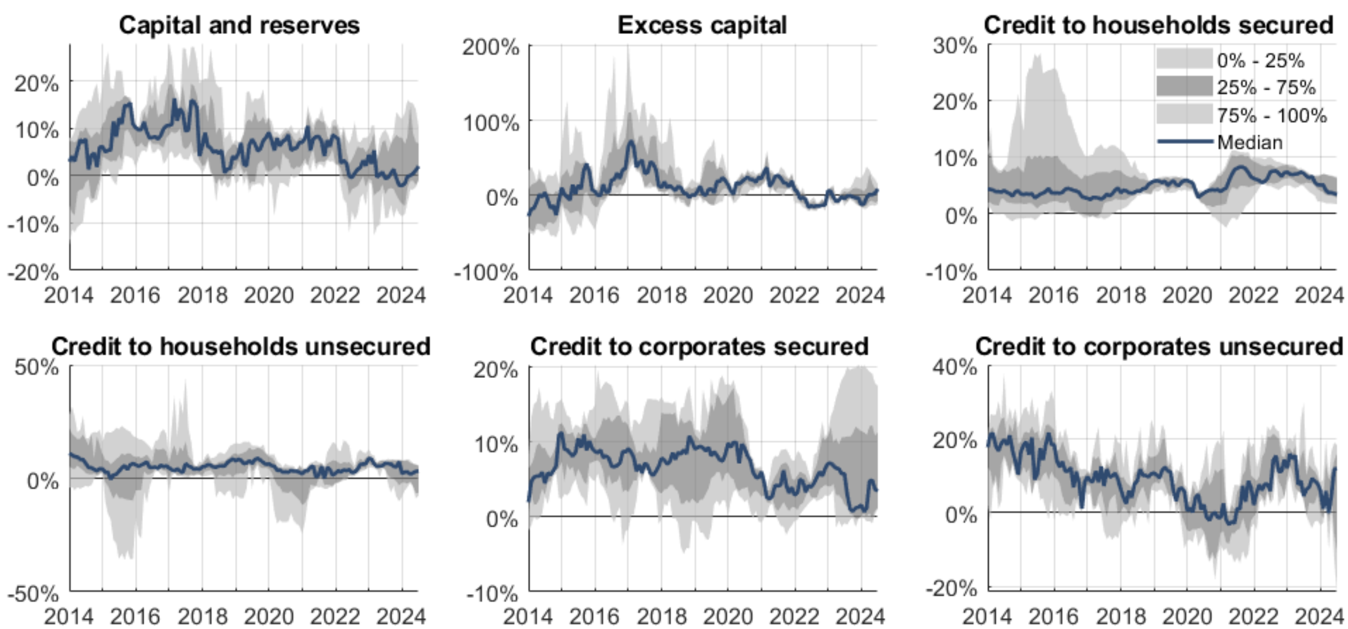

Figure 12: Distribution of variables in model 2 (across banks, over time). All variables are in year-on-year growth rates.

Source: Authors' calculations.

Figure 13 shows that the results are not statistically significant. Taken at the weighted mean of impacts, there is some evidence of a reallocation pattern: more statistically significant increases in secured credit than unsecured credit (which would tend to lower RWA for the same total asset value). The largest numerical mean effect is again a reduction in the growth rate of excess capital.

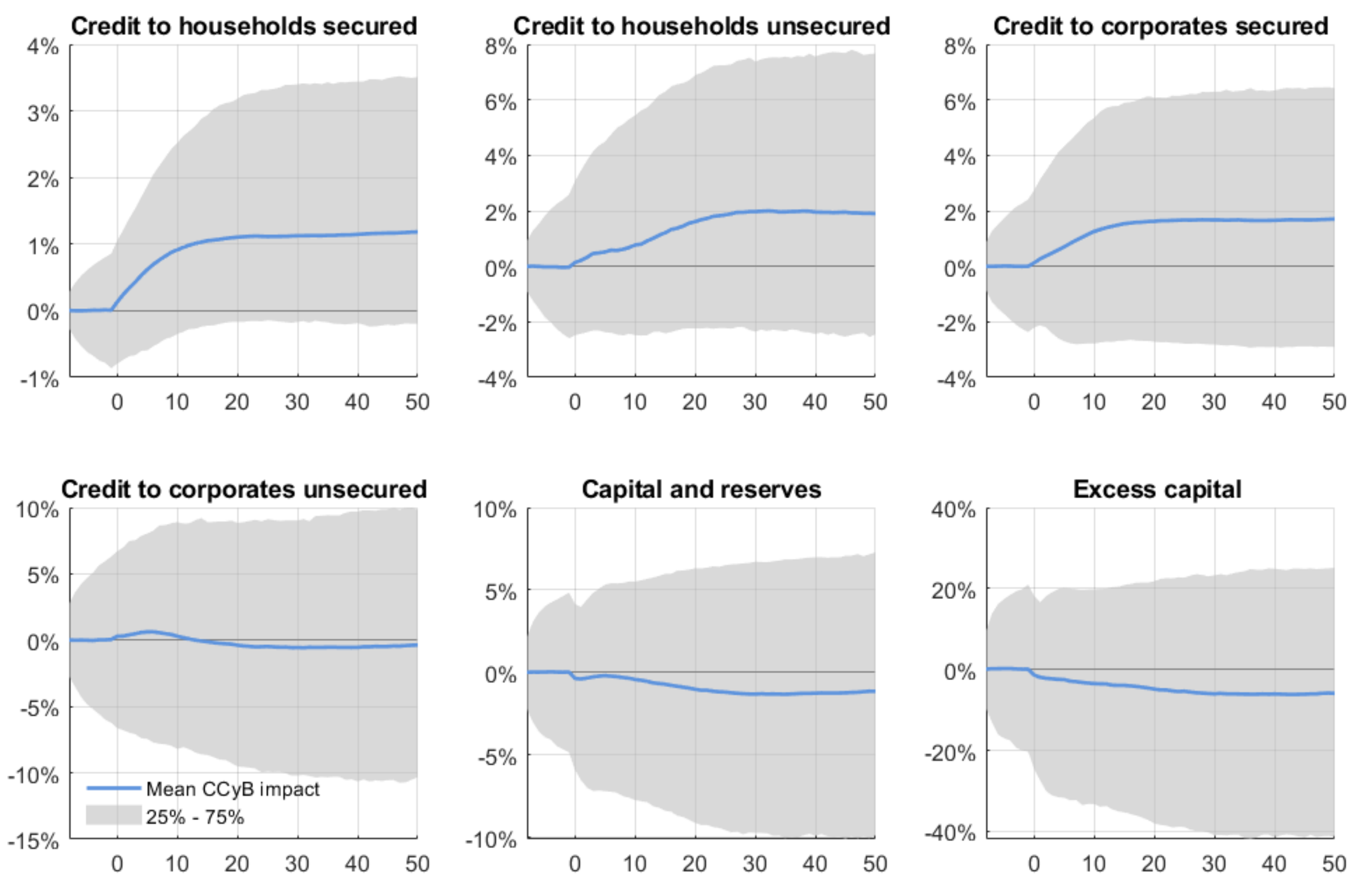

Figure 13: Distribution of the impact of the imposition of the 1% PCN-CCyB in model 2. The blue line represents the weighted average impact across the five largest banks and the shaded area, the 50% confidence set (the 25th and 75th percentiles of the predicted impact).

Source: Authors' calculations.

Figure 14 places the long run average effects in historical context of the variability of the modelled variables in terms of box plots. As above, all average effects are small in economic magnitude relative the historical variability of the variable in question. Table 3 summarises the mean impact and degree of precision of the estimated impact against the historical mean and measures of variability of the respective variables in the last 12 months of data.

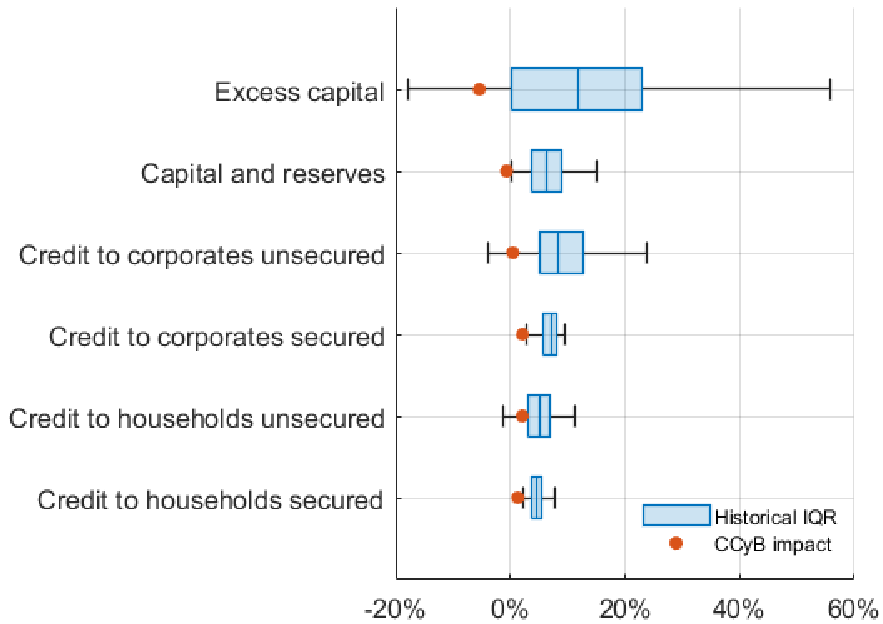

Figure 14: Box plots of the long run impact of the imposition of the 1% PCN-CCyB. The orange dots represent the weighted average impact (relative to zero impact), whereas the box-and-whisker plot represents the distribution of the historical variation of each variable (in terms of the weighted average across banks). The blue box represents the interquartile range (IQR), and the black whisker endpoints the 5th and 95th percentiles.

Source: Authors' calculations.

	Historical Variability			Estimated CCyB impact		
Variable	**Mean**	**Std Dev**	**CoV**	**Mean**	**Std Dev**	**CoV**
Credit to households secured	4.83	0.98	0.20	1.31	16.28	12.39
Credit to households unsecured	4.07	1.41	0.35	2.11	41.73	19.78
Credit to corporates secured	7.17	0.41	0.06	2.15	21.17	9.85
Credit to corporates unsecured	5.92	2.19	0.37	0.46	45.63	99.06
Capital and reserves	3.72	1.34	0.36	-0.63	29.98	-47.30
Excess capital	3.18	3.28	1.03	-5.40	152.03	-28.17

Table 3: *Estimated long run impact (and measures of precision) of the imposition of the 1% PCN-CCyB in model 2, relative to the mean and standard deviation (Std Dev) and Coefficient of Variation (CoV) of the respective variables over the last 12 months of data.*

Source: Authors' calculations.

5.3.3 *Model 3: Two lending, two capital adequacy and two rate variables*

In this model, we use six bank-level variables. To allow for adjustment on pricing channels, we use the weighted average interest rate on deposits and on lending.[10] We allow for adjustment on lending channels between secured and unsecured credit, and adjustment on capital channels via total capital and reserves and excess capital. Figure 15 shows the distribution of these variables over time and across banks. Immediately, we must note a difference in the time-series behaviour of the interest rates relative to the year-on-year growth rates.

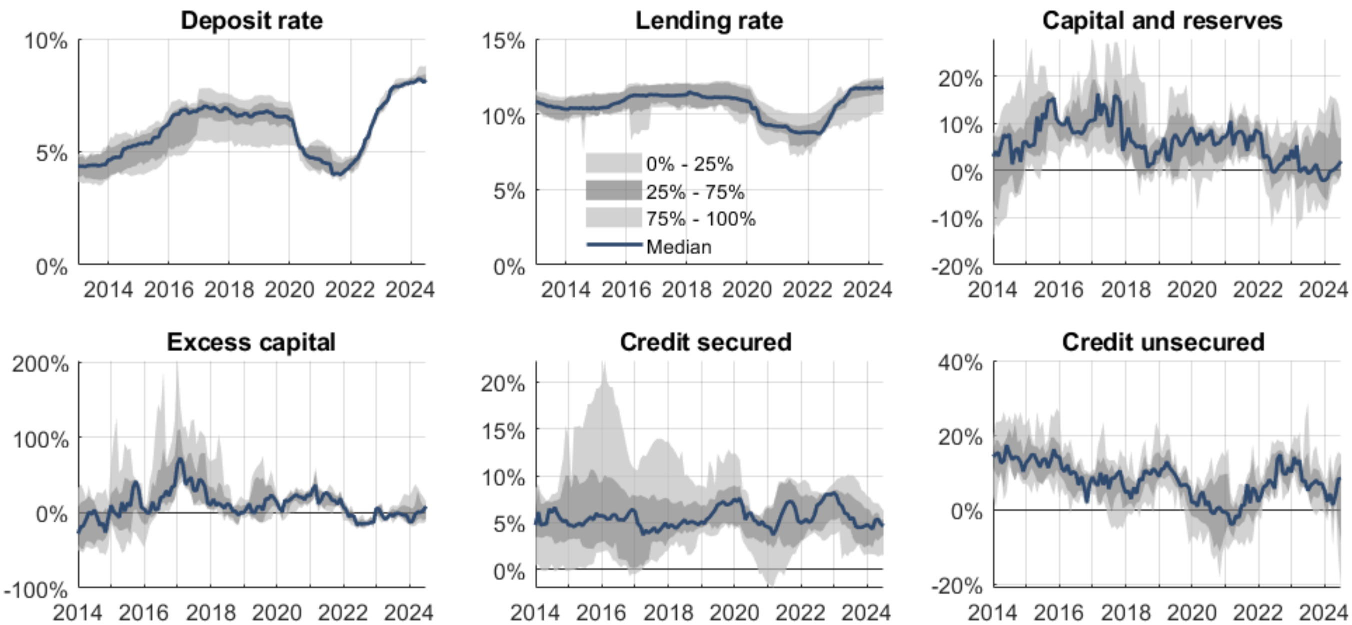

Figure 15: Distribution of variables in model 3 (across banks, over time). All variables other than interest rates are in year-on-year growth rates.

[10] Since the policy rate enters as an additional exogenous control in all bank-level models and the models are linear, the impact of the spread of each bank-level interest rate over the policy rate is accounted for.

The weighted average deposit and lending rates are noticeably more persistent than the year-on-year growth rates. This is due to these variables closely tracking the policy rate. The variation across banks at any moment in time is also smaller for the interest rates than the growth rates.

This has implications for the empirical model: simple linear models like the ones employed in this study and those in the literature struggle to identify effects when different series have different degrees of persistence, and overall, estimated systems of equations tend to exhibit more persistence when some of the variables are more persistent than others. Year-on-year growth rates represent the most persistent version of the variables in the model to ameliorate the statistical impact of differences in persistence. We comment on results from shorter growth rate intervals in the conclusion.

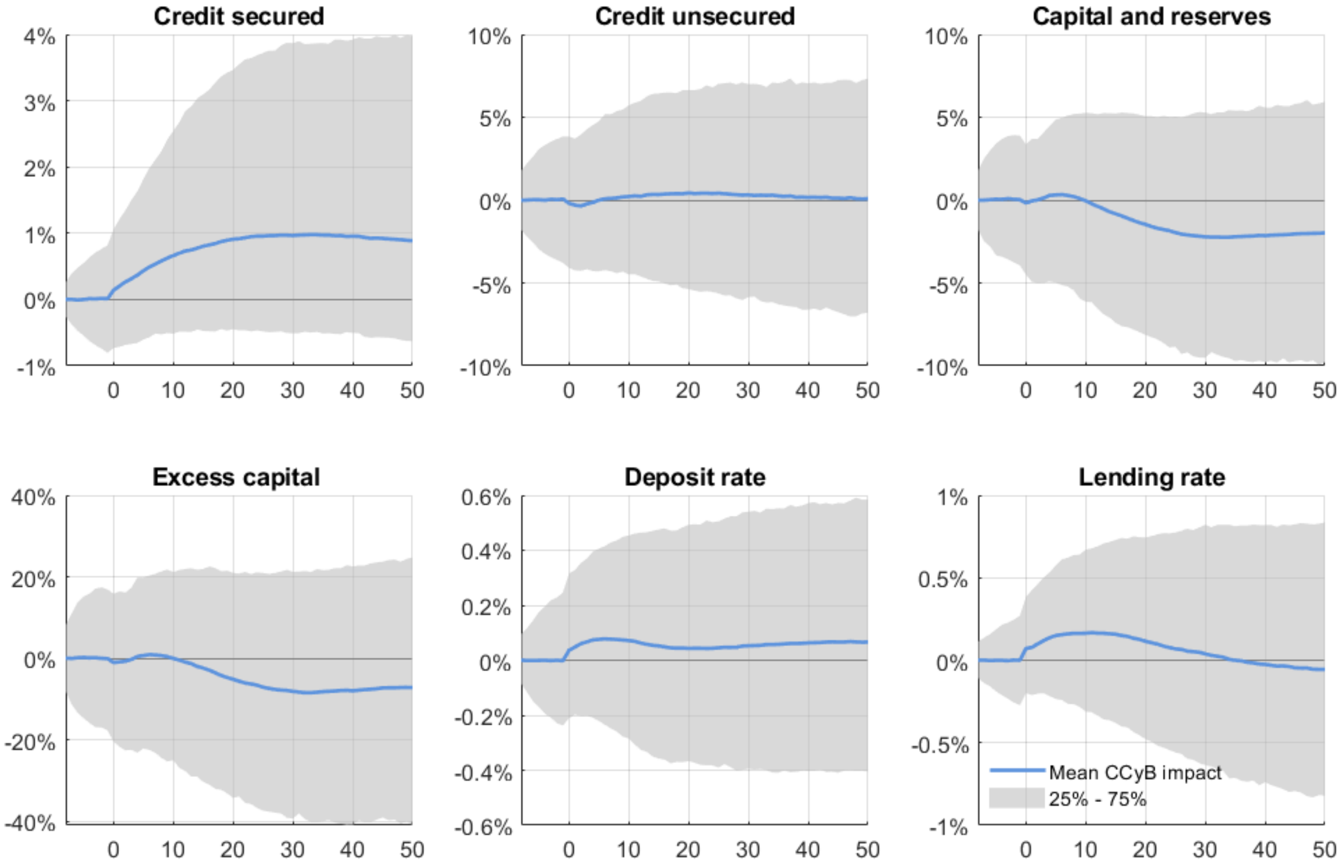

Figure 16: Distribution of the impact of the imposition of the 1% PCN-CCyB in model 3. The blue line represents the weighted average impact across the five largest banks and the shaded area, the 50% confidence set (between the 25th and 75th percentiles of the predicted impact).

Source: Authors' calculations.

Figure 16 shows the predicted impact of the CCyB increase on each of the variables in the model. As before, we find no significant effects. Taken at the weighted average impact, the new variables in this model (relative to those above) hints at a temporary increase in lending and an longer run increase in deposit rates. However, these average effects are very small in historical economic content: a maximum increase in lending rates of less than 0.2% points in an environment where the weighted average lending rate was 11.75% over the last 12 months (see Table 4).

For completeness we also present the weighted average impacts of the imposition of the 1% PCN CCyB in box plot format in Figure 17 and against the average and standard deviation over the last 12 months of available data in Table 4. Again, the strongest average (but statistically insignificant) effects are first on excess capital growth, and next on total capital growth.

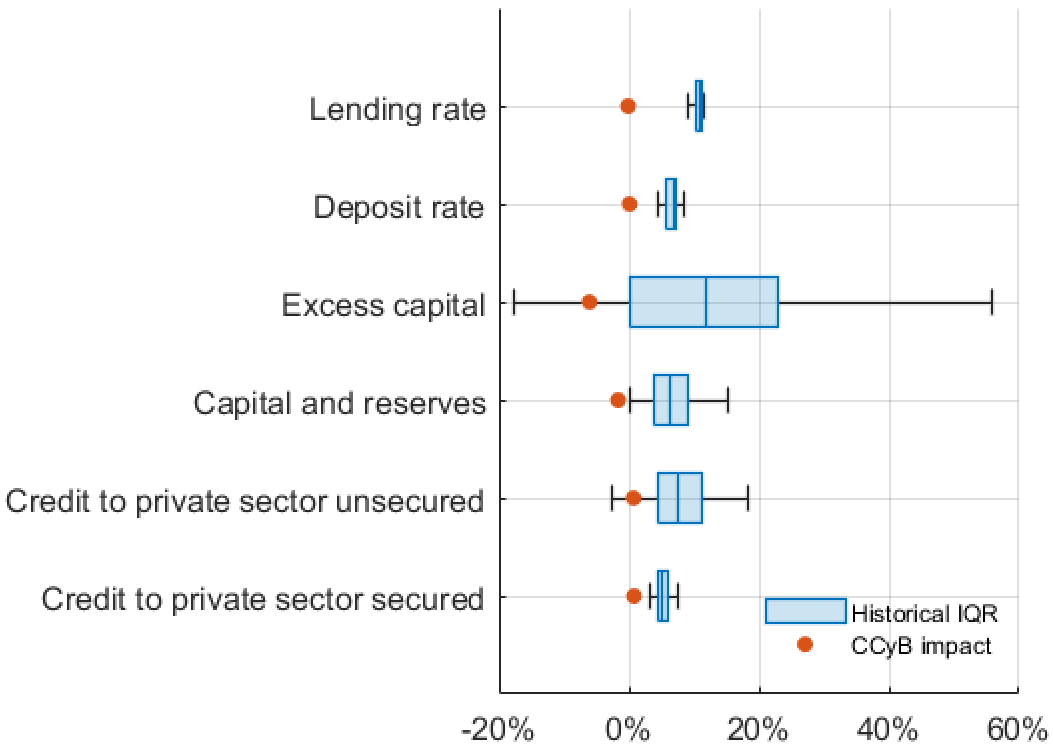

Figure 17: Box plots of the long run impact of the imposition of the 1% PCN-CCyB. The orange dots represent the weighted average impact, whereas the box-and-whisker plot represents the distribution of the historical variation of each variable (in terms of the weighted average across banks). The blue box represents the interquartile range (IQR), and the black whisker endpoints the 5th and 95th percentiles.
Source: Authors' calculations.

	Historical Variability			Estimated CCyB impact		
Variable	**Mean**	**Std Dev**	**CoV**	**Mean**	**Std Dev**	**CoV**
Credit to private sector secured	5.00	0.75	0.15	0.77	15.90	20.66
Credit to private sector unsecured	5.56	1.65	0.30	0.69	41.11	59.50
Capital and reserves	3.72	1.34	0.36	-1.67	41.73	-24.98
Excess capital	3.18	3.28	1.03	-6.09	191.59	-31.48
Deposit rate	8.24	0.07	0.01	0.09	2.40	27.88
Lending rate	11.20	0.15	0.01	-0.13	4.47	-34.59

Table 4: Long run impact of the imposition of the 1% PCN-CCyB in model 3 relative to the mean and standard deviation (Std Dev) of the respective variables over the last 12 months of data. Source: Authors' calculations.

6. Concluding discussion and robustness of results

The results presented here are all statistically insignificant at any standard accepted level, and no other variation of the model investigated yielded any significant impact. Taken at the weighted average impact, all effects that can be attributed to the imposition of the 1% PCN-CCyB are small relative to historical variability (except on excess capital in some models). As such, we conclude that there is no evidence that the imposition of the PCN CCyB will have a significant impact on bank level operations along dimensions that are likely to significantly impact real economy outcomes.

Had we made strong claims on the effect of the PCN CCyB in this paper, we would have presented an extensive and explicit robustness analysis. As we find no statistically significant effect in *any* variation of the models investigated, we restrict our robustness analysis to a brief discussion of the impacts of various changes to the model. The results from any of the discussed variants are available from the authors on request.

Timing of effects: In the model results above, the dates of changes to the total required CAR (and the imposition of the 1% PCN CCyB) were evaluated at *date of effect*. This ignores the reality that many of these changes are announced well in advance of the date that they take effect. Typically, the sizes of weighted average effects tend to be closer to zero when the model allows responses to changes in the required CAR before their date of effect.

VAR lag lengths and interval of growth rates: We present results with three lags in the bank-specific VARs and year-on-year growth rates. This imposes two implicit assumptions: the degree of persistence of the relevant empirical series and the persistence of economic history on bank decisions. Increasing the lag lengths assumes that bank decision depends on short run outcomes further in the past. Increasing the interval over which growth rates are calculated mechanically increases the persistence of the series in the empirical investigation. We chose year-on-year growth rates for ease of interpretation and judge three lag VARs to be sufficient to capture a reasonable representation of bank decision making time frames on short run adjustments. We find no change in significance or economic importance of any impact from either shortening or lengthening either dimension.

Modelled variables: We present three of the many models we estimated using available bank-level data. No variation of the model yielded significant results. Results from any similar model with different variables from any bank-level series collected by the Prudential Authority or any standardly available macroeconomic series is available from the authors on request.

Bibliography

Aiyar, S., Calomiris, C.W. and Wieladek, T., 2016. How does credit supply respond to monetary policy and bank minimum capital requirements? *European Economic Review*, *82*, pp.142-165.

Bichsel, R., Lambertini, L., Mukherjee, A. and Wunderli, D., 2022. The pass-through of bank capital requirements to corporate lending spreads. *Journal of Financial Stability*, *58*, Article 100910.

Borio, C. and Zhu, H., 2012. Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism? *Journal of Financial Stability*, *8*(4), pp.236-251.

Du Rand, G., Sikhosana, A. and Van Lill, D., 2025. The economic impact of changes in bank capital requirements in South Africa: A macro-econometric approach. *Financial Stability Department of the South African Reserve Bank, Topical Briefing TB/04.2/2025.*

Hamilton, J.D., 1994. *Time series analysis*. Princeton university press.

Hollander, H., 2025. The economic impact of changes in bank capital requirements in South Africa: An estimated structural macroeconomic theory approach. *Financial Stability Department of the South African Reserve Bank, Topical Briefing TB/04.3/2025.*

Merrino, S., Lesame, K. and Chondrogiannis, I., 2024. Macroprudential policy and credit allocation: evidence from South Africa. *South African Reserve Bank Working Paper Series, WP/24/09.*

Pillay, N. and Makrelov, K., 2025. The lending implications of banks holding excess capital. *South African Journal of Economics*, *93*(1), pp.27-42.

Sibande, X. and Milne, A., 2025. The impact of Basel III implementation on bank lending in South Africa. *South African Journal of Economics*, *93*(1), pp.6-26.

South Africa, 2012. R.1029 Banks Act (94/1990): Regulations relating to Banks. *Government Gazette No. 35950.*

Uhlig, H., 2005. What are the effects of monetary policy on output? Results from an agnostic identification procedure. *Journal of Monetary Economics, 52*(2), pp.381-419.

Appendix

The table below specifies all bank-level variables referred to and their source.

Variable name	**Description or *formula***	**BA form, line, column**
Required CAR	Total minimum capital adequacy ratio required by regulation.	BA700, 17, 3
Reported CAR	Capital adequacy ratio of the reporting bank	BA700, 18, 3
Excess CAR	*Reported CAR minus Required CAR*	
Retained earnings	Retained earnings including unappropriated profits, movement during the reporting period	BA700, 29, 1
Unappropriated profits	Unappropriated profits, movement during the reporting period	BA700, 30, 1
Retained earnings net	*Retained earnings minus Unappropriated profits*	
Common equity tier 1	Qualifying common equity tier 1 capital and reserve funds	BA700, 64, 1
Additional tier 1 capital	Qualifying additional tier 1 capital and reserve funds	BA700, 76, 1
Tier 2 capital	Qualifying tier 2 capital and reserve funds	BA700, 87, 1
Capital and reserves	*Common equity tier 1 plus Additional tier 1 capital plus Tier 2 capital*	BA700, 23, 3
Excess capital	Excess/ (shortfall) capital and reserve funds prior to the buffer requirements and other specified minima	BA700, 22, 3
RWA	Risk-weighted asset exposure	BA700, 6, 7
Return on assets	Return on Assets (ROA) from Du Pont analysis	BA120, 102,1
Return on equity	Return on Equity (ROE) from Du Pont analysis	BA120, 104,1
Deposit rate	Weighted average of all rates on deposits from the private sector, weighted by stock of each deposit	BA930, lines 1 to 46, columns 1 and 2

Variable name	Description or *formula*	BA form, line, column
Lending rate	Weighted average of all rates on credit assets in the private sector, weighted by stock of each credit asset	BA930, lines 47 to 85, columns 1 and 2
Credit to households secured	sum of all categories of secured credit to households (mortgages, instalment sales, leasing sales)	BA900, multiple lines, column 5
Credit to households unsecured	sum of all categories of unsecured credit to households (credit cards, overdrafts and other loans)	BA900, multiple lines, column 5
Credit to corporates secured	sum of all categories of secured credit to corporates (mortgages, instalment sales, leasing sales)	BA900, multiple lines, column 5
Credit to corporates unsecured	sum of all categories of unsecured credit to corporates (credit cards, overdrafts and other loans)	BA900, multiple lines, column 5
Credit secured	*Credit to households secured plus Credit to corporates secured*	
Credit unsecured	*Credit to households unsecured plus Credit to corporates unsecured*	