

The state-dependent impact of changes in bank capital requirements*



By Jan Hannes Lang (European Central Bank) and Dominik Menno (Deutsche Bundesbank)

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How large is the impact of changes in bank capital requirements on lending? Based on a non-linear model of the banking sector, we show that the impact of changes in bank capital requirements on lending is strongly state-dependent. When banks make profits or maintain voluntary capital buffers, the impact on lending works through a “pricing channel” which is quantitatively small: 0.1% less loans for a 1pp capital requirement increase. When banks are capital-constrained, the impact on lending works through a “quantity channel” which is very large: 10% more loans for a 1pp capital requirement reduction. Our results regarding the state-dependent impact of changes in bank capital requirements provide a theoretical justification for building up a positive countercyclical capital buffer in “normal” macro-financial environments.

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Introduction

Various empirical papers have shown that the impact of changes in bank capital requirements on lending varies a lot depending on bank conditions and the state of the macro-financial environment.¹ However, this empirical feature of state-dependence is missing from standard macro models with a banking sector, which commonly feature a constant lending response of around -1% for a 1pp increase in bank capital requirements.²

To study the state-dependent impact of changes in bank capital requirements in a structural setting, in Lang and Menno (2023) we develop a non-linear equilibrium model of the banking sector with two occasionally binding constraints. The first one is a (time-varying) regulatory capital requirement. The second one is an equity issuance constraint, or equivalently a non-negativity constraint on dividends, which implies that banks can only increase equity through retained earnings. We show that the interaction of these two occasionally binding constraints induces strong state-dependence in the impact of changes in bank capital requirements on loan supply, in line with the empirical findings.

Two distinct transmission channels of changes in bank capital requirements

In “normal” states of the world where banks maintain voluntary capital buffers³ and make sufficient profits to satisfy higher capital requirements, the impact on bank loan supply works through a “pricing channel” which is quantitatively small: loans change by around -0.1% (or even less) for a 1pp increase in capital requirements. In “bad” states of the world where banks are not able to come up with sufficient equity to satisfy capital requirements, the impact on loan supply works through a “quantity channel”, which acts like a financial accelerator and can be very large: up to 10% more loans for a capital requirement release of 1pp. This “quantity channel” will be present in states where banks have limited capital headroom above requirements and make losses.

The intuition behind our results is simple. If banks have sufficient equity to satisfy higher capital requirements, the only effect on loan quantities is through the pricing of loans (“pricing channel”): as equity funding is more costly than debt funding, the marginal cost of loans increases, which is passed on to customers via higher interest rates and this reduces equilibrium loan quantities (Figure 1 panel a). However, this “pricing channel” is extremely small, which can be illustrated with a back-of-the-envelope calculation. Under full passthrough, a 8% cost of equity, a 2% cost of debt, and a 50% bank risk-weight, funding costs and therefore bank lending rates will increase by merely 3 basis points (bps) in response to a 1pp higher capital requirement.⁴ This is just one eighth of a standard monetary policy rate hike increment! The response of loan quantities to this minimal increase in charged interest rates will depend on the interest rate semi-elasticity of loan demand, which is usually estimated to be around 3.⁵ Hence, the “pricing channel” should only reduce equilibrium loan quantities by around 0.1% for a 1pp increase in bank capital requirements.

¹ See for example the findings in Mora and Logan (2012), Carlson et al. (2013), Bridges et al. (2014), Jiménez et al. (2017), Arbatli-Saxegaard and Juelsrud (2020), De Jonghe et al. (2020), and Sivec and Volk (2021).

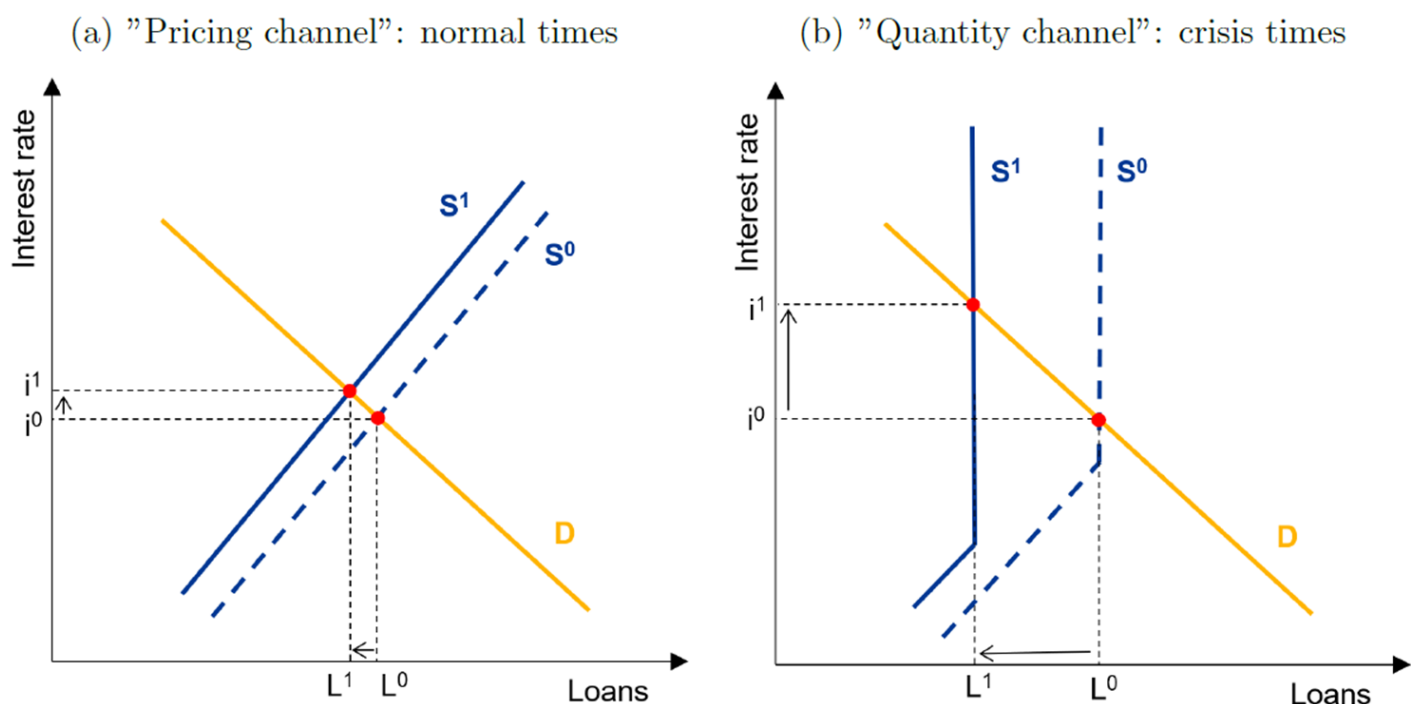
² See for example Gertler and Kiyotaki (2010), Gerali et al. (2010), Darracq Pariès et al. (2011), Clerc et al. (2015), Mendicino et al. (2018), and Table 2 in Cozzi et al. (2020).

³ We use the term “voluntary capital buffers” whenever banks have more equity funding than the minimum requirement.

⁴ Note that 0.5% more of each loan now needs to be funded by equity, which is 6pp more expensive than debt, leading to a 3 bps increase in the funding cost of a loan.

⁵ See e.g. DeFusco and Paciorek (2017), Davis et al. (2020), Best et al. (2020), or Bhutta and Ringo (2021) for evidence on the interest elasticity of mortgage credit.

Figure 1: Two distinct transmission channels of changes in bank capital requirements



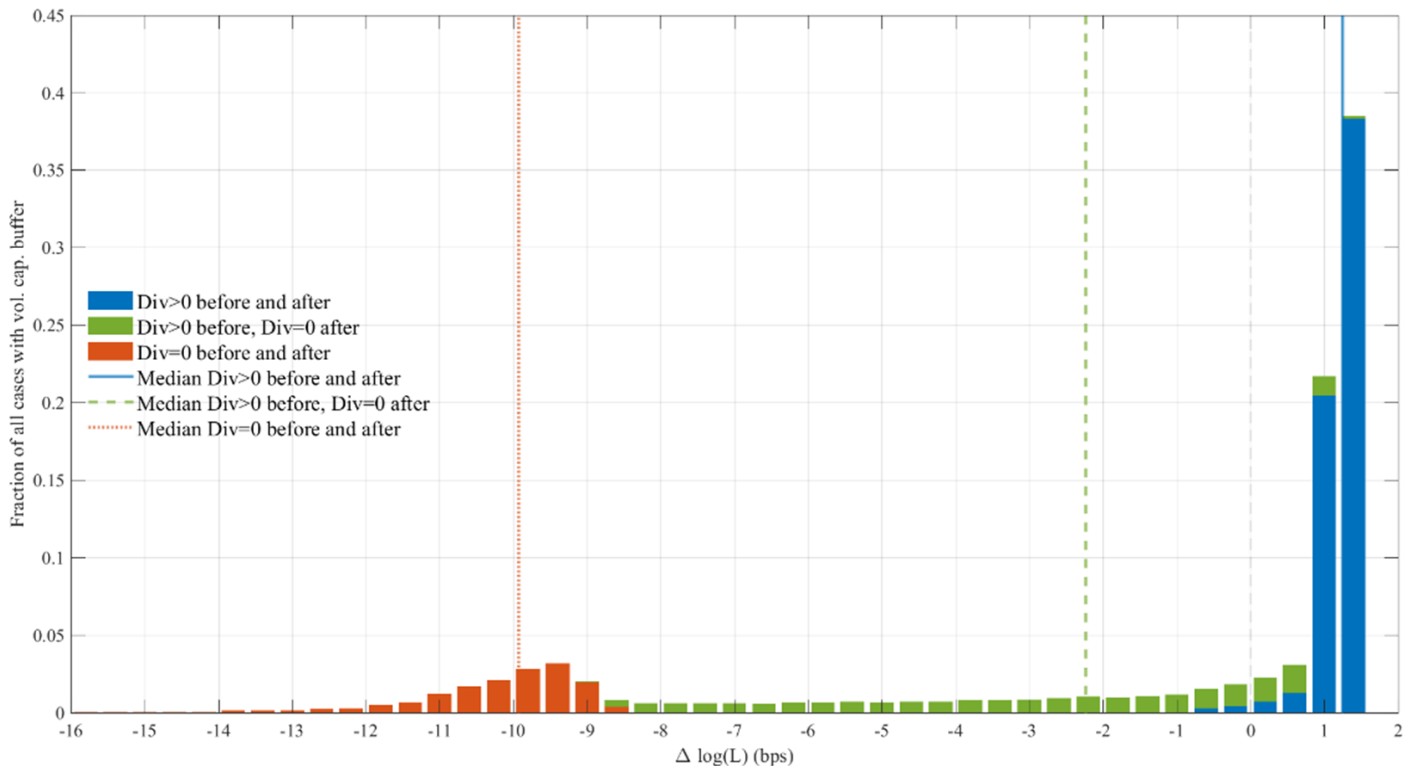
Notes: Stylised exposition. Bank equity is assumed to be more costly than bank debt. An increase in bank capital requirements therefore increases the marginal cost of loans and shifts the bank loan supply curve leftwards from S^0 to S^1 ("pricing channel"). Under the assumption that the bank cannot issue equity and the initial capital requirement already induces a hard limit on loan supply, the "quantity channel" of changing bank capital requirements comes into play.

However, if banks cannot come up with sufficient equity to satisfy higher capital requirements a second, potentially very large, "quantity channel" comes into play, which acts like a financial accelerator: the only way for banks to meet higher capital requirements is through capping the quantity of loans (Figure 1 panel b). Because banks are highly leveraged, adjustments via the "quantity channel" will be large, which can again be illustrated with a back-of-the-envelope calculation. Consider a bank with a 10% capital requirement, no voluntary capital buffers, and current period profits of zero. If the capital requirement is increased by 1pp to 11%, the only way for the bank to meet this higher requirement is through reducing loans by 9.1%, as this will "free-up" just enough equity to meet the higher requirement.⁶ Capital requirement releases can therefore provide strong support to bank lending in states of the world where the "quantity channel" is active.

Limited impact of implementing higher capital requirements in "normal" times

In our paper we use a calibrated model version for the euro area to provide further insights into the magnitude of the "pricing channel". As shown in Figure 2, whenever banks maintain voluntary capital buffers and have enough profits to pay dividends before and after an increase in capital requirements from 10% to 11%, the simulated "pricing channel" impact on lending is close to zero (blue bars). When banks maintain voluntary capital buffers but do not pay dividends before and after the requirement change because profitability is not sufficient, the impact on lending varies mostly between -8.5 and -11.5 bps, which is still small (red bars). These results suggest that the gradual build-up of regulatory capital buffers in "normal" states of the world, where banks maintain voluntary capital buffers and make positive profits, should only have a minimal impact on bank lending, and therefore have low economic costs.

⁶The old and new capital requirement hold with equality $R_j = E_j / (\omega L_j)$ for $j = \text{old, new}$; where ω is the risk-weight. As equity is fixed ($E_{\text{new}} = E_{\text{old}}$) we know that $L_{\text{new}}/L_{\text{old}} = R_{\text{old}}/R_{\text{new}} = 0.10/0.11 = 0.909$, which implies a 9.1% reduction in loans.

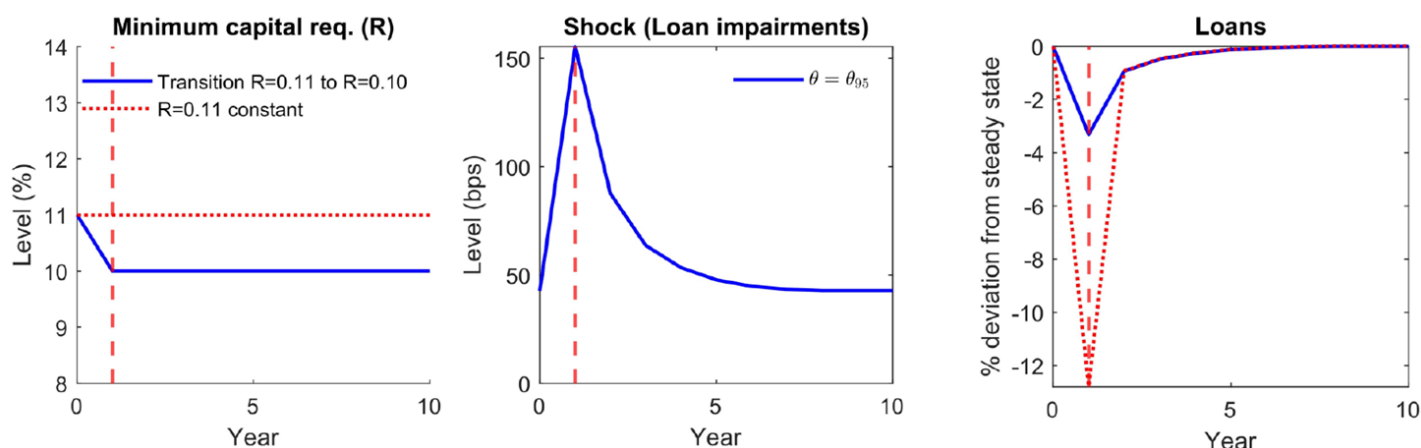
Figure 2: Low “pricing channel” impact on lending when banks maintain voluntary capital buffers

Notes: We simulate our calibrated benchmark economy with a 10% capital requirement for 200,000 periods. We then select all simulated states where banks maintain voluntary capital buffers. We then apply the policy functions for the economy with a 11% capital requirement to these states and only keep simulated states where banks again maintain voluntary capital buffers. For this set of simulated states we compare the loan policies under the two different capital requirements and produce the chart. The results provide a simulated distribution of the “pricing channel” impact on lending when banks maintain voluntary capital buffers.

Large supporting impact of releasing capital requirements in “bad” times

We also use the calibrated model version for the euro area to study an unanticipated 1pp “release” of capital requirements in “bad” states where banks are hit by a relatively large negative credit risk shock so that they make considerable losses. Compared to an economy with a constant capital requirement, equilibrium loans drop by 9pp less, as the 1pp requirement release leaves banks additional capital headroom to absorb their losses with the equity that is freed-up (See Figure 3). Hence, the “quantity channel” is muted and banks deleverage less compared to an economy without the release. Our analysis shows that capital requirement releases are most effective in supporting lending in states of the world where bank losses materialise and both the equity issuance constraint and the capital requirement constraint are binding. The release is ineffective in states of the world where banks face adverse shocks but still make positive profits.

Figure 3: High “quantity channel” impact on lending when banks become capital constrained

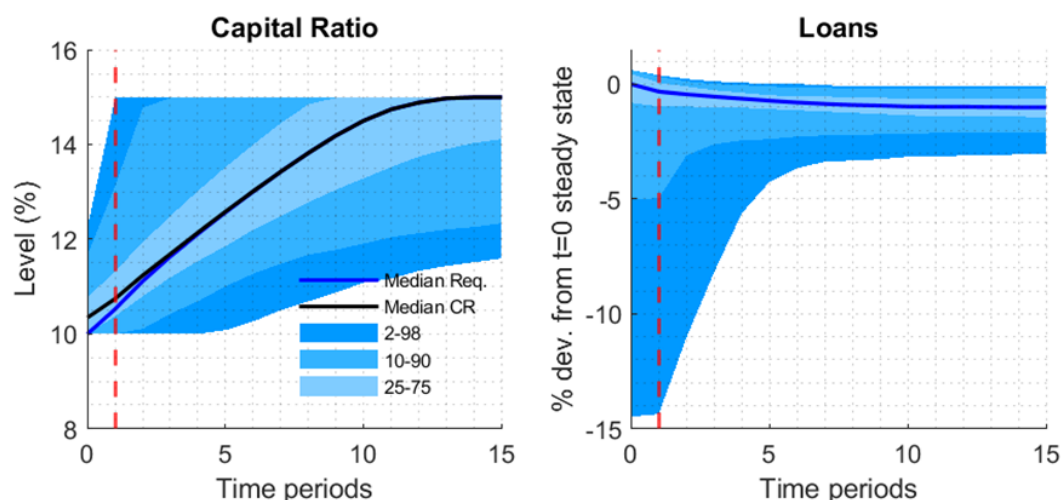


Notes: Red dotted lines show results for a model with a constant 11% capital requirement. Blue lines show results for a model with a 1pp unanticipated decrease of the capital requirement in period $t = 1$. The loan impairment shock plotted in the middle panel is the same for both economies. When the shock hits, banks make losses that exceed their voluntary capital buffers so that they become capital constrained.

A simple rule for time-varying capital requirements reduces tail risk to loan supply

We go on to show analytically and through model simulations that the “quantity channel” can be shut-off by a policy rule which ensures that capital requirements are always lower or equal to the current capital ratio plus the return on risk-weighted assets, while never turning negative. Such a policy rule implies that gradual increases in capital requirements should start as soon as the economy enters “normal” states of the world, where banks make positive profits. This is because many periods of gradual capital requirement increases are needed to ensure that requirement releases in “bad” states can be sufficiently large to allow banks to take losses without deleveraging and still be able to meet a positive capital requirement. Such a “gradual but early” build-up rule will impose limited economic costs during the build-up phase, while making sure that there is enough time to build up a sufficient level of releasable capital buffers before a bad shock hits the economy. Our model simulations show that such a simple state-dependent capital requirement rule is able to substantially reduce tail risk to loan supply, while on average loan supply is not reduced much compared to an economy with a constant (and lower) capital requirement (See Figure 4).

Figure 4: Simulations of transition paths from constant to state-dependent capital requirements



Notes: Before period 1 a constant capital requirement of 10% is in place. In period 1 a state-dependent capital requirement rule is implemented that varies capital requirements between 10% and 15% depending on capital headroom and profitability of the banking system. Solid lines show median responses over 100,000 simulated economies. The blue shaded areas show the 2%-98%, 10%-90%, and 25%-75% percentile ranges across the simulated economies. Loans are expressed in %-deviation from the steady state of the economy with a constant 10% capital requirement.

Conclusion

Our findings regarding the state-dependent impact of changes in bank capital requirements have important policy implications. In particular, our results provide a theoretical justification for building up a positive countercyclical capital buffer (CCyB) in “normal” macro-financial environments, i.e. before clear signs of excessive credit growth emerge.⁷ Such a policy strategy will impose limited economic costs during the buffer build-up phase, while minimizing the probability that a bad shock hits the economy before a sufficient level of regulatory capital buffers has been built up that can be released to support bank loan supply. In other words, such a policy strategy can create insurance at low economic costs against systemic risks that are inherently difficult to identify and measure. ■

⁷ A number of European countries (e.g. UK, LT, IE, EE, NL, SE, CY) have recently moved to CCyB frameworks where buffer build-up starts during “normal” macro-financial conditions, when systemic risk is neither elevated nor subdued. This policy strategy deviates somewhat from the purely risk-based Basel III CCyB build-up rule, where capital buffers should be increased commensurate with the level of cyclical systemic risk (see Basel Committee on Banking Supervision (2010) for details).

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About the authors

Jan Hannes Lang is a Team Lead in the Macroprudential Policy Division of the European Central Bank. He holds a Ph.D. in Economics from the European University Institute and his research interests include financial crises, macroprudential policy, the measurement of cyclical systemic risk, growth-at-risk applications, and the impact of uncertainty shocks on the real economy.

Dominik Menno is an Economist in the Financial Stability Division of the Deutsche Bundesbank. He holds a Ph.D. in Economics from the European University Institute and his research interests are Quantitative Macroeconomics, Financial Frictions and the Macroeconomy, Financial Stability and Macroprudential Policy, and International Macroeconomics.

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SUERF Secretariat
c/o OeNB
Otto-Wagner-Platz 3
A-1090 Vienna, Austria
Phone: +43-1-40420-7206
www.suerf.org • suerf@oenb.at