Bank capital (requirements) and credit supply: Evidence from pillar 2 decisions

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Bank Capital (Requirements) and Credit Supply: evidence from Pillar 2 decisions*

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Abstract

We analyze how time-varying bank-specific capital requirements affect banks' balance sheet adjustments as well as bank lending to the non-financial corporate sector. To do so, we relate Pillar 2 capital requirements to bank balance sheet data, a fully documented corporate credit register and firm balance sheet data. Our analysis consists of three components. First, we examine how time-varying bank-specific capital requirements affect banks' balance sheet composition. Subsequently, we investigate how capital requirements affect the supply of bank credit to the corporate sector, both on the intensive and extensive margin, as well as for different types of credit. Finally, we document how bank characteristics, firm characteristics and the stance of monetary policy impact the relationship between bank capital requirements and credit supply.

Keywords: Capital requirements, credit supply, credit register, bank, regulation

JEL classification: G01, G21, G28, L5

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1 Introduction

After many years of financial crisis in the Western economies a robust consensus among policy-makers has emerged that financial regulation needs a macroprudential dimension[1] on top of an improved microprudential framework. A prime tool of such micro -and macroprudential regulation are time-varying bank capital requirements.[2] Higher requirements on banks' own funds can foster bank stability but can also cool credit-led booms, either because banks internalize more of the potential social costs of credit defaults (through a reduction in moral hazard by having more "skin in the game") or charge a higher loan rate due to the higher cost of bank capital (Morrison and White (2005), Adrian and Shin (2010), Shleifer and Vishny (2010), Adrian and Boyarchenko (2012), Jeanne and Korinek (2013), Malherbe (2015)). Indeed, the tax benefits of debt finance and asymmetric information about banks' conditions and prospects imply that raising external equity finance may be more costly for banks than debt finance (Tirole (2006), Freixas and Rochet (2008), Hanson et al. (2011), Aiyar et al. (2014a), Gornall and Strebulaev (2013)).

Despite the many research efforts now underway by academics to help develop macroprudential policies (e.g., Galati and Moessner (2013)), *no* empirical study so far has *comprehensively* estimated the joint impact of both *time-varying, individual* bank *required* and *actual* capital ratios on bank balance sheets, the cost of bank credit and funding, and the supply of bank credit to firms, and that under different monetary conditions and across firm and bank characteristics.

This paper aims to fill this void by analyzing a series of policy experiments with individual bank capital requirements in Belgium.[3] From the adoption of the Twin Peaks supervisory model in April 2011 until the start of the Single Supervisory Mechanism in November 2014, the microprudential supervision of banks active in Belgium was the responsibility of the National Bank of Belgium (NBB). And one of its main microprudential instruments to maintain or achieve financial stability

[1] These macroprudential policies aim to boost the resilience of the financial system and to lessen the negative externalities from the financial to the macro real sector (e.g., Caruana (2014), Drehmann et al. (2010)).

[2] Indeed, under the new international regulatory framework for banks -Basel III- regulators agreed to vary minimum capital requirements over the cycle, by instituting pro-cyclical bank capital requirements. In this terminology, procyclical bank capital requirements generate countercyclical capital buffers that deal with the procyclicality of the financial system. Boosting equity in booms provides additional (counter-cyclical) buffers in downturns that help mitigate credit crunches.

[3] We customarily designate these changes in individual bank required capital ratios as "experiments", though micro-policy shocks as these are never (intentionally) randomized and banks dealing with different types of borrowers may be differentially affected. Therefore, both these confidential shocks and comprehensive micro data are necessary for identification.

was the bank-specific capital requirement (Pillar 2 capital requirement of Basel II) communicated directly to the bank but otherwise kept confidential. The resultant series of individual bank policy experiments coupled with comprehensive bank-, firm-, and loan-level data provides an almost ideal setting for the identification and comprehensive assessment of their impact.

In the *first part* of our analysis, and using bank-level data, we find that increases in required and especially in the actual bank capital ratios shrink banks' balance sheets, mortgage and term lending, holding of securities, deposit collecting while spurring interbank lending and borrowing. Hence the shrinking of balance sheets goes hand in hand with compositional changes away from assets that are costly to hold in terms of capital charges. We also find corresponding cost of credit effects. In the *second part* of our analysis, and using loan-level data, we find that especially the joint increase in the required and actual capital leads to a strong contraction in the supply of credit to firms, on all margins of credit granting and for both multiple-bank and single-bank firms. The fact that higher capital requirements lead to lower credit supply seems to indicate that equity capital costs for banks are not negligible, challenging the views of Admati et al. (2013) and Admati and Hellwig (2013). Therefore, in the *final part* of our analysis, mobilizing all aforementioned datasets, we inspect whether or not the impact of required capital on credit supply varies with bank and firm characteristics. In particular, we shed light on which frictions or costs affect raising actual equity as well as which firms will be affected more by banks' goal to reduce risk-weighted assets in response to increased capital requirements. We find that especially smaller, riskier, or less profitable banks reduce credit most and that the resultant credit contraction mostly affects large, risky and low borrowing cost firms.

Differences with the extant bank capital literature are many. We comprehensively study policy experiments that change individual required and actual bank capital ratios and the workings of their capital buffers,[4] and their impact on bank balance sheets and credit granting, depending on monetary conditions and bank and firm characteristics. In terms of our individual bank policy experiments we are closest to Aiyar et al. (2014), Aiyar et al. (2014a), Aiyar et al. (2014b), Bridges et al. (2014) and Mésonnier and Monks (2015) who similarly study the impact of changes in required capital ratios on bank balance sheets. But in contrast to these papers we can also study the bank-firm level granting of credit using a credit register. In this respect we follow Jimenez et al. (2016)

[4] In contrast, Peek and Rosengren (2000) and Puri et al. (2011), among others, exploit the negative shocks to the profitability of multinational banks that occur abroad and that may affect actual bank capital.

who use a credit register to study the impact on the supply of credit of the singular introduction and subsequent modifications of one macro-prudential policy, i.e., the dynamic provisioning in Spain, which affected all banks concurrently. Fraisse et al. (2015) similarly focus on a change in capital requirements that affected all banks in France during the most recent crisis, while Auer and Ongena (2016) study the compositional changes in banks' supply of credit using variation in their holdings of residential mortgages on which extra capital requirements were uniformly imposed by the Countercyclical Capital Buffer (CCB) introduced in Switzerland in 2012. Finally, Célérier et al. (2016) study the effect of tax reforms abroad (in particular in Italy and Belgium) and find that the resulting decrease in the cost of equity leads banks to raise their equity ratio, and to concurrently expand their balance sheet by increasing the amount of credit supplied in Germany. But by studying many changes in individual bank capital ratios over time we can better identify the interactive impact of changes in capital ratios and monetary, firm and bank conditions.

Following in the footsteps of the previously cited four papers, we also identify the supply of credit with a difference-in-difference analysis of loan-level data. Bernanke and Lown (1991), Berger and Udell (1994), Berrospide and Edge (2010), among many others, rely on a panel, VAR or matching analysis of bank-level data, while Hubbard et al. (2002), Ashcraft (2006), Mora and Logan (2012) and Berger and Bouwman (2013), among others, focus solely on bank-level credit growth or cost. Finally, we analyze not only the average effect on credit but also the differences that occur across banks and firms, in particular with respect to their size, risk-taking and profitability.

The rest of the paper proceeds as follows. Section 2 discusses the Pillar 2 capital requirements. The next three sections combine the estimated specifications and the results. Section 3 starts with the impact on bank balance sheets, Section 4 deals with the impact on the supply of credit to firms, while Section 5 assesses the heterogeneity of the effects across firms and banks. Section 6 concludes.

2 Pillar 2 capital requirements

We focus on an interesting period between the adoption of the Twin Peaks supervisory model in April 2011 and the start of the Single Supervisory Mechanism in November 2014 when the microprudential supervision of banks active in Belgium is the responsibility of the National Bank of

Belgium (NBB).[5] Hence, during that time period, the micro -and macro prudential supervision of the Belgian financial sector is integrated within one single institution, with the aim to maintain and improve both the micro -and macroeconomic resilience. One of the microprudential instruments in the NBB's toolbox to maintain or achieve financial stability are bank-specific capital requirements (Pillar 2 capital requirements of Basel II). The Pillar 2 regulatory capital requirements are the outcome of a (usually) yearly Supervisory Review and Evaluation Procedure (henceforth the evaluation process) of individual banks operating in Belgium. The evaluation process is a continuous procedure that results in a CET1 capital requirement that is privately communicated to the bank by the end of a given year and becomes effective and binding as of January 1st of the following year. Figure 1 provides a graphical presentation of the evaluation process that involves multiple inputs to assess the risk profile of an institution and to determine the appropriate supervisory actions.[6]

Insert Figure 1 around here

Inputs in the evaluation process are, among other things, internal bank performance reports, reports of external and internal auditors, the credit institution's Internal Capital Adequacy Assessment Process (ICAAP); as well as information obtained via contacts with the institutions and other supervisors (via so-called supervisory colleges). Quantitative and qualitative assessment of risks as well as their management by institutions are an essential component of the SREP. The structured analysis of risks under the SREP is provided by the scorecarding system, covering both a quantitative assessment of the level of risks and qualitative aspects of the quality of management control. Together with the review of the ICAAP and stress tests, the output of the scorecarding process feeds into the overall risk assessment of the institution and forms the basis on which supervisory actions will be determined and planned. Through this process, the final capital decision, which must be approved by the NBB board, takes into consideration a full range of risks. As micro-prudential

[5] Prior to April 2011, supervision is one of the responsibilities of the Commission for Banking, Finance and Insurance. Since the introduction of the SSM, the supervision of the significant banks is centralized at the European Central Bank, whereas that of less significant institutions is still the responsibility of the NBB.

[6] The International Monetary Fund writes in detail, in its 2013 FSAP, on the compliance of the SREP with the Basel Core Principles for effective banking supervision. In particular, they mention that "the NBB's approach to Pillar 2 is well developed using a scorecard as the primary tool for risk analysis, taking into account qualitative and quantitative measures. At least on an annual basis, the NBB determines the minimum capital adequacy requirements for all banks on a forward looking basis. The SREP and ICAAP analysis are important inputs into the process and, if available, outputs from banks' economic capital models. Stress testing is also taken into account as to ascertain whether the bank is able to maintain capital buffers under stress conditions." (see IMF Country Report No. 13/133).

supervisor, the NBB was -through the evaluation process- responsible for setting the pillar 2 capital requirements for the banks under its supervision. Till 2014 this involved all banks with a Belgian banking license, which are both domestic banks as well as subsidiaries of foreign banks operating in Belgium. On the basis of the evaluation process, the NBB sets capital requirements for all relevant legal entities including both capital requirements at the group level as well as at the level of the individual banks.[7]

From the microprudential supervisor, we obtain information on both the required capital ratio as well as the actual capital ratio at the individual bank level. More specifically, we focus in this paper on the following two variables. First, *Previous quarter actual capital ratio*$_{b,t-1}$ captures the ratio of Tier 1 common equity (CET1) to risk-weighted assets. It captures the amount of regulatory capital to risk-weighted assets at the beginning of the quarter over which loan growth is measured. Second, *Previous quarter required capital ratio*$_{b,t-1}$ is the required capital ratio (Pillar 2 capital requirement). The required capital ratio is communicated to the banks in the last quarter of the preceding year and is binding for the entire upcoming year. Hence, for all quarters in a given year Y, the variable *Previous quarter required capital ratio*$_{b,t-1}$ coincides with the announced required ratio in the last quarter of year Y-1. The difference between these two measures is the capital buffer.

Summary statistics on these measures are provided in Table 1. Over the sample period, the average required capital ratio is 11.2% of risk-weighted assets (RWA), with a standard deviation of 2%. The actual risk-weighted capital ratio has a mean of 14.9% of and a standard deviation of 3.7%. Hence, both the mean and the dispersion in actual capital ratios are higher than those of the required capital ratios. The average capital buffer, the difference between the actual and required capital ratio, equals 3.7% of RWA, indicating that the average bank has a relatively large cushion. The range of the variation in (required) capital across banks corresponds with the statistics reported by Aiyar et al. (2014a) who have information on the UK for the period 1998-2007). Using a longer time span and a larger sample of banks, they find that the minimum required capital ratio was 8%,

[7] With the introduction of the SSM and the transfer of the micro-prudential supervision of the significant institutions to ECB in November 2014, the evaluation process became a common exercise, co-ordinated and controlled by the ECB at the level of the euro area for the significant institutions (SIs). The evaluation process for the less significant institutions (LSIs), remains under the supervision of the NBB and the setting of capital requirements for these institutions is still controlled by the NBB. Our sample period is not affected by this change as it ends in 2015, implying that the last capital requirements we use in the analysis are still set by the NBB in December 2014, rather than the SSM/ECB.

its standard deviation was 2.2%, and its maximum was 23% of risk-weighted assets. In panel B of Table 1, we report summary statistics on some bank characteristics for the banks for which we have the regulatory capital ratio.

The bank capital requirements are set for domestic banks as well as for subsidiaries of foreign banks. The NBB has no supervisory authority over the branches of foreign banks and hence these are not included in our sample. In Table 2, we provide information on the number of borrowers, the total amount of credit granted and aggregate total bank assets for the group of banks for which we do and do not have information on regulatory capital. We also report the total number of banks in each group. For three banks, the information on required capital is not available for the first year of our analysis. While the number of banks in each group is similar, note, however, that the sample of banks with regulatory data covers 98% of all firm-bank relationships, 97% of the total volume of credit granted and 95% of total banking assets in Belgium. Note also that the share of corporate lending in total assets is lower in the group of foreign bank branches (no Pillar 2 data available) compared to the group of Belgian banks or foreign subsidiaries (for which Pillar 2 requirements are available).

3 Regulatory capital and balance sheet effects

In practice, banks response to increased capital requirements can be threefold: (i) asset liquidation (holding equity constant), (ii) recapitalization and reducing debt (holding bank size constant), or (iii) asset expansion (raising equity and expanding the balance sheet). However, according to Admati et al. (2013), one of the capital requirement fallacies is the statement that "Increased capital requirements force banks to operate at a suboptimal scale and to restrict valuable lending and/or deposit taking." Their view is that in terms of simple balance sheet mechanics, the notion that increased equity capital requirements force banks to reduce deposits and/or lending activities is simply false. If higher capital requirements actually lead banks to reduce lending activities, it must be that some costs or certain frictions lead the bank to pass up on otherwise profitable loans (Admati et al. (2013)).

In this section, we empirically test these statements. This first, exploratory analysis aims at documenting how regulatory capital may affect the composition of the balance sheet. In subsections

3.1 and 3.2, we present the methodology and results. In subsection 3.3, we discuss the economic effects and present some graphical evidence on the balance sheet effects in a similar fashion to Figure 1 in Admati et al. (2013). In a final subsection 3.4, we provide some evidence on the extent to which increased capital requirements affect the average price or cost of specific balance sheet items. Note that, we are for the moment only exploiting bank-level data coming from two sources. Balance sheet and income statement data come from (confidential) filings with the National Bank of Belgium (i.e., Schema A), which are linked with a database containing information on regulatory capital holdings and requirements.

3.1 Impact on the balance sheet composition: empirical setup

The empirical specification used to document the relationship between (required) regulatory capital and bank balance sheet effects is the following:

$$\begin{aligned}\text{Growth (Quarterly) of } \mathrm{X}_{b,t} = {} & \beta_1 * \text{Actual Capital Ratio}_{b,t-1} \\ & + \beta_2 * \text{Previous year Actual Capital Ratio}_{b,t-4} \\ & + \beta_3 * \text{Required capital ratio}_{b,t-1} \\ & + \beta_4 * \text{Previous year Required Capital Ratio}_{b,t-4} \\ & + \gamma * \text{Bank Controls}_{b,t-1} + \nu_b + \nu_t + \epsilon_{b,t} \qquad (1)\end{aligned}$$

The dependent variable, Growth (Quarterly) of $\mathrm{X}_{b,t}$, is the quarterly percentage change in a specific aggregate balance sheet item. We relate quarterly growth rates in six broad asset categories and four broad liability categories to lagged actual and required regulatory capital ratios. The asset classes we consider are: interbank assets, mortgages, term loans, aggregate credit, securities and total assets. Regarding banks' funding sources, we look at quarterly growth in interbank liabilities, deposits, other debt and equity.

There are four independent variables of interest based on the regulatory capital data. They are: *Required capital ratio*$_{b,t-1}$, *Actual Capital Ratio*$_{b,t-1}$, *Previous year Required Capital Ratio*$_{b,t-4}$ and *Previous year Actual Capital Ratio*$_{b,t-4}$. Next to the one quarter lagged (required) capital ratio, we also include the previous year required capital ratio, *Previous year Required Capital Ratio*$_{b,t-4}$, as

the impact of capital requirements may take time to have effect. *Previous year actual capital ratio*$_{b,t-4}$ is the one year lagged actual capital ratio, which is included in the specification for reasons of analogy with required capital.

Next to individual significance of coefficients, we are also interested in three different joint hypotheses. First, the effect of an increase in required capital, *ceteris paribus* (and hence holding constant the actual capital ratio), is reflected in coefficient β_3. Such a situation, in which a bank's actual capital ratio does not react to an increase in requirements leads to a reduction in the capital buffer. The effect on credit supply if banks maintain their buffer in response to increased capital requirements is given by $\beta_1 + \beta_3$. Hence, we also test whether the impact of changes in regulatory capital requirements, when banks hold their buffer constant, is significantly different from zero. If a bank only partially adjusts its actual capital ratio in response to changes in the required capital ratio, then this implies a response in the interval $[\beta_3, \beta_1 + \beta_3]$. Second, we test whether or not the sum of the coefficients on the actual and the previous year actual capital ratio is significantly different from zero. Third, we also test whether or not the sum of the coefficients on the required and the previous year required capital ratio is significantly different from zero.

The vector Bank Controls$_{b,t-1}$ consists of the following variables: bank size, loans to total assets ratio, loans-to-deposits ratio, off balance sheet to total assets ratio, share of demand and savings deposits in total deposits, quarterly return on equity, provisions to total loans, and the share of interest income in total income, which are all lagged with one quarter to mitigate reverse causality concerns. Summary statistics on these variables are reported in Table 1. ν_b is a bank fixed effect and ν_t is a time fixed effect. Among other things, the former is a crude proxy for time-invariant heterogeneity in banks' borrower pools, which may create heterogeneous demand for that asset type; whereas the latter accounts for general macro-economic factors

3.2 Impact on the balance sheet composition: estimation results

The results on assets are reported in Table 4, whereas those on liabilities are in Table 5. In Table 4, we report the regression results in three panels. The upper panel pools together domestic and foreign assets. In the middle panel, we only focus on growth rates in domestic assets, whereas in the lower panel C we only look at growth in foreign assets. For liabilities, we cannot distinguish between domestic and foreign sources. In both tables, the three last lines in each panel report

p-values of three different, aforementioned joint hypotheses tests.

Insert Tables 4 and 5 around here

The results in Tables 4 and 5 present mixed evidence on the impact of changes in the (required) capital ratio on the banks' balance sheet. We find scattered evidence across combinations of either actual capital ratios and required capital ratios on the one hand, and asset and liability categories on the other hand. Overall the results suggest that the relationships are negative, at least whenever a coefficient is statistically significantly different from zero (except for growth in interbank assets and liabilities). Looking at the results in more detail, we find, first of all, for the asset breakdown that changes in the actual capital ratio (either these of the previous quarter or the previous year) tend to be followed by decreasing growth in mortgage and term loans as well as decreasing growth in the securities held on the asset side of the balance sheet. These effects are statistically significant at the 10% level with p-values for the joint test of respectively 0.01, 0.10 and 0.06. While the effects of the one-quarter and one-year lagged capital ratio on total assets are individually not significant, their joint effect is nearly statistically significant (p-value of 0.12). However, changes in capital ratios also involve composition effects in the domestic and foreign activities. While for domestic assets, the impact of changes the actual capital ratio is primarily confined to mortgage credit, foreign assets are affected more broadly and strongly; with significant impacts measured for term loans (p-value of 0.03), overall foreign credit (p-value of 0.02), foreign securities (p-value 0.04) and the total of foreign assets (p-value of 0.07). These results align with the observed trends during the financial crisis consisting of a re-orientation of bank activities towards the home market and a de-risking of the balance sheet observed in response to the financial crisis.

The impact of changes in the capital ratio seems more specific at the liabilities side of the balance sheet. The strongest (negative) impact of changes in the actual capital ratio are observed for the banks' equity holding and financing through deposits. The results may suggest some targeting of the actual capital ratio by means of equity adjustment. Specifically, the estimates imply that an increase in the actual capital ratio tends to be followed by a statistically and economically significant slow-down in growth in equity and funding deposits. A one percentage point increase in the actual capital ratio triggers a slow-down in (quarterly) growth of approximately 0.5% for equity and almost 0.9% for funding deposits.[8]

[8] Gambacorta and Shin (2016) find that safer banks (lower leverage ratios) attract more deposit funding. The contrast with our results may be due to differences in measure (leverage ratio versus risk-weighted capital ratios), specification or sample.

3.3 Impact on the balance sheet composition: economic effects

The previous subsection documented that changes in actual and required capital ratios affect certain individual balance sheet items in a statistical sense. To analyze and summarize the economic impact, we resort to a small simulated scenario analysis. We summarize the findings that emanate from Tables 4 and 5 by assessing the changes that occur in the balance sheet of a representative (median) bank in different scenarios. The outcome of the different scenarios are reported in Figure 2. The upper left balance sheet is the starting point, where the items in bold are taken directly from the summary statistics in Table 1, while the other items are imputed. We take the median bank to have a size that is equal to 100 for easier comparisons below. We now take the estimates in Table 4 Panel A and Table 5 and apply them to the balance sheet items of the median bank. However, a few qualifications are in order. First, few individual estimated coefficients are actually statistically significant (though their sums more often are). Second, as the estimated regressions are individually linear it is possible that the "rest categories" (like Other Credit) turn negative under the imposed summing-up constraints. We start with an increase in the required capital ratio by one standard deviation (see Table 1), i.e., 2 percentage points (pp) and analyze the effect of this increase on the balance sheet composition the following quarter. We report the results in the lower left balance sheet. For now we leave the actual capital ratio unchanged thereby reducing the capital buffer (i.e., the actual minus required capital ratio) by 2 pp. According to the estimates reported in Table 4 Panel A and Table 5 the impact of this increase in the required capital ratio on the size of the bank is fairly limited, i.e., the bank shrinks by only 0.5 pp. But there are substantial compositional effects. Interbank credit granted for example increases by 1.2 pp, while both mortgages and term loans shrink by around 0.4 pp. On the liability side similar shifts occur. Interbank credit received increases by more than 1.2 pp, while deposits shrink by more than 5 pp.

Next we turn to an experiment whereby we increase both the required and the actual capital ratio by one standard deviation, i.e., 2 and 4 pp, respectively, thereby increasing the capital buffer by 2 pp. The outcome of this scenario is reported in the lower right balance sheet.[9] Again, we look at the resulting balance sheet the following quarter. Compared to the initial position (at 100) the bank now shrinks considerably, i.e., by more than 3.3 pp. Though not entirely surprisingly, and

[9] In the upper right balance sheet, we report the results of an intermediate scenario where required and actual capital ratios increase both with 2 pp, hence maintaining a constant capital buffer. The impact of this scenario sits in between the two other scenarios and is therefore left undiscussed.

observed in others studies, increasing the actual capital ratio is mostly accomplished by shrinking the balance sheet. On the asset side, interbank credit granted increases by almost 2 pp, while both mortgages and term loans shrink by around 1.3 pp, and securities held by almost 1.7 pp. On the liability side similar shifts occur. Interbank credit received increases by more than 1.4 pp, while deposits shrink by more than 10 pp. All in all, increases in the required and especially in the actual capital ratios shrink the bank's balance sheet and give rise to more interbank lending and borrowing and substantially less granting of mortgage and term loans, and holding of securities, and on the liability side less deposit collection. So shrinking of banks' balance sheets goes hand in hand with compositional changes away from assets that are costly to hold in terms of capital charges.

3.4 Impact on cost of funds and return on investment

Finally, we analyze how (required) regulatory capital ratios affect the return (cost) on (of) various assets (liabilities). To that end, we divide the revenues (expenses) accumulated over a quarter by the average stock of assets (liabilities) over that quarter. We use the same setup as in the two previous subsections, except for a different dependent variable. The results are reported in Table 6.

Insert Table 6 around here

The results suggest only a limited pricing impact of the required and actual capital ratio - both for assets and liabilities. On the asset side, the implicit lending rate of credit decreases as the capital ratio increases, especially for mortgage credit whereas interest rates charged on interbank claims tend to increase. An increase in the capital ratio requirement of 1 percentage point leads to a reduction in the lending rate for total (mortgage) credit of 10 (25) basis points, which in case that the bank decides to maintain the existing capital buffer (hence increasing by the same size the actual capital ratio) is further decreased by an additional 9 (26) basis points. Term loans by contrast do not seem to be affected.

The hypothesis that increases in capital ratios would result in lower funding costs is not fully confirmed (in this sample) given the ambiguous pricing impacts across funding sources. A negative, but insignificant, coefficient on the required capital ratio is found for the implicit interest rate on deposits. The cost of other debt seems to be negatively impacted by required capital, both in a

statistically and economically significant way (but we find no significant effect of the actual capital ratio). A 1 percentage point increase in the capital ratio would result in a decrease of about 29 basis points in the cost of debt. For interbank liabilities, however, we find strong evidence of a positive impact on the cost of funding for most measures of the capital ratio (actual or required), which seems however a priori harder to interpret.

4 Regulatory capital and corporate credit supply

The aggregate balance sheet data analysis shows effects of (required) capital changes on bank activities. While the results are intuitive and interesting, the setup is not necessarily perfect. First, we examine broad asset class and hence ignore the scope for heterogeneity within such an asset class for a given bank (a bank can substitute risky securities for safe securities) or between banks (clientele effects). Moreover, an analysis with aggregate data may suffer from other biases, such as imperfectly controlling for unobserved firm demand or borrower quality leading to biased estimates. To mitigate these concerns, we now turn to more granular micro-data to assess whether required capital increases constrain credit supply.[10] More specifically, we make use of information from the corporate credit register maintained by the National Bank of Belgium. The corporate credit register contains information on credit granted by credit institutions to legal entities (i.e., enterprises). A credit institution needs to provide information to the credit register on a monthly basis on all debtors. We extract all available credit data at the bank-firm-month level but exclude firms operating in the financial or insurance sector, public administration, education, household activities or activities of extraterritorial entities.

4.1 Empirical setup

In this section, we use an empirical specification akin to the one used in the aggregate balance sheet analysis. However, we now use much more detailed data and focus exclusively on corporate credit. More specifically, we now use as dependent variables bank credit variables that vary at the bank-firm-quarter level. Importantly, we define credit as the total amount of authorized credit.

[10]The cost of turning to micro-data is, in our case, that we can focus only on the effect on one asset class, which is domestic corporate lending.

For credit lines this implies that we look at the total amount of credit that is available, and not at the portion that is taken up by the borrower. In this way, we make sure that any changes in credit are not driven by a sudden draw down of a credit line by a borrower. Using the information on authorized credit from the credit register, we calculate four different quarterly credit growth measures, Credit Growth (Quarterly)$_{b,f,t}$, capturing both the intensive and extensive margins of credit growth.[11] First of all, we compute quarterly authorized credit growth at the bank-firm level (Credit Growth$_{bft}$). The average growth in authorized credit granted is slightly negative at -2.39%, mainly due to amortizations. There is substantial cross-sectional variation, with a standard deviation of 22.2%, indicating that some firms witness substantial drops in their credit exposures (due to outright cuts or lower likelihood of renewals or roll-overs), whereas other bank-firm exposures grow substantially. However, less than 10% of the bank-firm credit exposures strictly increase over the course of a quarter. Second, we create a dummy (Large drop in credit$_{bft}$) which equals one if the firm's credit growth is in the lowest quartile of credit growth of all the bank-firm observations in the sample. The quarterly growth rate of authorized credit at the 25th percentile is -6.15%, whereas the average in the lowest quartile is -24%. This variable proxies for authorized credit volumes that have been reduced substantially, or matured without having been rolled over. These measures provide information on the intensive margin of bank-firm relationships. Our third measure is a dummy (New relationships$_{bft}$) that equals one if a firm has credit granted from a bank at time t, but was not borrowing from that bank at the end of the previous year (when the new required capital ratio is communicated) Hence, we will not only test the impact of capital requirements on actual loan growth, but also the impact on banks' propensity to generate new bank-firm credit relationships. Finally, we also compute the utilization rate of credit, which is the ratio of the utilized amount over the authorized amount at time t.

Next to quarterly growth rates in (aggregate) authorized credit at the bank-firm level, we also investigate whether there are differential effects depending on the maturity of the loan or the nature of the loan. In particular, we look at growth in authorized credit for three different loan types: (i) Short-Term Loans: residual maturity less than a year (and initial maturity more than a year), (ii) Long-Term Loan: residual maturity more than a year, and (iii) Term Loans: Fixed term credits, Mortgage loans, Non-mortgage installment loans.[12]

[11] Information on the construction of the variables is reported in Appendix A1, whereas summary statistics are reported in Table 7.

[12] In principle, we could have looked at two other loan types. Short term loans with both an initial and residual maturity of less than one year as well as on demand loans (authorized credits with mixed uses,

The estimated regression takes the following form:

$$\begin{aligned}\text{Credit Growth (Quarterly)}_{b,f,t} = {} & \beta_1 * \text{Actual Capital Ratio}_{b,t-1} + \beta_2 * \text{Previous year Actual Capital Ratio}_{b,t-4} \\ & + \beta_3 * \text{Required capital ratio}_{b,t-1} + \beta_4 * \text{Previous year Required Capital Ratio}_{b,t-4} \\ & + \gamma * \text{Bank Controls}_{b,t-1} + \nu_{f,t} + \nu_b + \epsilon_{b,f,t} \qquad (2)\end{aligned}$$

There are again four independent variables of interest based on the regulatory capital data. They are: Required capital ratio$_{b,t-1}$, Actual Capital Ratio$_{b,t-1}$, Previous year Required Capital Ratio$_{b,t-4}$ and Previous year Actual Capital Ratio$_{b,t-4}$. The vector Bank Controls$_{b,t-1}$ consists of the following variables: the natural logarithm of total assets, quarterly growth in common equity, quarterly growth in deposits, quarterly growth in total assets and quarterly return on equity. All bank variables have been lagged one quarter such that they are in principle predetermined with respect to next quarter's credit growth at the bank-firm level. $\nu_{f,t}$ is a *firm* x *time* fixed effect that controls for observed and unobserved time-varying firm heterogeneity in loan demand, quality and risk. ν_b is a *bank* fixed effect that controls for observed and unobserved time-invariant heterogeneity across banks such as e.g., ownership structure or managerial quality. $\epsilon_{b,f,t}$ is a zero-mean random noise component. The standard errors are clustered at the bank level.

4.2 Results: multiple-bank sample

The results of estimating Equation 2 for seven different dependent variables that capture various dimensions of credit growth are reported in Table 8.

Insert Table 8 around here

Four general findings stand out. First, *ceteris paribus*, increasing the required capital ratio reduces the supply of credit on the intensive and extensive margin. Holding constant the level of actual capital (and hence a shrinking buffer), a one standard deviation increase in required capital (1.5pp) leads to a 0.19 pp decrease in the quarterly credit growth rate. Put differently, the same firm borrowing from two banks that differ only in the level of required capital, will see a slightly lower

overdrafts, other cash credits). However, due to the limited amount of variation in the authorized amounts of thesese types, these are not suitable for regression analyses. Demandable credit is constant for more than 90% of the observations, as can be seen from the 0% growth rate reported in Table 7. The growth in short term credit (short initial maturity) is zero for almost 75% of the bank-firm-quarter observations.

credit growth from the bank with the higher required capital ratio. The economic significance of this effect is, however, small. In line with this finding, banks with higher capital requirements are less likely going to start new bank-firm relationships, and again the effect is statistically significant but economically small. The coefficient on required capital is 2.5 times larger when only focusing on term loans, but this still leads to a moderate effect of 0.5% on term credit growth. Second, an increase in actual capital holdings (and thus an increase in the buffer!) also reduces the supply of credit. The economic effects are, however, again small and of comparable magnitude to an increase in the required capital ratio. Thirdly, combining the two aforementioned situations, i.e., an increase in the required and actual capital ratio (e.g., a situation where a bank is preserving its capital buffer in response to an increase in the capital requirement), leads to a stronger contraction of credit supply. A one standard deviation increase in required capital (1.5pp) combined with a 1.5pp increase in the actual capital ratio leads to a 0.39 pp decrease in the quarterly credit growth rate, a 1.14 pp increase in the probability of experiencing a large drop and a 1.11 pp decrease in the probability of starting a new bank-firm relationship. Moreover, the utilization rate of credit goes up with 0.70 pp in such a case. Finally, the effect of changes in the required capital ratio is long-lasting. That is, the required capital ratio set in the previous year has a significant impact on the growth of credit, whereas the previous year actual capital ratio does not have a significant impact on credit supply. In the next to last row of the table, the p-value of a significance test of the sum of the effects of the current and previous year required capital ratio almost always hints at statistical significant effects of the joint impact. These findings hold by and large for all specifications. The contraction in authorized credit caused by higher capital requirements leads to higher utilization rates. A firm's use of authorized credit is larger at banks with higher required or actual capital ratios. Only for the specification reported in column 5, we do not find any statistically significant relationship between required or actual capital and credit with a residual maturity less than one year (but an initial maturity more than a year). Note that that sample is much smaller, as it not only requires that a firm has such short-term credit, but also has it simultaneously at two different banks.

While we restrict the sample to multiple bank borrowers to better isolate supply from demand effects, it could still be that borrowers match with specific banks. If firms borrow from multiple banks, but similar in terms of (required) capital ratio, it may be hard to identify statistical relationships. Therefore, we redo the analysis using a slightly different sample. More specifically,

we only keep firms if they borrow, in one and the same quarter, from at least one bank that experiences a negative change in the required capital ratio and at least one bank that experiences a strictly positive change in the required capital ratio. In Table 9, we report these results. The specification is similar but we impose an additional constraint on the multiple borrower sample. This additional criterium implies that the sample size shrinks to about 70% of the sample used in Table 8. Nevertheless, the results in both tables are very similar, except for the utilization rate regression. An increase in required and/or actual capital ratios reduces credit supply. Moreover, capital requirements have a long-lasting effect.

Insert Table 9 around here

4.3 Results: full sample

All regression specifications reported in Table 8 include *firm* x *time* fixed effects and are hence comparing credit supply to the same firm in the same quarter by two banks with different regulatory capital. However, this implies that one can only include firm-quarter observations if that firm borrows simultaneously from at least two banks. However, in the Belgian context, the majority of firms borrow from a single banks. The multiple-bank borrower sample consists of 1,022,324 bank-firm-quarter observations involving 64,183 firms. Firms borrowing from more than one bank typically borrow from two banks, with a maximum of six banks. The full sample, including single-bank borrowers, has 3,338,729 bank-firm-quarter observations covering 316,969 unique firms. Hence, only about a fifth of the firms borrow from two or more banks in a given quarter. This has as a consequence that the average (median) firm in our sample has 1.373 (1) bank relationships. While focusing on multiple-bank borrowers may have methodological merit (as it allows controlling for demand following Khwaja and Mian (2008)), it also implies a substantial reduction in the sample, especially dropping smaller firms, potentially leading to misguided conclusions for the entire universe of firms (i.e., single-bank *and* multiple-bank borrowers). Comparing the mean of authorized credit in the left (multiple-bank borrowers) and right (all borrowers) hand side panel of Table 7, we see that the average authorized credit amount is much larger for the former group.

Therefore, we also redo the analysis using the full sample. In order to mitigate concerns about confounding credit demand effects, we now include a 'group' fixed effect to control for credit demand. The group is defined as the firm itself, in case of a firm with multiple bank relationships in a given

quarter. The single-bank firms are, in each quarter, grouped on the basis of sector affiliation, firm location, and size(defined ILS, industry-location-size, henceforth). More specifically, these firms are grouped according to the deciles of loan size in the credit register, the two-digit NACE code and the two-digit postal code (which broadly coincides with the district level). A similar approach is used by Edgerton (2012), Morais et al. (2015), De Jonghe et al. (2016) and Degryse et al. (2016).[13]

Insert Table 10 around here

The results for the full sample estimation are reported in Table 10, which is identical in setup to Table 8. The sample used in the first four columns now includes more than 3.3 million observations compared to just over 1 million in the multiple-borrower sample. In cases where the point estimate is significantly different from zero, we find that the established relationships are quantitatively similar. That is, point estimates are by and large the same in the full sample and the multiple-bank borrower sample. However, we do observe that some of the previously found relationships are no longer statistically significant. This could be due to two reasons. On the one hand could it be caused by only imperfectly controlling for firm demand, if firms in an industry-location-sector group have differential demand shocks in a given quarter. On the other hand, even if firms in such bins are homogenous the results could still differ if the characteristics of the firms that borrow from a single bank are different from the multiple-bank firms. One obvious dimension in which they differ is firm size (see Table 7. Larger firms are more likely to have more bank relationships. If the impact of required or actual capital on credit supply is size-dependent, it may lead to different effects in the multiple borrower sample versus the full sample. We will investigate this in more detail later in the paper when we look at heterogeneous effects for different firms (in subsection 5.2, we will document that the effect of an increase in required capital on credit supply is more negative for larger firms).

Finally, we also repeat the same reduced sample exercise for the full sample. That is, we only keep firms or ILS groups if they borrow, in one and the same quarter, from at least one bank that experiences a negative change in the required capital ratio and at least one bank that experiences a strictly positive change in the required capital ratio. These results are similar to those of the full sample (as in Table 10) and are reported in Appendix Table A2.

[13]To be precise, Edgerton (2012) use county times size times industry fixed effects when analyzing the impact of funding shocks on firm investments, while Morais et al. (2015) use industry times state fixed effects when analyzing the international monetary policy pass-through in Mexico. De Jonghe et al. (2016) and Degryse et al. (2016) use similar fixed effects as the ones used here.

5 Regulatory capital and credit supply: the impact of bank and firm characteristics

So far, we focused on the average effect of (required) capital on bank credit supply. However, this relationship need not be homogenous, but may vary with bank characteristics, firm characteristics and/or the stance of monetary policy. In the next subsections, we will explore whether or not the relationships are heterogeneous across banks (Subsection 5.1) and firms (Subsection 5.2). Exploring whether or not the impact of required capital on credit supply varies with bank characteristics may shed light on which frictions or costs affect raising actual equity. Likewise, exploring interaction with firm characteristics will provide insight on which firms will be affected more by banks' goal to reduce risk-weighted assets in response to increased capital requirements.

5.1 Regulatory capital and credit supply: interaction with bank characteristics

The Modigliani and Miller paradigm stipulates that a firm's capital structure is irrelevant for its operating decisions. In the banking context, this would imply, e.g., that the rate that a bank charges on its loans as well as the volume of loans should be independent of its funding structure, including its leverage and capital ratio. However, the real world may deviate in various ways from the theoretical Modigliani-Miller setup (see Kashyap et al. (2010) for an overview). Consequently, in the short-run, a phasing of increased capital requirements might prompt banks to fulfill them by contracting credit supply (lower volume and higher lending rates), rather than issuing equity or increasing retained earnings though reductions of dividends distributions. Unfortunately, we cannot directly test the deviations from the Modigliani-Miller world. However, we will test it indirectly by analyzing whether the established negative relationship between regulatory capital ratios and credit supply to corporations is less pronounced for banks whose equity financing is relatively cheaper or that are less in need to adjust equity. In particular, one way to test this conjecture is to assess whether or not the impact of changes in required capital on the supply of credit to corporations varies with bank characteristics. First of all, the negative relationship between the required capital ratio and credit supply should be more pronounced for small and risky banks given that in general the cost of capital is lower for larger and safer banks (Gandhi and Lustig (2015), Baker and Wurgler

(2015), and Kashyap et al. (2010)). Second, the cost of capital is lower for more profitable banks. Profitable banks have a larger franchise value, which reduces their incentives for excessive risk-taking. Moreover, they have more scope for internal capital generation by retaining earnings and hence can manage capital passively (as opposed to active management via raising equity externally, see e.g. De Jonghe and Öztekin (2015)). Finally, banks with higher past equity growth have built some financial slack as their capital buffer has increased. This may not necessarily affect the cost of raising equity, but reduces the need or urgency to do so. We thus expect that the negative relationship is less pronounced for these banks. Recent asset expansion, on the other hand, puts strain on the existing capital buffer, and thus may lead to a more negative relationship between required capital and credit supply as the need to make adjustments (in response to increased requirements) is larger.

We test the aforementioned hypotheses using the following regression framework:

$$\begin{aligned}\text{Credit Growth (Quarterly)}_{b,f,t} = {} & \beta_1 * \text{Actual Capital Ratio}_{b,t-1} + \beta_2 * \text{Previous year Actual Capital Ratio}_{b,t-4} \\ & + (\beta_3 + \beta_3^{BC} * \text{Bank Characteristic}_{b,t-1}) * \text{Required Capital Ratio}_{b,t-1} \\ & + \beta_4 * \text{Previous year Required Capital Ratio}_{b,t-4} + \gamma * \text{Bank Controls}_{b,t-1} \\ & + \nu_{f,t} + \nu_b + \epsilon_{b,f,t} \qquad (3)\end{aligned}$$

The specification is identical to Equation 2, except for the interaction term between *Bank Characteristic*$_{b,t-1}$ and *Required Capital Ratio*$_{b,t-1}$. The results of these regressions are reported in Table 11. For ease of comparison, we reproduce the homogeneous effect in the first column (as in column 1 of Table 8). In subsequent columns, we add an interaction term of the required capital ratio and total assets (size), loan loss provisioning ratio (risk measure), return on equity (scope for earnings retention), growth in common equity and growth in assets (relaxation of or strain on the buffer). Each interaction term enters as a one-quarter lag. The point estimates of the interaction terms provide support for each of the aforementioned hypotheses. First of all, firms are more shielded from a reduction in lending due to increased capital requirements at larger banks.[14] We also find that more risky banks[15] reduce lending by more in response to an increase in required

[14] Aiyar et al. (2014b) also find a positive interaction effect, though it is statistically insignificant.

[15] Our measure of credit risk, loan loss provisioning ratio, is an indicator of the quality of the existing loan portfolio. Our finding is in line with the theoretical prediction of Bahaj et al. (2016) that lending is less sensitive to a change in capital requirements when legacy assets are healthy.

capital, providing further support for the idea that the cost of equity (which is higher for riskier banks) is the constraining factor leading to negative effects of capital on lending. Second, more profitable banks constrain credit supply less in response to higher capital requirements. The point estimate has the expected sign, but is marginally insignificant at conventional levels (p-value less than 0.15). Finally, we also find that the negative impact is reduced for banks that expanded their capital buffer in the previous period. The interaction term on equity growth is positive, whereas the one on asset growth is negative (but insignificant).

What do these point estimates imply in economic terms? From an economic point of view, the obtained coefficients imply that a 1pp increase in required capital reduces credit supply with 0.25pp for small banks (5th percentile of total assets) and only 0.075pp for large banks (95th percentile of total assets).[16] The same firm's credit supply is three times more reduced at small banks facing an increased capital requirement vis-*à*-vis large banks facing the exact same capital requirement increase (in the same quarter). The effects are larger when looking at high and low profits (losses). The implied effect of a 1pp increase in required capital for low profit banks (5th percentile of ROE is -8.2%) is -0.35pp, whereas it is 0.04pp for highly profitable banks (value at 95th percentile of return on equity). Finally, when looking at equity growth and asset growth, we find that increases in required capital do not have an effect on credit supply at banks that have high equity growth (0.005pp at 95th percentile) or low asset growth (-0.05pp at 5th percentile), whereas they are -28.6pp for small equity growth and -0.17pp for large asset growth banks. In economic terms, the impact of increased capital requirements on credit supply is indeed almost non-existent for banks for which the cost or need to raise equity is low.

5.2 Regulatory capital and credit supply: interaction with firm characteristics and monetary policy

The period under analysis (2012-2015) is an exceptional period in terms of monetary policy conditions and interventions. The European Central Bank has been trying to stimulate bank lending

[16]The effects are computed as follows. We take the value of the 5th and 95th percentile of the interaction variable of interest from panel B of Table 7 and combine these with the point estimates reported in Table 11. These numbers are plugged into the following equation: $\hat{\beta}_3 + \hat{\beta}_4 * \text{Bank Characteristic}_{b,t-1}$. For example, for large banks, this results in -0.791 + 0.0584 * 12.268 = -0.07455, which we round to -0.075. Similar computations are used throughout this paragraph.

with a series of unconventional monetary policy measures. In all analyses, we have been controlling for monetary policy (and other macro-economic conditions) by means of time fixed effects. However, (un)conventional monetary policy and (micro)prudential policy may also interact in their effect on influencing banks' lending behavior.[17]. To that end, we introduce an interaction term between the required capital ratio and the quarterly growth in the balance sheet of the European Central Bank. The growth of the ECB's balance sheet is used as a proxy for the monetary policy stance as both conventional and unconventional monetary policy may lead to change in the volume of assets held by the ECB. Furthermore, the interactions between the required capital ratio and bank characteristics have been proven useful in discriminating banks based on their perceived cost of capital (adjustments). Banks for which the cost of capital is higher will constrain credit supply more. In this subsection, we analyze whether banks discriminate between borrowers in response to increased capital requirements. To satisfy the increased required capital ratio, banks reduce lending to adjust their actual risk-weighted capital ratio. Cutting credit more to larger firms and to riskier firms will enable banks to adjust their volume of risk-weighted assets more swiftly. We also include an interaction term with firm age. The predicted sign is ambiguous because of two opposite forces. Older firms are on average less risky, however, they also have larger loans. Finally, if banks have to cut credit, they might be less likely to cut it to firms who pay higher interest rates as this protects bank profits and leaves scope for earnings retention. We allow for a triple interaction effect between the required capital ratio, monetary policy and firm characteristics to test the presence of a risk-taking channel of monetary policy. We estimate these interaction effects using the following specification:

$$\begin{aligned}\text{Credit Growth (Quarterly)}_{b,f,t} = {} & \beta_1 * \text{Actual Capital Ratio}_{b,t-1} + \beta_2 * \text{Previous year Actual Capital Ratio}_{b,t-4} \\ & + (\beta_3 + \beta_3^{MP} * \text{MonPol}_{t-1} + \beta_3^{F} * \text{Firm}_{f,b,t-1} \\ & + \beta_3^{F,MP} * \text{Firm}_{f,b,t-1} * \text{MonPol}_{t-1}) * \text{Required Capital Ratio}_{b,t-1} \\ & + \beta_4 * \text{Previous year Required Capital Ratio}_{b,t-4} + \gamma * \text{Bank Controls}_{b,t-1} \\ & + \nu_{f,t} + \nu_b + \epsilon_{b,f,t} \qquad (4)\end{aligned}$$

The specification is identical to Equation 2, except for the interactions between $\text{MonPol}_{b,t-1}$,

[17]Theoretical models on the interaction of capital requirements and monetary policy have been developed by e.g., Angeloni and Faia (2013), Angelini et al. (2014) and Du and Miles (2014), while the relationship has been empirically tested by Aiyar et al. (2014b).

Bank Characteristic$_{b,t-1}$ and Required Capital Ratio$_{b,t-1}$. Information on the ECBs' balance sheet is obtained from their website. Characteristics on Belgian corporations are obtained via filings of their balance sheets and income statements to the NBB. [18] The monetary policy indicator and the firm characteristics have been standardized to facilitate comparing their economic magnitudes. Results are reported in Table 12.

Insert Table 12 around here

The results in the first column indicate that there might be a trade-off between (micro-)prudential capital requirements and monetary policy. The interaction term is negative and significant, implying that a balance sheet expansion of the European Central Bank will have a weaker impact on credit supply for banks with higher capital requirements. An alternative way of interpreting the negative interaction coefficient is that increasing capital requirements during expansionary monetary policy periods is more detrimental for credit supply compared to a similar increase during monetary tightening. A one standard deviation increase in the growth rate of the ECB's balance sheet increases the impact of required capital on credit supply from -0.199 to -0.363. Likewise, a one standard deviation decrease in the growth rate of the balance sheet of the ECB results in an almost zero impact of required capital on credit supply (-0.035, to be precise). When turning to firm characteristics, we find that the impact of an increase in required capital on credit supply is more negative for larger (firm total assets) and riskier firms (measured by either Altman Z score or financial leverage). The economic magnitudes of the size effect and financial leverage are similar, whereas the mitigating effect of firm risk measured by the Altman Z-score is slightly smaller. We find a negative interaction effect on firm age. Note that the predicted sign was unclear as older firms on average are both less risky but have larger loans. The volume effect seems to dominate as an increase in required capital leads to more constrained credit supply for older firms relative to younger firms. While cutting more to larger firms allows swifter adjustment of the risk-weighted capital ratio, there might also be another reason why banks restrict credit supply more to larger and

[18] The NBB collects all the information and performs a number of consistency checks on the reported balance sheets and income statements. Almost all Belgian firms incorporated under limited liability (irrespective of their size) are obliged to make this information public and report to the NBB. The most notable exceptions are sole traders or corporations whose legal situation implies an unlimited liability for the owner in case these corporations are not large. We match the last available firm balance sheet and income statement data with each respective quarter. The average firm in our sample is nineteen years old (standard deviation of 12), with 3187731 euro assets (standard deviation is 8909007). The average financial leverage ratio in the sample is 26% (standard deviation is 22%). The average Altman Z-score is 0.83, but has a standard deviation of 1.27.

older firms, in response to increased capital requirements. Banks can simultaneously facilitate larger and older firms their access to alternative sources of financing via debt markets or syndicated loans. Unfortunately, data availability does not permit us to investigate this conjecture in further detail. The interaction term with a firm's implied interest rate is positive and significant. The implied interest rate is computed as the ratio of firms' financial cost over the sum of long and short-term loans. The negative impact of increased capital requirements on credit supply is weaker for high versus low implied interest rate firms. Finally, two important extensions are worth stressing. The triple interaction effect between required capital, monetary policy and firm characteristics is never significant. In addition, the results on the interaction effects with firm risk are similar when we exclude the interaction term with monetary policy conditions.

6 Conclusion

Macroprudential capital requirements have the explicit goal to affect credit supply. The build-up of capital buffers during booms provides financial flexibility in downturns that helps mitigate credit crunches. Moreover, the higher capital requirements can also cool-down credit booms, if banks internalize more of the potential social costs of defaults. Microprudential capital requirements do not have the objective to affect credit supply, but rather aim at increasing the soundness and stability of individual financial institutions. However, micro-prudential capital requirements may affect bank activity and lending, if raising capital internally or externally is costly. Whether this is the case is a widely debated issue, as it would imply that there are costs or frictions associated with bank capital that lead banks to pass up on otherwise profitable loans.

We document using two alternative approaches that higher capital requirements correspond with balance sheet adjustments as well as lower credit supply to corporations. We also show that the effects are less pronounced for banks for which the cost of raising capital (internally or externally) is lower and more prevalent for firms that facilitate swifter adjustments to banks' risk-weighted assets ratio. Moreover, in line with most other studies, we do find that the economic magnitude on aggregate corporate lending is fairly small suggesting that the impact on real activity might be small. Overall, the unintended consequences of microprudential capital requirements on credit supply are present but small.

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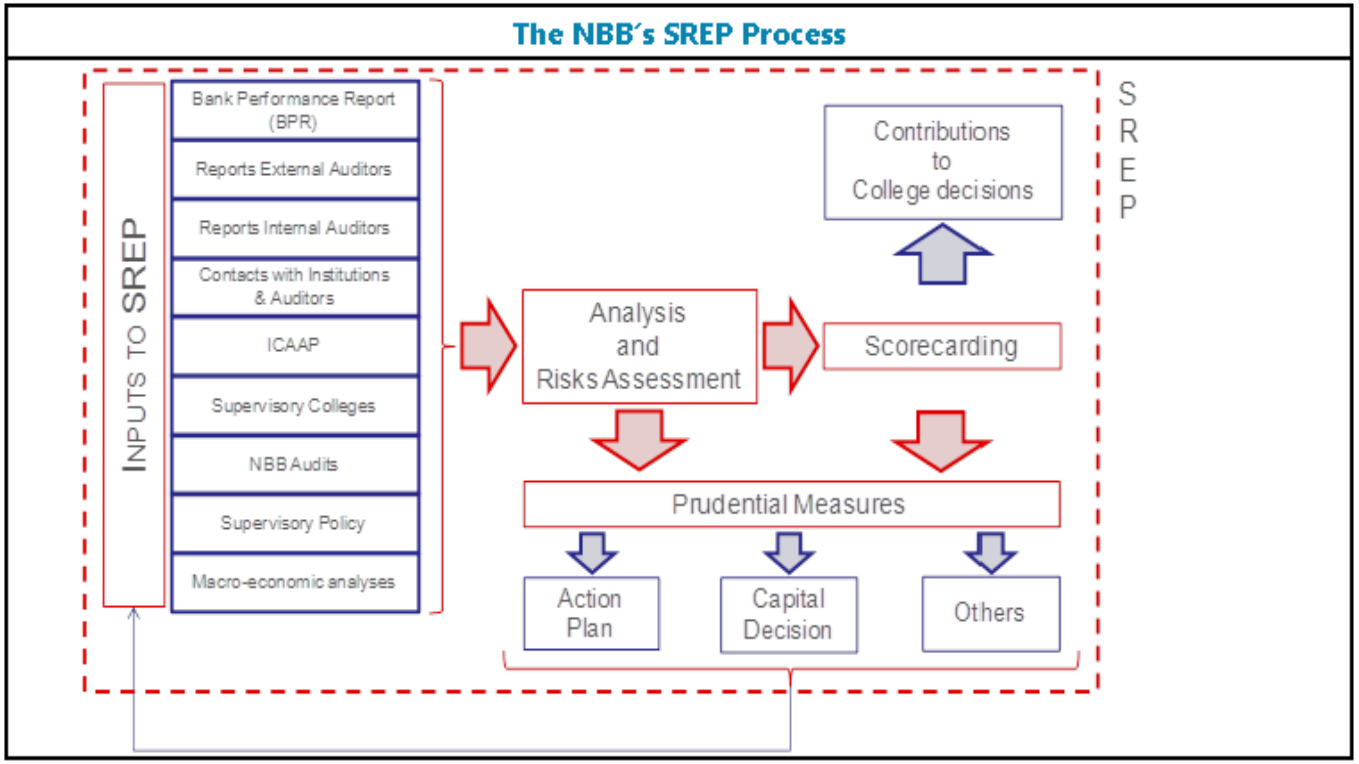
Figure 1: Diagram of the Supervisory Review and Evaluation Process

The flow chart depicts the various steps and ingredients in the Supervisory Review and Evaluation Process (SREP). On the left hand side, the various inputs to SREP are listed. ICAAP stands for internal capital adequacy assessment process and NBB is shorthand for National Bank of Belgium. The inputs are used to perform an analysis and risk assessment, which are quantified by means of a scorecarding system. The output of the SREP are prudential measures which could consist of three components: an action plan, a specific capital decision or other measures.



Source: Prudential regulation and supervision, NBB Report 2015, p. 239.

Figure 2: Impact of changes in (required) capital on bank balance sheets

This graphs summarizes the effects of changes in (required) capital on the (median) bank's balance sheet. The effects are computed based on the coefficient estimates reported in Tables 4 and 5. The upper left panel depicts the balance sheet of the median bank, scaling total assets to 100. In the lower left panel, we report the balance sheet of an otherwise similar bank that has experienced a permanent increase in required capital with 200 basispoints (a one standard deviation increase) and compute the balance sheet composition the quarter following this change. In the scenarios on the right hand side, the required capital ratio is increased with the same amount, but we now also allow the bank to adjust its actual capital ratio with 200 basis points, and thus maintaining the buffer (in the upper right table). In the lower right table, the actual capital ratio is increased with 400 basis points, which corresponds with an increase with one standard deviation. Mortgage loans, term loans and other credit are the constituents of all credit and are therefore right-aligned.

Starting balance sheet for median bank

Median Bank

Assets		Liabilities	
Interbank	**10.3**	Interbank	**7.0**
Mortgages	**17.1**	Deposits	**65.6**
Term Loans	**24.1**	Other Debt	**4.1**
Other Credit	12.4	Reserves and other	17.1
All Credit	**53.6**	Common Equity	**6.2**
Securities	**26.0**		
Other Assets	10.1		
	100		100

Resultant balance sheet for median bank if

Required capital ratio increases with 200 basispoints, holding buffer (actual - required capital ratio) constant

Median Bank

Assets		Liabilities	
Interbank	**11.9**	Interbank	**8.3**
Mortgages	**16.2**	Deposits	**57.1**
Term Loans	**23.2**	Other Debt	**3.8**
Other Credit	13.0	Reserves and other	22.7
All Credit	**52.4**	Common Equity	**6.1**
Securities	**24.7**		
Other Assets	9.1		
	98.1		**98.1**

Resultant balance sheet for median bank if

Required capital ratio increases with 200 basispoints, no change in actual capital ratio

Median Bank

Assets		Liabilities	
Interbank	**11.6**	Interbank	**8.2**
Mortgages	**16.7**	Deposits	**60.2**
Term Loans	**23.6**	Other Debt	**3.8**
Other Credit	12.5	Reserves and other	21.1
All Credit	**52.8**	Common Equity	**6.2**
Securities	**25.1**		
Other Assets	10.0		
	99.5		**99.5**

Resultant balance sheet for median bank if

Required capital ratio increases with 200 basispoints, actual capital ratio increases with 400 basispoints

Median Bank

Assets		Liabilities	
Interbank	**12.1**	Interbank	**8.4**
Mortgages	**15.8**	Deposits	**54.1**
Term Loans	**22.8**	Other Debt	**3.7**
Other Credit	13.5	Reserves and other	24.4
All Credit	**52.1**	Common Equity	**6.0**
Securities	**24.3**		
Other Assets	8.2		
	96.7		**96.7**

Table 1: Summary statistics

This table contains summary statistics (mean, standard deviation, 5th, 50th and 95th percentile) on (regulatory) bank capital (panel A) and other bank-specific characteristics (panel B). Data come either from the SREP (bank capital) or the regulatory filings (balance sheet and income statement) and are on the bank-quarter level. Stock data are measured at the end of the quarter. Flow data are changes accumulated over the quarter. In panel C, we report the share (in total assets) of five asset classes (interbank assets, mortgages, term loans, all credit and securities), three liabilities (interbank liabilities, deposits and other debt) as well as common equity. The total number of observations is 132, but are unbalanced over 12 quarters (2013Q1 to 2015Q4) and 14 banks. The data used in panel B and C are winsorized at the 2% level.

	mean	standard deviation	5th percentile	median	95th percentile
Panel A: Actual and Required Capital Ratio					
Actual capital ratio	0.149	0.037			
Previous year actual capital ratio	0.150	0.041			
Required capital ratio	0.112	0.020			
Previous year required capital ratio	0.111	0.024			
Panel B: Bank characteristics					
ln(Total assets)	9.881	1.684	7.077	9.835	12.247
Loans to total assets	0.525	0.174	0.035	0.528	0.766
Loans to Deposits	0.928	0.626	0.535	0.784	2.556
Off Balance Sheet items to total assets	6.775	5.788	1.438	4.176	20.825
Share of demand and savings deposits (in deposits)	0.800	0.110	0.594	0.817	0.947
Quarterly Return on Equity	0.103	0.129	-0.079	0.101	0.287
(quarterly) Provisions to loans	0.001	0.001	-0.000	0.000	0.003
(quarterly) Interest Income Share	0.582	0.296	0.044	0.684	0.893
Panel C: Share of ... in Total Assets					
Interbank assets	0.125	0.124	0.014	0.103	0.533
Mortgages	0.235	0.185	0.002	0.171	0.636
Term loans	0.239	0.125	0.006	0.241	0.407
All credit	0.533	0.172	0.038	0.536	0.771
Securities	0.254	0.097	0.088	0.260	0.410
Interbank liabilities	0.108	0.190	0.002	0.070	0.876
Deposits	0.664	0.195	0.013	0.656	0.876
Other debt	0.068	0.081	0.001	0.041	0.276
Common equity	0.061	0.022	0.030	0.062	0.100

Table 2: Banks covered in the SREP vis-*à*-vis the other banks: comparing number of borrowers, volume of loans and assets

This table provides information on the number of borrowers, the total amount of corporate credit (in million EUR), aggregate volume of total assets **(in million EUR)** as well as the number of banks for two groups of banks. In the left panel, we report the information for the banks covered in the SREP (and hence the sample used in this paper). The middle panel provides information for the other banks. In the rightmost panel, we report the share of the "'SREP"' sample in the total sample for the number of borrowers as well as the volume of corporate credit and assets. The information is provided for each quarter in the sample used in the analysis, running from the first quarter of 2013 to the last of 2015. The jump in the first quarter of 2014 is due to the inclusion in the SREP group as of 2014 of one of the four large banks in Belgium (as well as two other smaller banks).

	Banks with regulatory capital data				Banks without regulatory capital data				Share of regulatory sample in total sample			
time	Number of bank-firm relation-ships	Aggregate Firm-Bank credit exposure (million EUR)	Aggregate Total Assets (million EUR)	Number of Banks	Number of bank-firm relation-ships	Aggregate Firm-Bank credit exposure (million EUR)	Aggregate Total Assets (million EUR)	Number of Banks	Number of bank-firm relation-ships	Aggregate Firm-Bank credit exposure	Aggregate Total Assets	Number of Banks
2013Q1	298956	96921.66	628056	11	83013	32621.73	214481	17	0.78	0.75	0.75	0.39
2013Q2	302272	97886.88	629150	11	83543	30661.28	208372	17	0.78	0.76	0.75	0.39
2013Q3	302126	97033.13	613582	11	83879	30799.53	203970	17	0.78	0.76	0.75	0.39
2013Q4	305951	96932.13	578778	11	83851	30768.55	193217	17	0.78	0.76	0.75	0.39
2014Q1	371011	120623	751995	14	15342	6523.441	41098	14	0.96	0.95	0.95	0.50
2014Q2	369473	120984.4	767089	14	15012	6353.84	39450	14	0.96	0.95	0.95	0.50
2014Q3	366790	121525.7	778424	14	16697	6490.488	40058	14	0.96	0.95	0.95	0.50
2014Q4	373748	133141.3	777075	14	16581	6442.281	39118	14	0.96	0.95	0.95	0.50
2015Q1	370489	134097.3	821347	14	16765	6659.532	40374	14	0.96	0.95	0.95	0.50
2015Q2	369956	136131.9	788704	14	16811	6657.768	40946	14	0.96	0.95	0.95	0.50
2015Q3	370060	136918.5	782849	14	16878	6352.791	40209	14	0.96	0.96	0.95	0.50
2015Q4	369152	141002.3	754160	14	16731	6413.781	39886	13	0.96	0.96	0.95	0.52

Table 3: Summary statistics

This table contains summary statistics (mean, standard deviation, 5th, 50th and 95th percentile) on quarterly growth rates and (imputed) price of broad asset and liability classes. The quarterly growth rate is reported in panel A. The balance sheet data allow decomposing the asset values in domestic versus foreign. Therefore, we report the growth rate of domestically-originated assets and foreign-originated assets. Imputed prices (for some of the assets and liabilities) are reported in panel C. The imputed price is computed by dividing the quarterly revenues (or expenses) accumulated over a quarter by the stock (average of beginning and end of quarter value). The total number of observations is 132, and are unbalanced over 12 quarters (2013Q1 to 2015Q4) and 14 banks. However, the number of observations can be less than 132, as not all banks have each type of foreign assets (e.g. 105 for foreign mortgages and 120 for foreign term loans). Data are winsorized at the X% level.

	mean	standard deviation	5th percentile	median	95th percentile
Growth rate of ...					
Interbank assets	0.021	0.291	-0.518	-0.001	0.515
Mortgages	0.028	0.065	-0.034	0.016	0.159
Term loans	0.005	0.074	-0.092	0.010	0.116
All credit	0.011	0.056	-0.068	0.012	0.092
Securities	-0.004	0.062	-0.091	-0.008	0.146
Total assets	0.007	0.058	-0.079	0.006	0.078
Interbank assets (domestic)	0.014	0.538	-0.945	0.014	1.103
Mortgages Mortgages (domestic)	0.028	0.067	-0.033	0.016	0.158
Term loans (domestic)	0.009	0.055	-0.069	0.009	0.064
All credit (domestic)	0.013	0.058	-0.051	0.012	0.061
Securities (domestic)	-0.016	0.054	-0.128	-0.012	0.074
Total assets (domestic)	0.011	0.064	-0.061	0.006	0.051
Interbank assets (foreign)	-0.029	0.300	-0.511	-0.007	0.405
Mortgages (foreign)	-0.001	0.110	-0.153	0.000	0.189
Term loans (foreign)	0.017	0.217	-0.333	0.000	0.449
All credit (foreign)	0.017	0.218	-0.345	0.000	0.286
Securities (foreign)	0.026	0.141	-0.113	0.000	0.397
Total assets (foreign)	0.003	0.100	-0.184	0.000	0.182
Interbank liabilities	-0.025	0.479	-0.794	-0.003	0.661
Deposits	0.023	0.103	-0.036	0.008	0.104
Other debt	0.000	0.148	-0.198	-0.005	0.262
Common Equity	0.006	0.065	-0.122	0.022	0.119
Price of ...					
Interbank assets	0.010	0.009	0.000	0.007	0.033
Mortgages	0.045	0.025	0.029	0.037	0.105
Term loans	0.033	0.015	0.016	0.029	0.068
All credit	0.038	0.017	0.022	0.032	0.082
Total assets	0.108	0.206	0.031	0.048	0.320
Interbank liabilities	0.012	0.014	0.000	0.006	0.042
Deposits	0.009	0.004	0.003	0.008	0.018
Other debt	0.026	0.020	0.000	0.025	0.070

Table 4: Aggregate data: asset types

This table contains estimation results from a regression relating growth rates of bank asset classes to (regulatory) capital ratios. More specifically, we run the following regression for six asset classes, which are interbank assets (column 1), mortgages (column 2), term loans (column 3), all credit (column 4), securities (column 5) and total assets (column 6): Growth (Quarterly) of $X_{b,t}$ = β_1 * Actual Capital Ratio$_{b,t-1}$ + β_2 * Previous year Actual Capital Ratio$_{b,t-4}$ + β_3 * Required capital ratio$_{b,t-1}$ + β_4 * Previous year Required Capital Ratio$_{b,t-4}$ + γ * Bank Controls$_{b,t-1}$ + $\nu_b + \nu_t + \epsilon_{b,t}$. Next to the variables of interest (of which the point estimates and standard errors are reported), the equation includes control variables as well as bank and time fixed effects. Standard errors are clustered at bank level. The table consists of three panels depending on the origin (domestic and/or foreign) of the asset in question. In the upper panel A, we consider growth in both domestic and foreign assets, whereas panel B (C) focuses on domestic (foreign) assets. The last three rows of each panel contain p-values of the following hypotheses test. We test whether (i) $\beta_1 + \beta_2$=0, (ii) $\beta_3 + \beta_4$=0, and (iii) $\beta_1 + \beta_3$=0.

VARIABLES	Quarterly Growth IB assets	Quarterly Growth Mortgages	Quarterly Growth Term Loans	Quarterly Growth All Credit	Quarterly Growth Securities	Quarterly Growth Assets
Panel A: all						
Actual capital ratio	1.393	-0.846**	-0.498*	-0.235	-0.606*	-0.532
	(0.883)	(0.339)	(0.268)	(0.327)	(0.325)	(0.322)
Previous year actual capital ratio	-0.307	-0.446**	-0.284	-0.0723	-0.188	-0.176
	(1.031)	(0.157)	(0.265)	(0.344)	(0.240)	(0.237)
Required capital ratio	0.304	-0.440	-1.113	-0.710	-1.242**	-0.892
	(3.035)	(0.481)	(0.785)	(0.628)	(0.496)	(0.622)
Previous year required capital ratio	6.215***	-0.791	0.0131	-0.0697	-0.462	0.646
	(1.210)	(0.455)	(0.559)	(0.630)	(0.582)	(0.666)
Observations	132	132	132	132	132	132
R-squared	0.472	0.301	0.293	0.309	0.287	0.435
p-value of test (constant buffer effect)	0.63	0.11	0.09	0.28	0.00	0.07
p-value of test (sum actual)	0.43	0.01	0.10	0.62	0.06	0.12
p-value of test (sum required)	0.07	0.12	0.35	0.44	0.09	0.82
Panel B: domestic						
Actual capital ratio	3.718*	-0.939***	-0.0945	-0.216	-0.192	-0.360
	(1.762)	(0.297)	(0.415)	(0.358)	(0.179)	(0.337)
Previous year actual capital ratio	0.170	-0.461***	-0.0754	-0.180	0.187	-0.0890
	(1.805)	(0.150)	(0.292)	(0.403)	(0.351)	(0.319)
Required capital ratio	-2.405	-0.587	-0.573	-0.782	-1.568**	-0.881*
	(5.652)	(0.446)	(0.496)	(0.505)	(0.722)	(0.490)
Previous year required capital ratio	2.308	-0.836*	0.0129	-0.134	-0.286	0.0901
	(7.150)	(0.457)	(0.672)	(0.591)	(0.439)	(0.608)
Observations	132	132	132	132	132	132
R-squared	0.300	0.310	0.172	0.254	0.217	0.306
p-value of test (constant buffer effect)	0.83	0.04	0.41	0.22	0.04	0.10
p-value of test (sum actual)	0.21	0.00	0.81	0.59	0.99	0.44
p-value of test (sum required)	0.99	0.06	0.59	0.29	0.08	0.42
Panel C: foreign						
Actual capital ratio	-2.502	-0.0842	-2.516***	-3.199***	-1.231**	-1.183**
	(1.885)	(0.656)	(0.812)	(1.037)	(0.498)	(0.528)
Previous year actual capital ratio	0.804	-0.0754	-1.280	-0.726	-1.016	-0.209
	(1.520)	(0.673)	(1.154)	(0.728)	(0.824)	(0.473)
Required capital ratio	-0.688	-0.115	-2.646	-3.125*	0.889	-1.663
	(2.249)	(1.365)	(2.261)	(1.596)	(1.532)	(0.979)
Previous year required capital ratio	4.164	0.214	-6.271*	-4.996*	-2.663	0.813
	(2.838)	(1.135)	(2.896)	(2.418)	(2.433)	(1.540)
Observations	128	105	120	130	132	132
R-squared	0.327	0.142	0.398	0.398	0.183	0.380
p-value of test (constant buffer effect)	0.22	0.92	0.05	0.01	0.83	0.02
p-value of test (sum actual)	0.58	0.90	0.03	0.02	0.04	0.07
p-value of test (sum required)	0.46	0.97	0.04	0.04	0.22	0.59

Table 5: Aggregate data: funding

This table contains estimation results from a regression relating growth rates of bank liability classes to (regulatory) capital ratios. More specifically, we run the following regression for three liability classes, which are interbank liabilities (column 1), deposits (column 2), other debt (column 3) as well as common equity (column 4) and total assets (column 5): Growth (Quarterly) of $X_{b,t} = \beta_1 *$ Actual Capital Ratio$_{b,t-1} + \beta_2 *$ Previous year Actual Capital Ratio$_{b,t-4} + \beta_3 *$ Required capital ratio$_{b,t-1} + \beta_4 *$ Previous year Required Capital Ratio$_{b,t-4} + \gamma *$ Bank Controls$_{b,t-1} + \nu_b + \nu_t + \epsilon_{b,t}$. Next to the variables of interest (of which the point estimates and standard errors are reported), the equation includes control variables as well as bank and time fixed effects. Standard errors are clustered at bank level. The last three rows contain p-values of the following hypotheses test. We test whether (i) $\beta_1 + \beta_2$=0, (ii) $\beta_3 + \beta_4$=0, and (iii) $\beta_1 + \beta_3$=0.

VARIABLES	(1) Quarterly Growth IB liabilities	(2) Quarterly Growth deposits	(3) Quarterly Growth Other Debt	(4) Quarterly Growth Equity	(5) Quarterly Growth Total Assets
Actual capital ratio	0.192	-0.899*	-0.641	-0.537***	-0.532
	(2.002)	(0.473)	(0.897)	(0.162)	(0.322)
Previous year actual capital ratio	0.332	-1.396	0.149	-0.223	-0.176
	(2.405)	(1.177)	(0.307)	(0.253)	(0.237)
Required capital ratio	3.940	-1.074	-4.085*	0.346	-0.892
	(6.555)	(0.785)	(1.951)	(0.434)	(0.622)
Previous year required capital ratio	4.949*	-3.072	0.580	-0.179	0.646
	(2.591)	(2.144)	(2.089)	(0.384)	(0.666)
Observations	130	132	132	132	132
R-squared	0.129	0.349	0.099	0.459	0.435
Number of bankid	14	14	14	14	14
p-value of test (sum actual)	0.90	0.17	0.62	0.01	0.12
p-value of test (sum required)	0.27	0.13	0.17	0.76	0.82
p-value of test (constant buffer effect)	0.53	0.08	0.06	0.66	0.07

Table 6: Aggregate data: (imputed) pricing

This table contains estimation results from a regression relating imputed prices of certain assets and liabilities to (regulatory) capital ratios. The imputed price is computed by dividing the quarterly revenues (or expenses) accumulated over a quarter by the stock (average of beginning and end of quarter value). More specifically, we run the following regression for the price of interbank assets (column 1), mortgages (column 2), term loans (column 3), all credit (column 4), total assets (column 5), interbank liabilities (column 6), deposits (column 7), and other debt (column 8): Price of $X_{b,t} = \beta_1 *$ Actual Capital Ratio$_{b,t-1} + \beta_2 *$ Previous year Actual Capital Ratio$_{b,t-4} + \beta_3 *$ Required capital ratio$_{b,t-1} + \beta_4 *$ Previous year Required Capital Ratio$_{b,t-4} + \gamma *$ Bank Controls$_{b,t-1} + \nu_b + \nu_t + \epsilon_{b,t}$. Next to the variables of interest (of which the point estimates and standard errors are reported), the equation includes control variables as well as bank and time fixed effects. Standard errors are clustered at bank level. The table consists of three panels depending on the origin (domestic and/or foreign) of the asset in question. The last three rows of each panel contains p-values of the following hypotheses test. We test whether (i) $\beta_1 + \beta_2$=0, (ii) $\beta_3 + \beta_4$=0, and (iii) $\beta_1 + \beta_3$=0.

VARIABLES	(1) Price - IB Assets	(2) Price - Mortgages	(3) Price - Term Loans	(4) Price - All Credit	(5) Price - TA	(6) Price - IB Liabilities	(7) Price - Deposits	(8) Price - Other Debt
Actual capital ratio	0.0986*	-0.263**	-0.0440	-0.0877*	0.167	0.148***	-0.00103	-0.0113
	(0.0512)	(0.0934)	(0.0419)	(0.0485)	(0.259)	(0.0407)	(0.00978)	(0.109)
Previous year actual capital ratio	0.0424	-0.149	-0.0293	-0.0554	0.184	-0.0173	0.0103	-0.0502
	(0.0433)	(0.0952)	(0.0453)	(0.0392)	(0.271)	(0.0631)	(0.00634)	(0.0783)
Required capital ratio	0.0466	-0.249**	-0.0584	-0.104*	-0.843	0.239**	-0.00270	-0.287*
	(0.0852)	(0.101)	(0.0460)	(0.0565)	(0.713)	(0.0826)	(0.0175)	(0.152)
Previous year required capital ratio	0.105	-0.233	-0.118	-0.0942	1.294	0.125*	-0.0244	-0.191
	(0.0734)	(0.176)	(0.0829)	(0.0607)	(1.022)	(0.0650)	(0.0205)	(0.339)
Observations	92	124	126	132	132	91	124	105
R-squared	0.334	0.335	0.436	0.328	0.485	0.450	0.742	0.309
Number of bankid	10	13	14	14	14	11	14	13
p-value of test (constant buffer effect)	0.18	0.01	0.22	0.07	0.39	0.00	0.87	0.03
p-value of test (sum actual)	0.11	0.04	0.35	0.11	0.44	0.05	0.52	0.69
p-value of test (sum required)	0.30	0.06	0.15	0.09	0.63	0.02	0.46	0.21

Table 7: Summary statistics

This table contains summary statistics on corporate credit growth (upper panel) and bank characteristics (lower panel). The unit of observation is a (firm, bank, quarter) triplet. We provide information on various aspects of corporate credit growth, i.e. on the intensive as well as extensive margin, a breakdown according to maturity as well as a breakdown based on type of credit (demandable versus term credit). In the left hand side panel, we report the statistics for the sample of firms that borrow from multiple banks in a given quarter (i.e. firms with multiple bank relationships). In the right hand side panel, we also include observations of firms that borrow from only one bank.

Variable	Observations	Mean	Std.Dev	5th percentile	median	95th percentile	Observations	Mean	Std.Dev
	Multiple bank borrower sample						Single bank and Multiple bank borrower sample		
Panel A: credit growth									
Authorized credit amount	1022354	644575	7749733	2,500	75730	1569222	3338798	375335	4911296
Number of relationships	1022354	2.219	0.468	2.000	2.000	3.000	3338798	1.373	0.619
Credit growth	1022354	-0.029	0.237	-0.325	-0.012	0.182	3338798	-0.032	0.240
Large drop in credit	1022354	0.233	0.423	0.000	0.000	1.000	3338798	0.250	0.433
New bank-firm relationship	1067448	0.022	0.148	0.000	0.000	0.000	3431793	0.025	0.156
Utilization rate	1067448	0.667	0.391	0.000	0.877	1.000	3431793	0.670	0.395
Short term Credit growth (initial maturity, short)	472686	-0.012	0.271	-0.350	0.000	0.123	1934675	-0.016	0.283
Short term Credit growth (initial maturity, long)	70774	-0.214	0.695	-1.381	-0.316	1.372	734725	-0.224	0.689
LT Credit growth	370929	-0.039	0.181	-0.191	-0.045	0.118	1941847	-0.042	0.172
Demandable Credit Growth	435955	0.004	0.100	0.000	0.000	0.000	1919860	0.004	0.099
Term Credit Growth	577108	-0.067	0.320	-0.549	-0.045	0.314	2447531	-0.070	0.314
Panel B: bank characteristics (estimation sample)									
Actual capital ratio		0.155	0.029					0.155	0.029
Previous year actual capital ratio		0.161	0.033					0.161	0.033
Required capital ratio		0.109	0.015					0.109	0.015
Previous year required capital ratio		0.107	0.015					0.107	0.015
(lagged) log Total Assets		11.643	0.884	9.293	11.958	12.268		11.708	0.814
(lagged) Quarterly growth in Common Equity		0.005	0.060	-0.108	0.020	0.095		0.005	0.059
(lagged) Quarterly growth in Deposits		0.011	0.063	-0.030	0.005	0.052		0.011	0.063
(lagged) Quarterly growth in Assets		-0.007	0.062	-0.083	0.002	0.081		-0.008	0.063
(lagged) Return on equity		0.095	0.093	-0.082	0.092	0.233		0.093	0.094

Table 8: Capital (requirements) and credit supply: multiple-bank borrower sample

This table contains estimation results from a regression relating various dimension of credit growth to (regulatory) capital ratios. More specifically, we run the following regression for seven different dependent variables: Credit Growth (Quarterly)$_{b,f,t}$ = β_1 * Actual Capital Ratio$_{b,t-1}$ + β_2 * Previous year Actual Capital Ratio$_{b,t-4}$ + β_3 * Required capital ratio$_{b,t-1}$ + β_4 * Previous year Required Capital Ratio$_{b,t-4}$ + γ * Bank Controls$_{b,t-1}$ + $\nu_{f,t} + \epsilon_{b,f,t}$. Next to the variables of interest (of which the labels are reported in bold), the equation includes control variables. They are: the natural logarithm of total assets, quarterly growth in common equity, quarterly growth in deposits, quarterly growth in total assets and quarterly return on equity. All bank variables have been lagged one quarter such that they are in principle predetermined with respect to next quarter's credit growth at the bank-firm level. $\nu_{f,t}$ is a *firm* x *time* fixed effect that captures time-varying firm demand shifters. ν_b is a *bank* fixed effect. Standard errors are clustered at bank level.

VARIABLES	(1) Credit growth	(2) Large drop in credit	(3) New bank-firm relation-ships	(4) Utilization rate	(5) Credit growth - ST residual and LT initial	(6) Credit growth - LT residual	(7) Credit growth - Term Loans
Actual capital ratio	-0.133**	0.431**	0.0662	0.190**	-0.317	-0.0396**	-0.256**
	(0.0525)	(0.167)	(0.0954)	(0.0705)	(0.263)	(0.0144)	(0.115)
Previous year actual capital ratio	-0.00645	-0.0363	-0.0782	0.0121	0.778	-0.0341	0.0499
	(0.0474)	(0.0743)	(0.100)	(0.0777)	(0.437)	(0.0256)	(0.128)
Required capital ratio	-0.126*	0.330	-0.807***	0.279*	-0.600	-0.0747*	-0.308**
	(0.0666)	(0.265)	(0.245)	(0.153)	(0.608)	(0.0418)	(0.135)
Previous year required capital ratio	-0.250***	0.394*	-0.858***	0.0897	0.0731	-0.132**	-0.281**
	(0.0498)	(0.184)	(0.198)	(0.125)	(0.643)	(0.0503)	(0.101)
(lagged) log Total Assets	0.0144	-0.0381**	-0.363***	-0.00243	0.282	-0.0189**	0.0117
	(0.0156)	(0.0176)	(0.0851)	(0.0108)	(0.215)	(0.00729)	(0.0225)
(lagged) Quarterly growth in Common Equity	-0.0433**	0.0464*	0.00488	0.0481***	-0.287	-0.00945	-0.0947***
	(0.0153)	(0.0254)	(0.0134)	(0.00806)	(0.252)	(0.00708)	(0.0282)
(lagged) Quarterly growth in Deposits	0.00883	0.0150	-0.0569**	-0.0128	-0.143	0.0168***	-0.0122
	(0.00605)	(0.0110)	(0.0234)	(0.0155)	(0.151)	(0.00435)	(0.0155)
(lagged) Quarterly growth in Assets	-0.0182	0.0534***	0.101***	0.0762***	0.389***	-0.0206**	0.0437*
	(0.0115)	(0.0159)	(0.0274)	(0.0173)	(0.124)	(0.00929)	(0.0237)
(lagged) Return on equity	0.0243	-0.0373	-0.0376	-0.00786	-0.0883	0.0119	0.0258
	(0.0179)	(0.0332)	(0.0331)	(0.00976)	(0.180)	(0.00684)	(0.0230)
Observations	1,022,324	1,022,324	1,067,410	1,067,410	70,774	370,922	577,090
R-squared	0.467	0.504	0.510	0.579	0.503	0.480	0.477
SAMPLE	multiples	multiples	multiples	multiples	multiples	multiples	multiples
Fixed effects 1	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime
Fixed effects 2	BANK	BANK	BANK	BANK	BANK	BANK	BANK
cluster	BANK	BANK	BANK	BANK	BANK	BANK	BANK
constant buffer effect ($\beta_1 + \beta_3$)	-0.26	0.76	-0.74	0.47	-0.92	-0.11	-0.56
p-value of test (constant buffer effect)	0.04	0.09	0.02	0.04	0.22	0.05	0.02
p-value of test (sum actual)	0.17	0.12	0.94	0.15	0.37	0.06	0.33
p-value of test (sum required)	0.00	0.11	0.00	0.11	0.59	0.00	0.01
p-value of test (jointly zero)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9: Required capital and credit supply: multiple-bank borrower sample, opposite capital change

This table contains estimation results from a regression relating various dimension of credit growth to (regulatory) capital ratios. More specifically, we run the following regression for seven different dependent variables: Credit Growth (Quarterly)$_{b,f,t}$ = β_1 * Actual Capital Ratio$_{b,t-1}$ + β_2 * Previous year Actual Capital Ratio$_{b,t-4}$ + β_3 * Required capital ratio$_{b,t-1}$ + β_4 * Previous year Required Capital Ratio$_{b,t-4}$ + γ * Bank Controls$_{b,t-1}$ + $\nu_{f,t} + \epsilon_{b,f,t}$. Next to the variables of interest (of which the labels are reported in bold), the equation includes control variables. They are: the natural logarithm of total assets, quarterly growth in common equity, quarterly growth in deposits, quarterly growth in total assets and quarterly return on equity. All bank variables have been lagged one quarter such that they are in principle predetermined with respect to next quarter's credit growth at the bank-firm level. $\nu_{f,t}$ is a *firm* x *time* fixed effect that captures time-varying firm demand shifters. We only include firm-quarter observations if a firm is in that specific quarter borrowing simultaneously from a bank with a decrease and a strict increase in required capital ratios. ν_b is a *bank* fixed effect. Standard errors are clustered at bank level.

VARIABLES	(1) Credit growth	(2) Large drop in credit	(3) New bank-firm relation-ships	(4) Utilization rate	(5) Credit growth - ST residual and LT initial	(6) Credit growth - LT residual	(7) Credit growth - Term Loans
Actual capital ratio	-0.174***	0.533***	0.0987	0.226	-0.381	-0.0292	-0.272**
	(0.0475)	(0.158)	(0.117)	(0.129)	(0.372)	(0.0407)	(0.0904)
Previous year actual capital ratio	0.0195	-0.0975	-0.0449	-0.0124	0.678	-0.0221	0.165
	(0.0300)	(0.0772)	(0.0837)	(0.0993)	(0.524)	(0.0233)	(0.101)
Required capital ratio	-0.160*	0.463	-0.677**	0.114	-0.378	-0.113	-0.521***
	(0.0796)	(0.302)	(0.268)	(0.289)	(0.568)	(0.0734)	(0.106)
Previous year required capital ratio	-0.283***	0.618***	-0.709***	0.243	0.126	-0.148***	-0.333***
	(0.0599)	(0.200)	(0.219)	(0.197)	(0.581)	(0.0297)	(0.0895)
(lagged) log Total Assets	0.0387*	-0.0637**	-0.310**	0.00732	0.560*	-0.0164	0.0336
	(0.0197)	(0.0233)	(0.116)	(0.0199)	(0.271)	(0.00995)	(0.0295)
(lagged) Quarterly growth in Common Equity	-0.0388**	0.0437	0.00136	0.0556***	-0.133	-0.0166	-0.0850***
	(0.0142)	(0.0276)	(0.0138)	(0.00829)	(0.268)	(0.0109)	(0.0279)
(lagged) Quarterly growth in Deposits	0.0101	0.0244*	-0.0240	-0.0201	-0.121	0.0198**	-0.0145
	(0.00938)	(0.0120)	(0.0139)	(0.0211)	(0.185)	(0.00852)	(0.0266)
(lagged) Quarterly growth in Assets	-0.0151	0.0468**	0.0807***	0.0734**	0.212*	-0.0149	0.0678***
	(0.0136)	(0.0185)	(0.0214)	(0.0324)	(0.116)	(0.0122)	(0.0214)
(lagged) Return on equity	0.0262	-0.0351	-0.0295	-0.00618	0.191	0.0105	0.0240
	(0.0175)	(0.0360)	(0.0294)	(0.00926)	(0.177)	(0.00934)	(0.0215)
Observations	713,314	713,314	744,649	744,649	47,355	244,396	388,424
R-squared	0.456	0.493	0.494	0.576	0.496	0.471	0.467
SAMPLE	multiples	multiples	multiples	multiples	multiples	multiples	multiples
Fixed Effect 1	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime
Fixed Effect 2	BANK	BANK	BANK	BANK	BANK	BANK	BANK
cluster	BANK	BANK	BANK	BANK	BANK	BANK	BANK
constant buffer effect ($\beta_1 + \beta_3$)	-0.33	1.00	-0.58	0.34	-0.76	-0.14	-0.79
p-value of test (constant buffer effect)	0.01	0.04	0.06	0.36	0.16	0.22	0.00
p-value of test (sum actual)	0.05	0.08	0.76	0.35	0.56	0.30	0.47
p-value of test (sum required)	0.00	0.04	0.01	0.46	0.80	0.00	0.00
p-value of test (jointly zero)	0.00	0.00	0.01	0.00	0.54	0.00	0.00

Table 10: Capital (requirements) and credit supply: single-bank and multiple-bank borrowers

This table contains estimation results from a regression relating various dimension of credit growth to (regulatory) capital ratios. More specifically, we run the following regression for seven different dependent variables: Credit Growth (Quarterly)$_{b,f,t}$ = β_1 * Actual Capital Ratio$_{b,t-1}$ + β_2 * Previous year Actual Capital Ratio$_{b,t-4}$ + β_3 * Required capital ratio$_{b,t-1}$ + β_4 * Previous year Required Capital Ratio$_{b,t-4}$ + γ * Bank Controls$_{b,t-1}$ + $\nu_{ILS,t}$ + $\epsilon_{b,f,t}$ Next to the variables of interest (of which the labels are reported in bold), the equation includes control variables. They are: the natural logarithm of total assets, quarterly growth in common equity, quarterly growth in deposits, quarterly growth in total assets and quarterly return on equity. All bank variables have been lagged one quarter such that they are in principle predetermined with respect to next quarter's credit growth at the bank-firm level. $\nu_{ILS,t}$ is a *ILS* x *time* fixed effect that captures time-varying firm demand shifters. ILS allows for the inclusion of single-bank borrowers, by creating groups (for each quarter separately) based on firms their industry, size and location. ν_b is a *bank* fixed effect. Standard errors are clustered at bank level.

VARIABLES	(1) Credit growth	(2) Large drop in credit	(3) New bank-firm relation-ships	(4) Utilization rate	(5) Credit growth - ST residual and LT initial	(6) Credit growth - LT residual	(7) Credit growth - Term Loans
Actual capital ratio	-0.126*	0.308*	0.168	0.0701	-0.568***	-0.0255	-0.142*
	(0.0627)	(0.167)	(0.121)	(0.142)	(0.175)	(0.0232)	(0.0800)
Previous year actual capital ratio	-0.0396	-0.0816	-0.136	-0.143*	-0.386	0.00423	-0.0563
	(0.0736)	(0.122)	(0.147)	(0.0799)	(0.444)	(0.0447)	(0.175)
Required capital ratio	-0.116	0.216	-0.887**	0.0752	0.0717	0.00824	-0.217
	(0.0882)	(0.236)	(0.338)	(0.157)	(0.700)	(0.0412)	(0.154)
Previous year required capital ratio	-0.286***	0.548**	-0.954***	0.279	-0.147	-0.0644***	-0.249**
	(0.0634)	(0.208)	(0.296)	(0.235)	(0.843)	(0.0209)	(0.100)
(lagged) log Total Assets	0.0197	-0.0759***	-0.438***	-0.0198*	0.303	0.00318	0.00928
	(0.0175)	(0.0247)	(0.131)	(0.00933)	(0.242)	(0.00887)	(0.0292)
(lagged) Quarterly growth in Common Equity	-0.0445*	0.0385	0.0122	0.0450***	-0.219	-0.0114	-0.0788*
	(0.0224)	(0.0319)	(0.0148)	(0.0109)	(0.327)	(0.0153)	(0.0375)
(lagged) Quarterly growth in Deposits	0.00677	-0.00168	-0.0569*	-0.0125	0.0553	0.0151*	-0.00611
	(0.00709)	(0.0147)	(0.0301)	(0.0141)	(0.332)	(0.00718)	(0.0130)
(lagged) Quarterly growth in Assets	-0.0190***	0.0655***	0.108***	0.0970***	0.0298	-0.0250*	0.0345
	(0.00593)	(0.00831)	(0.0332)	(0.0131)	(0.392)	(0.0123)	(0.0256)
(lagged) Return on equity	0.00791	-0.0122	-0.0596	0.00861	-0.339	0.0129	-0.0119
	(0.0184)	(0.0301)	(0.0509)	(0.00912)	(0.320)	(0.00985)	(0.0210)
Observations	3,338,729	3,338,729	3,431,693	3,431,693	734,719	1,941,812	2,447,476
R-squared	0.206	0.287	0.198	0.383	0.214	0.194	0.232
SAMPLE	all	all	all	all	all	all	all
Fixed effects 1	ILSxTime	ILSxTime	ILSxTime	ILSxTime	ILSxTime	ILSxTime	ILSxTime
Fixed effects 2	BANK	BANK	BANK	BANK	BANK	BANK	BANK
cluster	BANK	BANK	BANK	BANK	BANK	BANK	BANK
constant buffer effect ($\beta_1 + \beta_3$)	-0.24	0.52	-0.72	0.15	-0.50	-0.02	-0.36
p-value of test (constant buffer effect)	0.08	0.17	0.07	0.62	0.47	0.75	0.08
p-value of test (sum actual)	0.17	0.41	0.88	0.74	0.05	0.73	0.41
p-value of test (sum required)	0.01	0.09	0.01	0.35	0.96	0.34	0.05
p-value of test (jointly zero)	0.01	0.00	0.00	0.00	0.03	0.00	0.05

Table 11: Required capital and credit supply: interaction with bank characteristics

This table contains estimation results from a regression relating quarterly growth in authorized credit to (regulatory) capital ratios. More specifically, we run the following regression: Credit Growth (Quarterly)$_{b,f,t} = \beta_1 *$Actual Capital Ratio$_{b,t-1} + \beta_2 *$Previous year Actual Capital Ratio$_{b,t-4} + (\beta_3 + \beta_3^{BC} *$ Bank Characteristic$_{b,t-1}) *$Required capital ratio$_{b,t-1} + \beta_4 *$Previous year Required Capital Ratio$_{b,t-4} + \gamma *$Bank Controls$_{b,t-1} + \nu_{f,t} + \epsilon_{b,f,t}$. The required capital ratio also enters in interaction with a bank characteristic. We add these interaction terms one-by-one in the subsequent columns. The last row of the table indicates which bank characteristic enters as interaction term. They are, respectively, a proxy for bank size, bank credit risk, bank profits, equity growth and total assets growth. Next to the variables of interest (of which the labels are reported in bold), the equation includes control variables that have been lagged one quarter. $\nu_{f,t}$ is a *firm* x *time* fixed effect that captures time-varying firm demand shifters. ν_b is a *bank* fixed effect. Standard errors are clustered at bank level.

VARIABLES	Credit growth	Credit growth	Credit growth	Credit growth	Credit growth	Credit growth
Actual capital ratio	-0.133**	-0.131**	-0.131**	-0.125**	-0.147**	-0.136**
	(0.0525)	(0.0535)	(0.0477)	(0.0550)	(0.0583)	(0.0536)
Previous year actual capital ratio	-0.00645	-0.00497	-0.0337	0.00909	-0.00184	-0.000395
	(0.0474)	(0.0470)	(0.0448)	(0.0444)	(0.0441)	(0.0460)
Required capital ratio	-0.126*	-0.791***	-0.142*	-0.248*	-0.131*	-0.111
	(0.0666)	(0.252)	(0.0773)	(0.117)	(0.0670)	(0.0683)
Previous year required capital ratio	-0.250***	-0.252***	-0.256***	-0.264***	-0.267***	-0.243***
	(0.0498)	(0.0482)	(0.0411)	(0.0515)	(0.0531)	(0.0496)
Required capital ratio * Bank Characteristic		0.0584**	-97.39***	1.255	1.436***	-0.739
		(0.0215)	(21.10)	(0.822)	(0.455)	(0.884)
Observations	1,022,324	1,022,324	1,022,324	1,022,324	1,022,324	1,022,324
R-squared	0.467	0.467	0.467	0.467	0.467	0.467
SAMPLE	multiples	multiples	multiples	multiples	multiples	multiples
Fixed Effects 1	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime
Fixed Effects 2	BANK	BANK	BANK	BANK	BANK	BANK
Bank controls	YES	YES	YES	YES	YES	YES
cluster	BANK	BANK	BANK	BANK	BANK	BANK
Bank Characteristic		(lagged) log Total Assets	(lagged) loan loss provisions to total loans	(lagged) Return on equity	(lagged) Quarterly growth in Common Equity	(lagged) Quarterly growth in Assets

Table 12: Required capital and credit supply: interaction with firm characteristics and monetary policy

This table contains estimation results from a regression relating quarterly growth in authorized credit to (regulatory) capital ratios. More specifically, we run the following regression: Credit Growth (Quarterly)$_{b,f,t} = \beta_1 *$Actual Capital Ratio$_{b,t-1} + \beta_2 *$Previous year Actual Capital Ratio$_{b,t-4} + (\beta_3 + \beta_3^{MP} *$MonPol$_{t-1} + \beta_3^{F} *$Firm$_{f,b,t-1} + \beta_3^{F,MP} *$Firm$_{f,b,t-1} *$MonPol$_{t-1}) *$Required capital ratio$_{b,t-1} + \beta_4 *$Previous year Required Capital Ratio$_{b,t-4} + \gamma *$Bank Controls$_{b,t-1} + \nu_{f,t} + \epsilon_{b,f,t}$. The required capital ratio also enters in interaction with a monetary policy indicator and/or a firm characteristic. We add these interaction terms one-by-one in the subsequent columns. The last row of the table indicates which firm characteristic enters as interaction term. They are, respectively, a proxy for firm size, firm age, firm risk, firm leverage, firm cost of borrowing. Next to the variables of interest (of which the labels are reported in bold), the equation includes control variables that have been lagged one quarter. $\nu_{f,t}$ is a *firm* x *time* fixed effect that captures time-varying firm demand shifters. ν_b is a *bank* fixed effect. Standard errors are clustered at bank level.

VARIABLES	Credit growth	Credit growth	Credit growth	Credit growth	Credit growth	Credit growth
Actual capital ratio	-0.217**	-0.214**	-0.215**	-0.214**	-0.214**	-0.198**
	(0.0936)	(0.0975)	(0.0990)	(0.0958)	(0.0961)	(0.0870)
Previous year actual capital ratio	-0.0284	-0.0214	-0.0234	-0.0206	-0.0212	-0.0163
	(0.0536)	(0.0618)	(0.0631)	(0.0603)	(0.0600)	(0.0553)
Required capital ratio	-0.199*	-0.183	-0.180	-0.185*	-0.186*	-0.190*
	(0.0923)	(0.105)	(0.108)	(0.101)	(0.101)	(0.0889)
Previous year required capital ratio	-0.284***	-0.266***	-0.265***	-0.269***	-0.268***	-0.289***
	(0.0543)	(0.0658)	(0.0679)	(0.0644)	(0.0646)	(0.0683)
Required capital ratio x MP	-0.164**	-0.177**	-0.177**	-0.175**	-0.177**	-0.160**
	(0.0751)	(0.0730)	(0.0729)	(0.0738)	(0.0735)	(0.0703)
Required capital ratio x IA		-0.0909***	-0.142***	0.0553*	-0.106***	0.0590***
		(0.0201)	(0.0321)	(0.0259)	(0.0161)	(0.0132)
Required capital ratio x IA x MP		-0.0306	-0.0477	0.0101	0.0361	0.00283
		(0.0309)	(0.0423)	(0.0267)	(0.0260)	(0.0134)
Observations	1,022,324	969,725	969,725	969,651	969,725	874,134
R-squared	0.467	0.467	0.467	0.467	0.467	0.464
SAMPLE	multiples	multiples	multiples	multiples	multiples	multiples
Fixed Effects 1	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime	FirmxTime
Fixed Effects 2	BANK	BANK	BANK	BANK	BANK	BANK
Bank controls	YES	YES	YES	YES	YES	YES
cluster	BANK	BANK	BANK	BANK	BANK	BANK
IA		lagged firm size	lagged firm age	lagged Altman Z	lagged financial leverage	lagged cost of borrowing

Appendix

Table A1: Variable definition

CREDIT VARIABLES	
Credit growth	Quarterly change in natural logarithm of authorized credit at bank-firm level
Large drop in credit	A dummy = 1 if Credit Growth is in the lowest quartile of the distribution, and 0 otherwise
New bank-firm relationships	A dummy = 1 if a bank-firm pair exists at the end of the quarter but not yet in the beginning of the quarter, and 0 otherwise
Utilization rate	A ratio of the utilized credit amount (at bank-firm level) to the authorized credit amount (at bank-firm level)
Credit growth - ST residual and LT initial	Quarterly change in natural logarithm of authorized credit (at bank-firm level) that has a maturity >1 year at origination, but remaining maturity <1 year
Credit growth - LT residual	Quarterly change in natural logarithm of authorized credit (at bank-firm level) that has a maturity > 1year at origination, and has a remaining maturity >1 year
Credit growth - Term Loans	Quarterly change in natural logarithm of authorized term credit (at bank-firm level)
BANK CAPITAL VARIABLES	
Actual capital ratio	The ratio of Tier 1 common equity to risk-weighted assets
Required capital ratio	The required capital ratio under Pillar 2, which is the outcome of the SREP process
FIRM VARIABLES	
Firm size	natural logarithm of total assets
Firm age	number of years since incorporation
Altman Z	weighted sum of 5 common business ratios, lower values imply more risk
Financial leverage	sum of long-term and short term loans / total assets
Cost of borrowing	interest expenses / (sum of long-term and short term loans)
OTHER VARIABLES or ABBREVIATIONS	
MP	Monetary Policy - quarterly growth rate of the ECB's balance sheet
ILS	Industry-Location-Size triple
SREP	Supervisory Review and Evaluation Procedure
SSM	Single Supervisory Mechanism

Table A2: Required capital and credit supply: all borrowers, restricted samples

This table contains estimation results from a regression relating various dimension of credit growth to (regulatory) capital ratios. More specifically, we run the following regression for seven different dependent variables: Credit Growth (Quarterly)$_{b,f,t}$ = β_1 * Actual Capital Ratio$_{b,t-1}$ + β_2 * Previous year Actual Capital Ratio$_{b,t-4}$ + β_3 * Required capital ratio$_{b,t-1}$ + β_4 * Previous year Required Capital Ratio$_{b,t-4}$ + γ * Bank Controls$_{b,t-1}$ + $\nu_{ILS,t}$ + $\epsilon_{b,f,t}$ Next to the variables of interest (of which the labels are reported in bold), the equation includes control variables. They are: the natural logarithm of total assets, quarterly growth in common equity, quarterly growth in deposits, quarterly growth in total assets and quarterly return on equity. All bank variables have been lagged one quarter such that they are in principle predetermined with respect to next quarter's credit growth at the bank-firm level. $\nu_{ILS,t}$ are *ILS* x *time* fixed effects that capture time-varying firm demand shifters. ILS allows for the inclusion of single-bank borrowers, by creating groups (for each quarter separately) based on firms their industry, size and location. We only include firm-quarter observations if a firm (ILS group) is in that specific quarter borrowing simultaneously from a bank with a decrease and a strict increase in required capital ratios. ν_b is a *bank* fixed effect. Standard errors are clustered at bank level.

VARIABLES	(1) Credit growth	(2) Large drop in credit	(3) New bank-firm relation-ships	(4) Utilization rate	(5) Credit growth - ST residual and LT initial	(6) Credit growth - LT residual	(7) Credit growth - Term Loans
Actual capital ratio	-0.165*	0.377*	0.185	0.0503	-0.482**	-0.0286	-0.145*
	(0.0768)	(0.192)	(0.128)	(0.143)	(0.204)	(0.0251)	(0.0772)
Previous year actual capital ratio	-0.0689	-0.0279	-0.132	-0.189*	-0.356	0.00401	-0.0445
	(0.0869)	(0.159)	(0.154)	(0.0966)	(0.442)	(0.0451)	(0.175)
Required capital ratio	-0.211**	0.433	-0.898**	-0.00648	0.362	0.00422	-0.234
	(0.0936)	(0.257)	(0.366)	(0.198)	(0.752)	(0.0385)	(0.151)
Previous year required capital ratio	-0.292***	0.633**	-0.944**	0.329	-0.0340	-0.0658**	-0.256**
	(0.0727)	(0.230)	(0.316)	(0.265)	(0.926)	(0.0224)	(0.103)
(lagged) log Total Assets	0.0275	-0.0938***	-0.452***	-0.0170	0.323	0.00461	0.0128
	(0.0201)	(0.0263)	(0.143)	(0.0133)	(0.278)	(0.00983)	(0.0317)
(lagged) Quarterly growth in Common Equity	-0.0420*	0.0323	0.0135	0.0495***	-0.220	-0.0112	-0.0766*
	(0.0232)	(0.0314)	(0.0155)	(0.0117)	(0.334)	(0.0161)	(0.0392)
(lagged) Quarterly growth in Deposits	0.00613	0.000294	-0.0554*	-0.0104	0.0641	0.0148*	-0.00786
	(0.00772)	(0.0160)	(0.0299)	(0.0146)	(0.345)	(0.00717)	(0.0143)
(lagged) Quarterly growth in Assets	-0.0240***	0.0764***	0.110***	0.0908***	0.0132	-0.0246*	0.0377
	(0.00748)	(0.0107)	(0.0330)	(0.0187)	(0.391)	(0.0127)	(0.0262)
(lagged) Return on equity	0.00821	-0.0135	-0.0599	0.0105	-0.305	0.0130	-0.0136
	(0.0179)	(0.0307)	(0.0510)	(0.00848)	(0.321)	(0.00966)	(0.0205)
Observations	2,985,820	2,985,820	3,065,149	3,065,149	661,694	1,765,854	2,211,135
R-squared	0.178	0.262	0.162	0.363	0.195	0.169	0.208
SAMPLE	all	all	all	all	all	all	all
Fixed effect 1	ILSxTime	ILSxTime	ILSxTime	ILSxTime	ILSxTime	ILSxTime	ILSxTime
Fixed effect 2	BANK	BANK	BANK	BANK	BANK	BANK	BANK
cluster	BANK	BANK	BANK	BANK	BANK	BANK	BANK
constant buffer effect ($\beta_1 + \beta_3$)	-0.38	0.81	-0.71	0.04	-0.12	-0.02	-0.38
p-value of test (constant buffer effect)	0.01	0.06	0.09	0.89	0.88	0.64	0.05
p-value of test (sum actual)	0.10	0.29	0.81	0.57	0.05	0.69	0.42
p-value of test (sum required)	0.00	0.03	0.01	0.46	0.84	0.25	0.04
p-value of test (jointly zero)	0.00	0.00	0.00	0.00	0.07	0.00	0.03

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