Higher Bank Capital Requirements and Mortgage Pricing: Evidence from the Countercyclical Capital Buffer (CCB)

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By CHRISTOPH BASTEN AND CATHERINE KOCH*

We examine how the CCB affects mortgage pricing after Switzerland was first to activate this macroprudential tool of Basel III. Observing multiple offers per request, we obtain three core findings. First, the CCB changes the composition of mortgage supply, as capital-constrained and mortgage-specialized banks raise prices relatively more. Second, risk-weighting schemes do not amplify the CCB effect. Third, CCB-subjected banks and CCB-exempt insurers both raise mortgage rates. To conclude, changes in the supply composition hint at the CCB's success in shifting mortgages from less to more resilient banks, but stricter capital requirements do not discourage banks from risky mortgage lending.

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* BASTEN: ETH Zurich and Swiss Financial Market Supervisory Authority FINMA; KOCH (corresponding author): Bank for International Settlements, Centralbahnplatz 2, 4002 Basel, Switzerland; Catherine.Koch@bis.org. We are grateful to *comparis.ch* for providing their data and to Katja Rüegg and Stefan Rüesch for the many helpful discussions about the data. Any views are those of the authors and may not be attributed to the BIS, Comparis, ETH Zurich or FINMA. For comments and discussions we would like to thank Urs Birchler, Martin Brown, Jill Cetina, Leonardo Gambacorta, Benjamin Guin, Mathias Hoffmann, Terhi Jokipii, Jongsub Lee, Reto Nyffeler, Steven Ongena, George Penacchi, Uwe Steinhauser and Kostas Tsatsaronis, as well as seminar participants at the BIS, Deutsche Bundesbank, the FDIC, FINMA, the GRETA Credit Conference, the Office of Financial Research in the US Treasury Department, the Swiss National Bank, and the Universities of Lausanne and Zurich. Any remaining errors are solely our responsibility.

1. Introduction

Macroprudential policies aimed at strengthening the resilience of the entire financial system are attracting considerable attention. One appealing reason is that macroprudential tools can serve as a complement to monetary policy in countries where central banks are committed to ensuring consumer price stability or adhere to a fixed exchange-rate regime. The new Basel III banking regulation features the *Countercyclical Capital Buffer (CCB)* as its dedicated macroprudential tool to protect the banking sector from the effects of the financial cycle (see Basel Committee, 2010). We provide the first empirical analysis of the CCB, as in 2013 Switzerland was the first country to activate it. To reinforce banks' defences against the build-up of systemic vulnerabilities, the CCB's activation increased their regulatory capital requirements. However, little is known about moderating side effects as higher requirements could also slow down or change the quality of credit growth during the boom and hence enable policy-makers to "lean against the wind". Policy debates on this question so far tended to focus on the CCB's effect on the quantity of *aggregate* credit growth. We aim to shift the angle of debate towards the quality, namely the *composition of lenders* and how tighter capital requirements interact with borrower risk traits: Does the CCB have the potential to shift lending from less to more resilient banks, and from more to less risky borrowers?

To answer these questions, our paper examines how the CCB affects the pricing of mortgages. Our unique dataset of an online mortgage platform allows us to separate mortgage supply from demand as each mortgage request receives several offers from multiple distinct lenders, and each lender offers mortgages to many different households with distinct borrower risk traits. To identify the CCB effect on mortgage supply, we exploit lagged bank balance sheet characteristics that render a bank more sensitive to the regulatory design of the CCB. To examine whether risk-weighting schemes that link borrower risk traits to capital requirements actually amplify the CCB effect, we use comprehensive information specified in the mortgage request. Finally we compare the mortgage pricing of CCB-subjected banks to that of CCB-exempt insurers which act as competitors on the supply side of the Swiss mortgage market. Our dataset of the online mortgage platform ensures that lenders submit independent offers that draw precisely on the same set of anonymized hard information as we observe, undistorted by superior knowledge or private, soft information.[1]

Three findings stand out. First, the CCB impacts the *composition of mortgage supply*. Once the activated CCB imposes higher requirements, *capital-constrained* banks with low *capital cushions* raise their mortgage rates relatively more. Further, after the CCB's activation, *specialized* banks that operate a very mortgage intensive business model per unit of equity capital do also raise their mortgage rates relatively more. In fact, the CCB applies to new mortgages as well as to the stock of all mortgages listed on a bank's balance sheet. We hence infer that banks attempt to roll over the extra capital costs of previously issued mortgages to their new customers. To assess the CCB's overall impact, both insights on changes in the *composition of mortgage supply* are indicative of whether the CCB achieves its goal to allocate mortgage volume to more resilient banks. Our second finding incorporates the borrower side and the effectiveness of common *risk-weighting schemes* that translate borrower risk into capital requirements for a bank. We find that banks do claim extra compensation for granting very risky mortgages in general, but risk-weighting schemes do not amply the CCB effects. Apparently, the link between borrower risk traits (like the LTV) and capital requirements is too weak to discourage banks from offering mortgages to high LTV borrowers after the CCB's activation.

[1] For the role of existing bank-client relationships in bank lending, see e.g. Puri et al (2013) and the papers cited therein.

Third, we broaden the scope of our sample to compare CCB-subjected banks with CCB-exempt insurers. We find that insurers raise prices as well after the CCB's activation. Thus, policy leakage effects in the sense of insurers underbidding the prices of banks to win market shares do not arise. Two lines of argument might rationalize this finding. On the one hand, insurers might follow an investment strategy that limits their mortgage issuance to an optimized share of their asset portfolio. On the other hand, insurers might interpret the CCB a signal from regulators that the mortgage market is more risky than previously revealed in mortgage rates.

Our paper contributes to the literature in four different respects. First, our empirical setup allows us to advance the understanding of the CCB effects as the macroprudential policy tool of Basel III in particular[2]. However, our insights on the CCB do also contribute to a better understanding of how higher capital requirements impact the pricing of loans to private households in general. Knowing how the CCB effect varies with bank characteristics should help policy makers in other jurisdictions to form more precise expectations about its effectiveness. Second, our dataset allows us disentangle mortgage supply and mortgage demand. By merging bank-level information to the respective offers, we can attribute changes in the composition of mortgage supply to distinct bank balance sheet characteristics that shape a banks reaction to the CCB. By contrast, a standard analysis based on mortgage contracts has a blind spot with respect to the spectrum of all offered (but non-concluded) rates. In order to assess whether the CCB renders a banking systems more resilient, it is however crucial to understand *which* types of banks offer the cheapest rates and are hence most likely to attract future customers. Third, our analysis informs the debate on the effectiveness of risk-weighting schemes. In general, risk-weighting schemes specify how borrower risk traits translate into bank-specific regulatory capital requirements. Our interaction of borrower risk traits with the CCB provides a test of whether

[2] A simulation of the effects has been carried out by Drehmann and Gambacorta (2012).

banks price risk-weighting schemes or whether these risk indicators just flesh out very risky mortgages inducing lenders to charge a risk premium independent from sanctioning risk-weighting schemes. Fourth, our comparison of banks with insurers allows us to track possible leakage effects of a regulatory measure that targets some market participants but may also have an indirect effect on other market participants.

Our paper is structured as follows. The remainder of this chapter reviews the relevant literature. Section 2 then sketches the institutional background of the Basel III regulation in general and the issuance and activation of the CCB in particular against the Swiss background. It then explains the CCB's regulatory design by help of a back-of-the-envelope calculation and develops four hypotheses on how the CCB's activation shapes the pricing of mortgages. Section 3 presents our dataset, the sequence of events and some descriptive statistics of our estimation sample. Section 4 translates our four hypotheses into four distinct regression specifications and presents their results. Section 5 concludes and discusses potential policy implications as well as possible avenues for future research.

1.1 Literature Review

As Switzerland was the first country to activate the CCB as macroprudential policy tool of Basel III, empirical evaluations do to the best of our knowledge not yet exist. Yet several strands of literature relate to our paper.

First, while there has been some work on the need for more countercyclical instruments as well as on possible conditioning variables (see for instance Drehmann et al, 2011), work on the effects of a CCB once implemented is very limited. Our paper builds upon the work by Aiyar et al (2012) and Jimenez et al (2012), who investigate policy measures that share some specific features of the CCB. Aiyar et al (2012) evaluate the effects of bank-specific capital requirements in the UK that used to vary counter-cyclically already since Basel I. They point out that if there exists a set of lenders to whom requirements do not apply, "policy leakage" effects might ensue and the purpose of counter-cyclical capital requirements may be defeated. This motivates our comparison of CCB-subjected banks with CCB-exempt insurers who act as competitors on the Swiss mortgage market. Aiyar et al also find that the effectiveness of counter-cyclical capital requirements depends on banks' existing capitalization, which motivates our first analysis. By contrast, Jiménez et al (2012) evaluate the effects of "dynamic provisioning" introduced by the Spanish regulator already in 2000.[3] Using observations at the bank-loan-firm level, Jiménez et al (2012) analyze the impact of these provisions on bank lending to firms. They find that the countercyclical provisioning rules did indeed help to smooth the Spanish credit cycle. More specifically on the CCB, Drehmann and Gambacorta (2012) run a simulation of the CCB effects on bank lending and find that the buffer can indeed slow down credit growth during booms and moderate a credit contraction once it is released.

Second, our paper relates to a literature on the more general effects of actual bank capitalization on bank lending. On the theory side, Boot et al (1993), Sharpe (1990), and Diamond and Rajan (2000) develop models that examine how equity capital should affect bank lending. Gersbach and Rochet (2012) build a simple model of bank lending and show that the volatility of lending can be reduced by requiring higher capital ratios in boom times. With respect to the regulatory framework, Repullo and Suarez (2004) investigate how the transition from Basel I to Basel II translates into changes in a theoretical loan pricing equation. On the empirical side, Kishan and Opiela (2000) stress that the degree of capitalization matters in that small and

[3] Crowe et al (2011) point out that counter-cyclical provisioning differs from countercyclical capital requirements in that provisioning requirements can be binding also when banks are already better capitalized than required by regulators.

less well capitalized banks respond most strongly to monetary policy. The impact of capital cushions or "excess capitalization" is also investigated by Gambacorta and Mistrulli (2004 and 2014). More specifically on the effects of regulatory capital requirements, several papers conduct mostly accounting-based quantitative impact studies (QIS) on the effect of capital requirements on loan pricing. These include Cournède and Slovik (2000), Elliot (2009), King (2010), Cosimano and Hakura (2011) and Hanson et al (2011).

Third, we contribute *loan-level evidence* to the literature on loan pricing started with the "dealership model" by Ho and Saunders (1981) and continued more recently by amongst others Saunders and Schumacher (2000) and Maudos and Fernandez de Guevara (2004). These papers investigate how banks price loans at a spread above the prevailing wholesale rate, depending inter alia on credit risk, interest rate risk, and bank capitalization. Being able to analyze pricing at the loan rather than bank level allows us to compare the pricing of different lenders while using request fixed effects to completely absorb borrower risk traits and hence make a valuable contribution to that literature, too.

2. The CCB and Expected Effects

To discipline its loan issuance, a bank has to hold a fraction of each granted loan as equity capital. This fraction depends on the presumed riskiness of the loan as the regulator intends the bank to "put skin in the game" and thus to prevent it from taking excessive risks. In the Basel standardized approach, these capital requirements, are specified as a fraction of risk-weighted assets and risk-weights in turn depend on the presumed riskiness of a loan. In particular, in the Swiss implementation of this standardized approach, risk-weights are a function of the customer's loan-to-value (LTV) ratio. This section introduces the CCB as an additional capital charge on top of the *minimum capital requirement* (MCR) and Pillar II requirements already in place under Basel II and the *capital conservation buffer* also imposed by Basel III. We then proceed to a brief back of the envelope calculation to suggest a rough estimate of how much extra cost the CCB imposes on a bank for a new mortgage. Finally, we develop four hypotheses that will guide our empirical approach.

2.1 The CCB and its first activation

The Countercyclical Capital Buffer (CCB) is the key macro-prudential tool of the Basel III banking regulation proposed by the *Basel Committee on Banking Supervision* (BCBS 2010a). It seeks to address the *pro-cyclical effects of* bank capital requirements implied by earlier sets of the Basel regulation. In that previous set of regulation, risk weights derive from the estimated probability of default which however tended to fall during periods of high credit growth.[4] Bank capital requirements made lending less expensive in periods in which growth was already high

[4] See for instance Gordy and Howells (2006) or Aikman et al (2014), as well as the relevant papers cited therein.

and vice-versa, thereby *reinforcing* the credit cycle. In response, the Basel Committee developed the CCB (BCBS, 2010b). As a macroprudential device, the CCB is not only geared to strenghtening individual banks on a standalone basis, but also to augment financial stability more generally. The Basel Committee (BCBS, 2010b) seems confident that by requiring banks to increase their risk-weighted capital ratios, the CCB can render them more resilient to potential loan losses when risks materialize and collateral values plunge during a downturn. By contrast, there appears to be more uncertainty on the CCB's potential to support regulators in their attempt to "lean against the wind" by increasing the cost of lending and hence slowing down credit growth during a boom.[5,6]

The first activation of the CCB worldwide occurred in Switzerland. On June 1, 2012, the Federal Council adopted the Basel III regulation through a revision of the "Capital Adequacy Ordinance" (CAO), one year after the issuance by the BCBS. This legal act included the option for the government to activate a CCB from July 2012 onward, while all the other Basel III requirements officially went into force on January 1, 2013. The CCB option was then exercised on February 13, 2013. As Section 4 points out, we exclusively focus on the effects of the *activation* rather than those of the CCB becoming a policy *option*. In each country the CCB becomes a legal option only once, whereas the activation may be exercised and adjusted whenever deemed appropriate. In deviation from the general Basel III framework, the Swiss authorities restricted that activation to those assets that are secured by domestic residential property. They calibrated it to 1% of those risk-weighted mortgages and granted banks a

[5] By contrast, Article 44 of the Swiss Capital Adequacy Ordinance (CAO), which regulates the Swiss implementation of Basel III, attributes equal weight to both objectives.

[6] There has also been a lively discussion on appropriate indicators to suitably time the activation and release of the CCB. Instead of reflecting this discussion, we refer the reader to Drehmann and Tsatsaronis (2011) and the references therein.

transition phase ending on September 1, 2013.[7] Most central to our analysis, the CCB as designed in Switzerland applies to all mortgages that a bank has previously concluded and that it lists on its balance sheet as well as all new mortgages that a bank is going to conclude. Furthermore, note that the CCB applies to all banks contained in our sample, including subsidiaries of foreign banks.[8,9.] Section 3.2 describes the precise timing of events which sets the background of our empirical analysis. The Online Appendix contains more detailed information on the Swiss mortgage market and other equity capital regulation compulsory for Swiss banks

2.2 Back of the Envelope Expected Effects

As all banks in our sample are regulated under the Basel Committee's *Standardized Approach,* we can sketch a common back-of-the-enveloppe estimate for their credit risk charges[10]. In the Swiss implementation of that approach, the risk weights for residential mortgages only vary with a mortgage's loan-to-value (LTV) ratio. Figure 1 illustrates a back of the envelope calculation for a bank that intends to make a mortgage worth CHF 1mn. According to the Swiss National Bank (SNB), the market-wide average risk weight per mortgage in Switzerland lies at 40% which corresponds to a loan-to-value (LTV) ratio of about 77% (see SNB, 2012). This leads to a *risk-weighted* mortgage amount of CHF 400'000. The CCB's first activation requires all banks to hold additional CET 1 capital instead of debt worth 1% of *risk-weighted* assets. The CCB hence prompts a bank to replace debt worth CHF 4'000 by equity capital finance. If the Modigliani and Miller (1985) Theorem holds, so that equity capital and debt finance are equally costly, a bank's

[7] About a year later, in January 2014, that requirement was furthermore raised to 2%, to be fulfilled by July 2014. But this increase in the CCB's requirements is not subject to our analysis for lack of data on the subsequent period.

[8] By contrast, foreign branches would not yet be covered, as full reciprocity has not yet been implemented. However, foreign branches do not play a significant role in the Swiss mortgage market and no branch enters our sample.

[9] For further details on the adoption of the Basel III regulation and the first activation of the CCB, see also FINMA (2012a), FINMA (2012b), SNB (2013a) and SNB (2013b).

[10] Switzerland's two big banks, UBS and Credit Suisse, follow the Internal Ratings Based (IRB) approach, but they are not included in our sample.

total funding costs are unaffected by the CCB's imposed liability substitution.[11] However, if by contrast capital is more costly than debt financing, Modigliani and Miller (1985) is not valid, a bank has to bear the diffence between the cost of equity capital and debt. We thus have to multiply those CHF 4'000 with this cost differential called X in Figure 1. If that cost differential amounts to for example 10%, then the CCB would on average imply additional funding cost of CHF 400, or 4 basis points when set in relation to the requested total mortgage amount.

When now facing the mortgage market, a bank has three options to deal with the CCB's imposed extra cost. First, it can add less than those 4 bp to its previously charged mortgage rates and incur part of the extra cost itself in an attempt to underbid competitors. Second, it can add exactly this amount and thereby pass on the entire extra cost to the customer. Third, it can add more than this amount to its previously charged mortgage rates for three reasons. According to the first reason, banks that specialize in mortgage lending, carry a balance sheet burden as the CCB applies to existing and new mortgages. In this sense, a bank might pass on not only the additional cost for the new mortgage itself, but it might attempt to roll over part of its extra cost burden that ensues from on-balance sheet mortgages whose rates having been concluded in the past. The second reason suggests that a bank might welcome this opportunity to boost its profits as customers expect that mortgages become more expensive because of the CCB. A bank can use these higher profits to strengthen its capital base by retained earnings instead of paying higher dividends to its owners. The third reason suggests that a bank might interpret the CCB as the regulators waving a red flag to signal considerably more credit risk in the market than previously

[11] Junge and Kugler (2013) find for a sample of five publicly listed Swiss banks that the elasticity between a bank's leverage and its CAPM-β is about 55% of what it would be if the Modigliani-Miller theorem did fully hold. Furthermore, in their analysis of the extra costs of Basel III, they estimate a cost difference of 4.66% using the annual return of the Swiss SPI stock market index and the 12-month CHF LIBOR rate for 1990-2010.

priced in the mortgage rates. Such a bank will add a risk premium to its previously charged mortgage rate after the CCB's activation.

Thus, specific balance-sheet characteristics render a bank more sensitive to the CCB's imposed extra capital. In the following we derive four specific hypotheses that we are going to test.

2.3 Developing four Hypotheses and One Alternative Mechanism

Capital-Constrained Banks with low Capital Cushions (Hypothesis 1a)

An increase in regulatory capital requirements reduces the "capital cushion" between a bank's actual and required capital ratio. Indeed, Berger et al. (2008) find evidence that US banks set targets for "capital cushions" to ensure that they do not accidentally violate the requirements. [12] A bank's response to the CCB should hence depend on its capitalization before the CCB's activation. To restore its "capital cushion" after the CCB's activation eat up part of it, a bank can either raise capital or constrain new lending or both. Our paper focuses exclusively on the immediate CCB effect on mortgage *pricing* as opposed to whether or not banks make an offer. We do so for three reasons[13]. First, a bank can strengthen its capital base by demanding higher mark-ups which result in higher profits such that higher retained earnings over some period ultimately restore the "capital cushion". This way of raising capital hence also operates through an immediate price increase. Second, any other way of raising equity capital for instance by asking shareholders is a more time-consuming undertaking and most unlikely to happen in the short run. Third, as argued by Allen and Saunders (2012), banks stand ready to absorb every risk at an appropriate price. In line with this, Edelberg (2006) finds that since the introduction of risk-

[12] Similar results are obtained for European banks by Jokipii and Milne (2011). They speak of "capital buffers", while Berger et al speak of "capital cushions" and Gambacorta and Mistrulli (2004) speak of "excess capital". We follow Berger et al and speak of "capital cushions".

[13] We explicitly address this issue in the Online Appendix by testing whether customers receive more rejections after the CCB's activation. Our results suggest that there is no significant difference.

based loan pricing US banks respond to loan requests from high-risk applicants by offering higher rates as opposed to making outright rejections. In our context, "constrain lending" hence translates into a bank raising mortgage rates instead of submitting more outright rejections.[14] This leads us to our first hypothesis on the sensitivity of mortgage supply.

Hypothesis 1a: Banks with lower capital cushions raise mortgage rates relatively more in response to the CCB's tighter capital requirement.

Specialized Banks (Hypothesis 1b)

The CCB as designed in Switzerland exclusively addresses residential mortgage lending while sparing other bank businesses. However, it applies to all residential mortgages on balance sheets and hence bites more into the equity of banks with a high share of mortgages to total assets. Yet, the rates on mortgage contracts concluded in the past cannot easily be adjusted to the CCB's increased capital requirements[15]. For this reason, we expect that banks with a very mortgage intensive business model per unit of equity respond more strongly to the CCB's activation. However, before the CCB's activation, economies of scale might have induced mortgage-specialized banks to charge lower prices relative to their competitiors. This leads us to our second hypothesis on the sensitivity of mortgage supply.

Hypothesis 1b: Specialized banks with a mortgage-intensive business model per unit of equity raise mortgage rates relatively more after the CCB's activation.

[15] While some banks in Switzerland issue contracts that allow them to change also fixed rates when "regulatory costs" change, doing so in practice is reported to be difficult for reputational reasons.

Hypotheses 1a and 1b address the composition of mortgage supply. Both of our sensitivity measures relate to a bank's exposure to the CCB's regulatory design. Our hypotheses go beyond some average aggregate CCB effect and instead shed light on characteristics of a bank that determine its offered rate. A standard analysis of the concluded rates on mortgage markets has a blind spot with respect to the spectrum of all offered rates as only one rate will be concluded. To assess the overall impact of the CCB, however, insights on the composition of mortgage supply reveal whether the design of the CCB proves effective in that it allocates mortgages to more stable banks and hence renders the system more resilient.

Do Risk-Weights linked to LTV ratios amplify the CCB? (Hypothesis 2)

Risk-weighting schemes on a bank's assets that are associated with the LTV ratio of a requested mortgage might amplify the effect of tighter capital requirements imposed by the CCB. Figure 3 illustrates how risk-weighting schemes translate the individual customer's loan-to-value (LTV) ratio into capital requirements for the offering bank and thereby link the riskiness of the mortgage to the capitalization of a bank. The tranche of a mortgage above a customer's LTV ratio of two-thirds (66%) receives a risk weight of 75%, while the mortgage tranche with LTV ratios below two thirds receives only a risk weight of just 35% (see FINMA, 2013). The top tranche above the LTV ratio of 80% receives a risk weight of 100%.[16] Hence, risk-weighting schemes put an extra capital levy on mortgages with LTV ratios above 66% and again with LTV ratios above 80%. As the CCB requirement is specified as 1% of risk-weighted assets, we expect banks to claim extra compensation for granting these more capital-consuming mortgages in general and

[16] Basel II implied a default risk-weight of 35% for residential mortgages given "strict prudential lending standards" and mandates national authorities to impose higher risk weights when such standards are not met. The risk-weighting scheme illustrated in Figure 3 reflects the Swiss implementation of those more general principles applicable during our sample period. For details, see FINMA (2013a)

even more so after the CCB imposes higher capital standards. [17] This leads us to our third hypothesis on risk traits of the mortgage demanding customer.

Hypothesis 2: Risk-weighting schemes linked to the LTV ratio of a mortgage amplify the CCB effect and *lead to a relatively larger increase in mortgage rates for borrowers with LTV ratios above* 66% *and for yet a larger increase for LTV ratios above 80%.*

Banks and Insurers as Competitors on the Mortgage Market: Leakage Effects? (Hypothesis 3)

So far we have focused on the behavior of banks in isolation. We now broaden the scope to the entire supply side as two types of lenders offer mortgages in Switzerland: banks and insurers. Our next hypothesis deals with the mortgage pricing of insurers, which are exempt from the CCB's tighter capital requirements[18], but offer mortgages in the same market as CCB-subjected banks. In fact, insurers might anticipate banks to raise prices, making insurers' offers relatively more attractive and hence shifting out the residual demand curve faced by insurers. Two scenarios might arise. On the one hand, insurers might seize this opportunity to underbid banks and hence expand their market shares ("policy leakage"). On the other hand, insurers might prefer to keep their market share constant for the following reason: To accommodate the maturity structure of their liabilities, insurers might tailor their mortgage issuance to the fit of one distinct asset class to an optimized, well-diversified, low-risk portfolio. These portfolio limits might induce insurers to raise their prices in parallel with banks and thereby implicitly boost their profits per unit of

[17] Higher credit risk is also implied by higher Loan-To-Income (LTI) ratios. In our regressions we implicitly control for those.

[18] Note that the relevant mortgage regulation for insurers has not changed during our sample period. It is specified in FINMA (2013b) and sets the same incentives for faster repayment of the LTV>2/3 portion as exists for banks: It only as long as the portion above an LTV ratio of two-thirds is being amortized, any mortgage lending until an LTV of 80% can be fully counted for computing insurers' "tied assets". Hence for insurers we would not expect a discontinuity in costs at the two-thirds LTV as for banks, but we would expect a discontinuity at the 80% LTV.

lending instead of winning market shares from banks. [19] We establish the second line of argument as our last hypothesis on mortgage supply.

Hypothesis 3: *CCB-exempt insurers tailor their mortgage issuance to self-imposed optimal portfolio limits that in turn induce them to raise their mortgage rates instead of winning market shares from banks.*

Hypothesis 3 again speaks to the composition of mortgage supply. The observed rate of a market outcome remains silent about the spectrum of submitted offers by individual lenders as the borrower just picks one lender. For this reason, a standard analysis of the average aggregate rate would not be able to detect that some types of lenders have raised their rates relatively more than others.

Alternative Mechansim: The CCB as a Signal about Credit Risk

These four hypotheses all deal with restrictions that either banks or insurers seek to comply with. In addition, one might imagine a *signaling mechanism* being at work by which lenders suddenly change their risk perception. When the regulatory authorities activate the CCB, all types of lenders might interpret this as the regulator waving a red flag to signal considerably more credit risk in the market than previously priced into mortgage rates. In this sense, mortgage rates charged by both types of lenders might jump to account for this previously underestimated risk premium.Banks with small capital cushions or high mortgage market exposure should be more responsive to a reassessment of credit risk, such risk should matter relatively more for high-LTV

[19] The resulting behavior is analogous to that under Bertrand price setting with capacity constraints, see e.g. Mas-Colell et al (1995), Ch. 12G

customers, and insurers should care about the risk as much a banks We cannot explicitly test the signaling mechanism. Instead, we assume that it might reinforce the behavioural patterns described in our hypothesis but that it does not play a dominant role on its own.

3. Data and Sample Period

3.1 Unique Empirical Features of the Comparis Online Mortgage Platform

Our data on mortgage requests and offers originate from the Swiss online platform "comparis.ch". Comparis gives Swiss consumers the opportunity to compare prices of various financial services, some for free and some against a small fee. To compare prices of mortgages, customers pay CHF 148 (about USD 160 as of 2014) and submit comprehensive information on the real estate property to be bought, their household finances and the requested mortgage amount and maturity model. Comparis sends the anonymized request to different banks from all major banking groups (except for the two big banks) as well as several insurance companies which both generally constitute the Swiss mortgage supply side. Having screened the customers, mortgage lenders then decide whether to make a binding offer and at which mortgage rate and conditions. Indeed, lenders have an incentive to submit competitive offers while knowing that customers will most likely have a choice among on average almost five independent offers from different banks and insurers. These offers vary by mortgage interest rate, while lenders cannot deviate from the requested mortgage amount.[20]

This dataset forms the backbone of our paper and it has several remarkable features that suit our empirical analysis. First, it allows us to distinguish between mortgage demand and supply. In

[20] In some cases, banks offer a shorter maturity or a variable rate for a small part of the mortgage. We repeat our estimations on all offers without composite mortgages altogether and find that this does not alter our core results.

particular, we observe *several* distinct offers by lenders on the supply curve for each unique mortgage demand request that appears only once in our dataset. Second, we are able to observe both the willingness to make a loan (like for instance Jiménez et al 2012) and its pricing. Third, all lenders receive the same anonymized information, but cannot make their offers depend on soft information or considerations of relationship lending. Fourth, lenders do neither know which competitors participate nor do they observe the details of their competitors' offers. These features assure that lenders submit binding offers that truly reflect their eagerness to bid for the mortgage without distorting aspects of competition or superior knowledge. Fifth, since the request is costly and since offers are binding conditional on verifiable information, customers have an incentive to submit correct information. Sixth, our data set contains lenders from all Swiss banking groups (except for the two big banks[21]) which are all subject to the CCB, as well as insurance companies which are exempt from the CCB.

To avoid any distortions from different lenders bidding for different maturity models, we restrict our view to 10 year fixed rate mortgages which account for more than half of the requested mortgage models (see our companion paper Basten and Koch 2014]).[22] While some offers carry only a single rate for the entire mortgage, others carry different rates for different tranches. In that case we compute the tranche-weighted average mortgage rate for each offer.

[21] For the two Globally Systemically Important Banks (GSIBs) UBS and Credit Suisse, domestic mortgage lending is not a core business activity and furthermore their risk weights and hence capital requirements are computed using the Internal Ratings Based (IRB) approach rather than the Basel Standardized Approach (SA) described in this paper and used by all other banks.

[22] We repeat our analyses with the 2nd most frequent category of 5 year fixed rate mortgages. This yields very similar results, which are available upon request.

3.2 Our Sample Period and the Sequence of Events

We focus on a period of 15 months around the CCB's activation that caught Swiss mortgage market participants by surprise against an otherwise stable regulatory environment. Figure 2 illustrates our sample period from July 1, 2012 to October 24, 2014 and the sequence of regulatory events in Switzerland. On 1 June 2012, the revision of the *Swiss Capital Adequacy Ordinance* (CAO) creates the legal basis for a CCB, making it a policy option available from July 1, 2012 onwards. Yet, the CCB was only activated on February 13, 2013.

Also on 1 June 2012, the CAO revision specifies the details of other Basel III elements that became effective on January 1, 2013. We expect these regulatory changes to start exerting any potential effects on mortgage pricing at the latest from the point in time when they had definitely been decided on, on 1 June 2012. [23]

Two additional changes in the Swiss mortgage market regulation become effective on July 1, 2012. Indeed, also on 1 June 2012 the Swiss Financial Market Supervisory Authority FINMA declares the Swiss Bankers Association's self-regulation as a new minimum standard applicable to all banks. It brings about two major revisions. First, the Loan-to-Value (LTV) ratio must be reduced to at most two-thirds within at most 20 years. Second, home buyers must provide at least 10% of the house value as "hard equity", i.e. own resources not taken from households' pension funds. [24] Further references on this self-regulation are available in the Online Appendix.

Given these concomitant events, our sample starts in July 2012 against a from that point on stable regulatory environment. In fact, our paper investigates the impact of the actual CCB *activation* after the CCB becoming available as a policy *option*. After the implementation of

[23] In an attempt to minimize costs, banks most likely start adjusting as soon as binding information becomes available. Note however that this assumption is not crucial for our identification of the CCB effects, as fixed effects absorb any remaining common effects.

[24] By contrast, Swiss mortgage market regulation does to this day not take any references to other common mortgage risk indicators like the Loan-to-Income (LTI), Debt-Service-to-Income (DSTI), or Payment-to-Income (PTI) ratio.

Basel III and the *CCB option* in Swiss law, uncertainty governed the mortgage market for about half year. Then on February 13, the announcement of the CCB's activation caught mortgage market participants by surprise. Hence, the period from July 1, 2012, to February 12, 2013 (denoted as CCB=0) serves as our control period, and the period from February 13, 2013 until the end of our data (October 24, 2013)[25] as CCB=1 serves as our treatment period. Our research questions go beyond some average aggregate CCB effects. Instead, we focus on how key characteristics of lenders and borrower risk traits impact mortgage pricing after the CCB's activation.

3.3 Descriptive Statistics

Table 1 presents our database in terms of demand and supply participation based on the entire sample featuring the offers of banks and insurers. Column (1) refers to the period CCB=0 starting on July 1, 2012, while Column (2) ranges from the activation of the CCB on February 13, 2012 until the end of our sample on October 24, 2013 (CCB=1). Our data on mortgage demand show that the number of requests declines slightly over time. We attribute this to the fact that initially Comparis was the only major online mortgage platform in Switzerland, whereas other platforms went online later, too. However, the average LTV remains at about 65%, such that the composition of applicants appears to be stable over time[26]. To absorb any aggregate changes that might affect all lenders, we include request fixed effects to analyze mortgage supply and monthly time fixed effects to analyze borrower risk traits in our empirical analysis below.

[25] In November 2013 Comparis decided to move from a fully automated model of mortgage intermediation to one involving client advisors, so that later observations would no more be fully comparable to earlier ones.

[26] We also run a difference in means test to check whether the LTV ratios of customers that banks and insurers send offers to change over time. Our results in the Online Appendix do not find a significant difference between both periods.

Turning to mortgage supply, Table 1 shows that customers receive on average 5.9 (=3873/661) answers in the period before the CCB activation and 4.8 (=2461/516) answers after it. Most importantly, the shares of offers and rejections relative to the total number of answers are fairly stable over time. On average, 85.54% of received answers are offers before the activation of the CCB and 87.2% after it. Table 1 also suggest that both banks and insurance companies charge higher rates in later periods. Section 4.4 returns to the issues of average offered interest rates and accepted LTV ratios in more detail.

The structure of our dataset is no doubt unique in the analyses it allows us to conduct. But the question arises whether this dataset is actually representative of the entire Swiss mortgage market. Our Online Appendix offers a host of comparisons and tests based on publicly available statistics on the entire Swiss market. These analyses confirm that the data are representative both in terms of the borrower side (geographical distribution, risk traits, etc.) and in terms of the supply side.

Table 2 shows our descriptive statistics on the sample of bank offers only while relating to Sections 4.2 and 4.4 of our empirical analyses below. In the upper panel, Table 2 gives customer traits of the requests to which banks respond with an offer. The mean offered mortgage rate amounts to 208 bp and the mean indicated LTV ratio by the customer lies at 65%. Note that in the first panel the indicated borrower request characteristics are "inflated" insofar as this sample draws on multiple offers per individual request. The second panel gives the bank sensitivity dummies, while the third panel refers to the underlying ratios. Table 2 indicates that banks report a capital cushion of 40.58%. Banks further invest 974.40 CHF into mortgage lending per 1 CHF of equity. The average share of liquid assets to total assets amounts to 5.45%.

4. Empirical Analysis

After giving some conceptual background, this section presents the empirical approach and results structured by our four hypotheses. Subsection 4.1 decomposes the mortgage interest rate in line with the "dealership model" of banking. Subsection 4.2 focuses on mortgage supply to analyze which specific balance-sheet characteristics render a bank more sensitive to the CCB's regulatory design. Subsection 4.3 turns to borrower risk traits of mortgage demand to assess the effectiveness of risk-weighting schemes that might amplify the CCB effects. Subsection 4.4 compares the responses of respectively banks and insurers.

4.1 Decomposing the Mortgage Interest Rate

The CCB affects the offered mortgage rate via two separate channels, one reflecting a bank's sensitivity that ensues from balance sheet characteristics, the other capturing the risk traits of the borrower demanding a mortgage. We have previously laid out how the CCB's tighter capital requirements prompt a bank to replace debt by equity capital finance and thereby might increase mortgage rates if Modigliani and Miller (1985) was not valid. To implement this idea empirically, we now build on the classic *dealership model* originated by Ho and Saunders (1981) that was extended more recently by amongst others Saunders and Schumacher (2000) and Maudos and Fernandez (2004). In this framework, banks set loan rates r_L at a spread above the prevailing wholesale market rate r. In fact, any deposits not turned into loans would need to be invested in the wholesale market, hence the prevailing wholesale market rate gives the opportunity cost of lending. Indeed, Ho and Saunders (1981) focus on interest rate risk only. In an extension, Maudos and Fernandez (2004) point out theoretically and empirically that the spread above the wholesale rate and hence also the loan rate are increasing not only in interest rate risk, but also in credit risk. Furthermore, the loan rate is increasing in a bank's capitalization, although Maudos and Fernandez interpret capitalization merely as a proxy for a bank's risk aversion. By contrast, Saunders and Schumacher (2000) point out that banks may choose higher capital ratios not only because of economic risk aversion, but also to comply with regulatory requirements (like the CCB). Either way, higher capital ratios imply higher loan rates are costly if Modigliani and Miller (1985) does not hold. In this vein, a bank that holds a "capital cushion" might try to recover the additional cost by adding a premium to the spread for interest rate risk (termed "pure spread" in Ho and Saunders ,1981). This leads us to the following equation that is tailored to the structure of our dataset and to the hypotheses we wish to test:

$$loanrate_{ij} = swaprate_{i} + credit\_risk_{ij} + bank\_residual_{ij} \quad (1)$$

The loan rate offered by bank *j* to customer *i* depends on the *swap rate* featuring the opportunity cost on the wholesale market at that point in time[27]. further depends on the *credit risk* that bank *j* associates with the riskiness of the borrower *i*.[28] As credit risk connects the borrower risk traits with the individual capital requirements of a bank, it carries an *i* and a *j* subscript. Here the CCB's additional capital charge comes into play, because extra equity capital worth 1% of the risk-weighted mortgage amount translates into higher *cost of equity capital* in Equation (1). As the average risk weight in turn increases with higher LTV ratios, risk-weighting schemes might amplify the CCB effect (Hypothesis 2 above). The *bank residual* in Equation (1) captures bank *j*'s operating costs as well as a targeted mark-up over marginal costs with respect to request *i*.

[27] As each unique request appears only once in our dataset it pertains to a specific point in time. The chronological sequence of all requests hence constitutes a time series that allows us to abstract from a time index in Equation (1). When addressing mortgage supply, our empirical analysis will later use request fixed effects that implicitly capture time fixed effects. When addressing mortgage demand traits, we cannot use request fixed effects anymore and resort to the swap rate plus monthly time fixed effects that nest all requests within each month. February 2013 is split into pre and post activation part and thus receives two month fixed effects.

[28] *Credit risk* features two cost components: first, the *cost of the expected loss (EL)* linked to the new loan and second the *cost of holding equity capital* that captures any *unexpected* losses linked to the new loan.

Indeed, the CCB requires banks to hold extra equity capital worth 1% of all issued risk-weighted mortgages. According to our Hypothesis 1a, banks with a low capital cushion will hence exhibit a stronger response to the CCB. Each bank hence has to cope with a burden of extra costs that ensues from mortgages listed on its balance sheet that have been contracted in the past. In this sense, the CCB ceteris paribus squeezes mark-ups, especially for banks with a mortgage-concentrated asset portfolio. In an attempt to restore its mark-up, a bank can raise its mortgage interest rate as put forward by Hypothesis 1b.

To sum up, the CCB effect on a bank's offered mortgage rate runs through two separate channels: first via the *residual* addressing a bank's balance sheet characteristics, and, second via the *credit risk term* addressing the borrower risk traits of the currently requested mortgage. Our analysis disentangles both channels while first elaborating on the bank balance sheet's sensitivity to the CCB and then turning to individual borrower traits that interact with the CCB.

4.2 Sensitivity Measures of Bank Balance Sheets

The regulatory design of the CCB might render *capital constrained* and *specialized* banks particularly sensitive to the CCB's increased capital requirements. This subsection on the mortgage supply of banks introduces our estimation approach to test Hypotheses 1a and1b. It hence discusses two bank balance sheet characteristics that might increase a bank's sensitivity to the CCB and tests it against one placebo measure that should not interact with the CCB at all.

4.2.1 Sensitivity Measures Estimation Approach

Equation (2) describes our estimation procedure with the tranche-weighted mortgage rate $rate_{ij}$ offered by bank *j* to requesting borrower *i* as dependent variable.

$$rate_{ij} = \alpha_1 + \beta^{sens}{}_{11} sens_{j,201x} + \beta^{sens}{}_{12} ccb_i * sens_{j,201x} + FE\_request_i + FE\_lender_j + \varepsilon_{ij}$$

(2)

In fact, Equation (2) unfolds the *bank_residual*$_{ij}$ of Equation (1). More specifically, to study whether bank characteristics render a bank more sensitive to the CCB shock, we let the bank-level sensitivity indicator $sens_{j,201x}$ and its interaction with the CCB shock dummy ccb_i enter our estimation. To mitigate endogeneity concerns, we use lagged time-varying sensitivity measures taken from the respective bank's annual public report of the previous year, i.e. bank-level data of 2011 for all offers to requests submitted in 2012. Further, individual lender (j=1, …, J) fixed effects should absorb *time-invariant* heterogeneity among banks. To absorb borrower risk traits, we also add request (i=1, …, I) fixed effects $(FE\_request_i)$ to our specification. As each request *i* appears exactly once in our dataset, it pertains to a unique point in time, time fixed effects are redundant. We compute heteroskedasticity robust standard errors, but do not cluster them by bank as the number of clusters would be too low, the cluster size differs considerably across lenders and we use lender fixed effects. [29] [30]

To address the bank-specific residual, we study capitalization and specialization as bank balance sheet characteristics that potentially render a bank more sensitive to the effects of the CCB. As a placebo, we also study the role of liquidity, which we would expect to impact the rate itself, but not to interact with the CCB.

<u>*Capital-Constrained* Banks with low Capital Cushions (Hypothesis 1)</u>

[29] See Petersen (2009) for a general discussion on the computation of standard errors in finance panel data sets.

[30] As a robustness check, however we cluster standard errors by request.

First, we look at the role of *capital cushions*, defined as the percentage deviation of a bank's actual capital ratio (total capital as a percentage of risk-weighted assets) from the capital ratio below which the supervisor would intervene.[31] [32] To make our estimates robust to such differences, our regressions include not the continuous measure of the capital cushion, but a *"Constrained"* indicator of whether a bank's cushion is below or above the median value for all banks in a given year.

Banks with comfortable capital cushions have more degrees of freedom. We therefore anticipate that banks with a small capital cushion deemed *constrained* in our framework on average charge higher rates ($\beta^{constrained}{}_{11} > 0$). When the CCB introduced an additional capital charge, these banks became even more constrained charging even higher rates as a compensation for granting a mortgage ($\beta^{constrained}{}_{12} > 0$).

Specialized Banks with a Mortgage-Intensive Business Model per Unit of Equity Capital (Hypothesis 2)

Mortgage-specialized banks, defined as banks whose ratio of mortgages to equity capital lies above the median of all banks, might be more sensitive to the CCB's particular design in Switzerland. These banks can pass their gains from economies of scale on to their customers by charging lower mortgage rates ($\beta^{specialized}{}_{11} < 0$). As the CCB applies to all residential mortgages listed on balance sheets, it bites even more into the equity capital of banks reporting a high share of mortgages relative to equity capital. For this reason, we expect that mortgage-specialized banks respond more strongly to the CCB's activation ($\beta^{specialized}{}_{12} > 0$).

[31] The intervention threshold in Switzerland differs across five risk categories, into which the supervisor has allocated banks depending on amongst others a bank's total assets. For details, see our Online Appendix and the references therein.

[32] Given data availability in public annual reports, we use the total capital ratio, but acknowledge that for some banks total capital cushions and Tier 1 capital cushions may be of different size.

Liquid Banks

We use liquidity as a kind of placebo measure. The liquidity of banks' asset structures should not matter for the effect of the CCB on mortgage pricing. We define *liquid* banks as those reporting a ratio of liquid assets to total assets above the median of all banks. In general, less liquid banks might only be willing to make a mortgage, if they are highly compensated as they risk running into illiquidity problems. We hence expect a negative coefficient on the liquidity indicator ($\beta^{liquid}{}_{11} < 0$), but an insignificant interaction term ($\beta^{liquid}{}_{12} = 0$).

4.2.2 Sensitivity Measures Results

Table 3 displays our estimation results on testing *Hypotheses 1a and 1b* related to mortgage supply characteristics. We regress the offered mortgage rate on the different balance sheet sensitivity measures and their interactions with the *CCB* dummy indicating the activation of tighter capital requirements. Based on the full sample, Columns (1) through (3) focus on each sensitivity measures in isolation, whereas Column (4) exhibits the joint estimation. Columns (5) and (6) report subsamples of new mortgages and rollover requests as a robustness check of the joint estimation.

Results in Columns (1) and (4) point out that *capital-constrained* banks *raise* their rates relatively more after the CCB's regulatory shock to capital requirements than do their unconstrained peers. In line with the joint estimation, these constrained banks now charge on average 2.72 bp more which reflects their tradeoff between approaching the now even closer intervention threshold and forgoing additional profits. The simple *constrained* indicator is not statistically significant in either estimation.

Results in Columns (2) and (4) reveal that banks that *specialize* in the mortgage business increase their mortgage rates after the CCB's activation by on average 5.57 bp relative to non-specialized competitors. The higher capital requirements force banks to hold more equity capital for each mortgage already on their balance sheets. Some of that additional cost on their existing portfolio is hence passed on to new customers. Again, the simple *specialized* indicator is insignificant in both regressions. We hence find that *constrained* and *specialized* banks raise prices relatively more and leads us to conclude that we cannot reject Hypotheses 1a and 1b.

As previously mentioned, the *signaling mechanisms* might even reinforce the effect of these characteristics. *Constrained* and *specialized* banks might change their risk perception relatively more as they are particularly exposed because of lower capital cushions or a business focus on an asset class whose risk premiums have been underestimated.

The third bank balance sheet measure acts as a placebo. Our results in Columns (4) reveal that the interaction effect turns insignificant in the joint estimation, while only the simple l*iquid* indicator carries a negative and significant coefficient. The regulatory design of the CCB, however, does not touch on any aspect of liquidity. Hence, more liquid banks offer mortgage rates which are on average 4.21 bp cheaper than their competitors', but the interaction effect with the CCB is insignificant.

Our subsample regressions of Columns (5) and (6) replicate the joint estimation. New mortgages clearly drive our previous findings as they constitute more than 60 percent of the observations and their numerical estimates increase in absolute size. Rollovers, however, differ in that *constrained* banks charge much higher prices on rollovers per se, but there is no reinforcement after the CCB. Remarkably, both subsamples confirm that *specialized* banks raise their rates relatively more once the CCB imposes tighter capital requirements. To further assess the robustness of these findings, we run some additional tests. First, we drop the lender fixed effects, second we cluster standard errors by request. The Online Appendix reports our results which again replicate our previous findings.

In brief, we cannot reject Hypotheses 1a and 1b that *capital-constrained* as well as *mortgage-specialized* banks raise their mortgage rates relatively more. We hence infer that the composition of mortgage supply changes in that banks with a higher exposure to the CCB's regulatory design substantially adjust their mortgage pricing. We highlight these two results as core findings of our paper.

4.3 Do Risk-Weighting Schemes linked to LTV ratios amplify the CCB?

This subsection unfolds the request-level dimension to study whether LTV thresholds that are associated with risk-weighting schemes of a bank's assets amplify the effect of tighter capital requirements imposed by the CCB. We hence provide a formal test of Hypothesis 2 on risk traits of mortgage demand and the effectiveness of risk-weighting schemes.

4.3.1 Risk-Weights Estimation Approach

To examine the impact of risk-weighting schemes before and after the CCB's activation, we now focus on the *credit risk* term of Equation (1). The swap rate now enters our estimation equation explicitly and lender fixed effects absorb time-invariant bank characteristics.

$$\begin{aligned} rate_{ij} &= \alpha_2 + \beta_{21} ltv_i + \beta_{22} ltv67_i + \beta_{23} ltv80_i + \beta_{24} ccb_i * ltv67_i + \beta_{25} ccb_i ltv80_i \\ &+ \gamma_{20} refin_i + \gamma_{21}' CUSTOM_i + FE + \varepsilon_{ij} \end{aligned} \quad (3)$$

Equation (3) describes our new estimation approach. We regress the tranche-weighted mortgage rate $\left(rate_{ij}\right)$ offered by bank *j* to requesting customer *i* on the customer-specific LTV ratio, two dummies *ltv67* and *ltv80* indicating whether this LTV ratio equals or exceeds respectively 67% or 80%, as well as the interactions of these dummies with the *CCB* activation indicator. To control for aggregate supply effects such as refinancing conditions, we include the Swiss 10-year swap rate ($refin$). To control for the individual borrower risk traits of non-repeated requests, the vector CUSTOM adds further individual customer data such as income, wealth, an indicator of other debt and age. We again include lender fixed effects and, to control for aggregate demand effects across individual requests, we add month[33], property-type and domiciled canton fixed effects. Standard errors are robust for the previously specified reasons.

Due to the higher risks as well as higher risk weights, we anticipate that banks put an extra levy on LTV ratios above 66% ($\beta_{22} > 0, \beta_{23} > 0$). After the activation of the CCB, very high LTV mortgages consume even more of the equity capital. We hence assume that banks charge higher mortgage rates after the CCB shock, as they require extra compensation for the additional capital that they have to hold ($\beta_{24} > 0, \beta_{25} > 0$).

4.3.2 Risk-Weights Results

Table 5 presents our results while sequentially adding different request-level control variables. It shows that LTV per se is insignificant, but banks charge on average more than 2.1 to 2.6 bp extra on the entire mortgage for LTV ratios exceeding 66% and on top of that another 1.5 to 1.9 bp on LTV ratios exceeding 79%. However both interactions of the CCB with the high LTV dummies turn out to be insignificant. Thus the risk-weighting scheme does not amplify the CCB

[33] We use monthly time fixed effects while splitting the event month February 2013 into two parts.

effect. We stress this as the second core finding of our paper. One likely reason for this result is the fact that escalating risk weights apply only to the mortgage *tranche* in excess of the 66% or 79% LTV threshold and not to the entire mortgage. Our alternative hypothesis suggests that LTV threshold indictors just flesh out very risky mortgages inducing lenders to charge a risk premium. In that case, risk-weighting schemes might indeed prove to be ineffective when capital requirements on behalf of the bank become stricter, but lending standards with respect to the customer risk traits in general remain unaffected.

Our findings point out that banks generally tune mortgage rates according to the borrower risk traits while charging a risk premium for very risky mortgages. As to the CCB, risk-weighting schemes addressing these very risky mortgages prove to be ineffective. This however does not contradict a *signaling mechanism* working in the background for the entire mortgage market. If the aggregate risk perception for all mortgages jumped, but not for very risky ones in particular, our time fixed effects would absorb it.

We briefly discuss our results on control variables to assess whether our regression specification yields reasonable results. The estimated coefficient on the swap rate states that a 100 bp increase in the swap rate translates into an increase of the average mortgage rate of about 74 bp. A hint at the fact that many of our participating banks substantially draw on retail instead of wholesale funding can rationalize this number. We further find that a 100 bp increase in the specified income or wealth (entering our regression in logs) of the customers reduces her mortgage rate by on average 3 or 0.8 bp, respectively. Coefficients on the indicator of other private debt or the customer's age do not yield significant estimates. This leads us to use the regression specified in Column (3) as our preferred set of control variables which incorporates income and wealth but ignores insignificant customer characteristics.

We repeat these regressions for different subsamples and cluster standard errors by request to assess the robustness of our findings. The Online Appendix reports our results on different subsamples. First, we isolate the respective best offer in terms of the lowest offered mortgage rate for each request. Again, the interaction effects of high LTV indicators and the CCB turn out to be insignificant. Second, we split the sample into requests for new mortgages and rollovers. Our results on new mortgages confirm that risk-weighting schemes do not amplify the CCB effect. Our results on rollovers with the preferred specification in Column (3) suggest that the effect of the CCB on mortgage rates is 3.3 bp smaller for requests with LTV ratios equal or above 67%, but 7.45 bp larger for requests with LTV ratios equal or above 80%. Apparently, banks become more concerned about very high LTV ratios (LTV>66) of mortgage customers that have so far repaid little. Relative to rollover requests with smaller LTV ratios, banks view them as particularly risky and charge a very high risk premium. Clustering standard errors by request rarely affects our previous findings.

We conclude from these results that LTV thresholds most likely flesh out very risky mortgages and induce banks to charge a risk premium. Indeed, LTV thresholds do not amplify the CCB effects for banks which hints at the weak nexus between the risk-weighting schemes currently in place in Switzerland and capital requirements. This is certainly an issue warranting further study.

4.4 Banks and Insurers as Competitors in the Mortgage Market

This subsection broadens the scope of our analysis to the entire supply side. We contrast the pricing of banks which have to comply with the CCB's tighter capital requirements and that of insurers, which are exempt from the regulatory framework of Basel III in general and the CCB in particular. We thus test Hypothesis 3, whereby insurers with a targeted limit of mortgages in their asset portfolio might also raise prices after the CCB, despite being exempt from the CCB. Furthermore, insurers may also respond to the *signaling channel* in that their risk perception experiences a sudden change.

Apart from the pricing of mortgages, one might raise the concern that the CCB impacts mortgage demand and supply in terms of the requested and accepted risk profiles. Mortgage customers might expect banks to reject more requests with high LTV ratios and hence shy away from requesting such a mortgage. If that was the case, our analysis of mortgage rates might suffer from a selection bias as fewer risky mortgages would enter the sample after the CCB's activation. We explicitly address this issue in the Online Appendix. We conclude from several comparison of means tests that neither mortgage demand nor supply in terms of accepted requests and risk profile do significantly differ between the pre and the post CCB activation period. If there was an impact on mortgage supply at all, it would have to operate through pricing rather than through the propensity to offer a mortgage. That said, we turn to our regression analysis of mortgage rates without having to worry about selection issues.

4.4.1 Banks and Insurers Estimation Approach

Knowing that one type of lender is exempt from the CCB (but operates in the same market), we test whether the CCB has a differential impact on banks and insurers. Our estimation sample now features banks and insurers, whereas all previous regressions only drew on banks. Equation (4) presents our specification:

$$rate_{ij} = \alpha_3 + \beta_{31} ccb_i nonb_j + \beta_{32} ccb_i bank_j + FE\_request_i + FE\_lender_j + \varepsilon_{ij} \quad (4)$$

This time, we regress the tranche-weighted offered mortgage rate $rate_{ij}$ on an indicator of whether the offering lender j is an insurer $(nonb_j)$ or a bank $(bank_j)$, interacted with the CCB indicator, respectively. To relate our specification to Equation (1), the interaction of the lender group dummies with the CCB indicator speaks to the bank residual. We include individual lender (j=1, …, J) and request (i=1, …, I) fixed effects again using robust standard errors for the previously cited reasons. Request fixed effects absorb any traits of this distinct, non-repeated request. Implicitly, such a request fixed effect also picks up a unique time fixed effect of the date when the requestor receives the lender's responses. [34] As linear combinations of these request and lender fixed effects respectively add up to the CCB and lender type dummies, we borrow from Puri et al (2001) to focus on the estimated interaction coefficients $(\beta_{31};\beta_{32})$ of lender type dummies with the CCB. This approach suits our purpose to compare insurers to banks and distinct banking groups explicitly without needing to drop either one group as omitted category. We then examine the difference ($\beta_{31} - \beta_{32} = 0$) with a Wald test to identify a differential impact of the CCB on distinct types of lenders. A negative [positive] and significant difference suggests that banks have raised their rates relatively more [less] than insurers albeit possibly starting from different levels in the CCB=0 period. By analogy, we further split up banks into mutually exclusive banking groups as defined by the Swiss National Bank, to shed light on differential impacts of the CCB on these banking groups and relate these differences to insurers.

4.4.2 Banks and Insurers Results

[34] To relate our specification to Equation (1), the interaction effects of the lender group dummies with the CCB indicator speak to the bank residual, non-interacted lender fixed effects speak to a time-invariant part of the bank residual and request fixed effects address credit risk as well as the swap rate.

Table 5 shows our results on the joint sample of banks and insurers. Columns (1) and (2) draw on the full sample, whereas Columns (3) and (4) focus on the subsample of very risky mortgages with LTV ratios exceeding 66%. We contrast banks and insurers in Columns (1) and (3), while Columns (2) and (4) split up banks into mutually exclusive banking groups and contrast them with insurers, respectively. The main focus lies on the difference between the interaction terms as captured by Wald estimates. The Wald test in Column (1) suggests that insurers have raised rates by on average 9.05 bp more than banks. This result lends support to Hypothesis 4 meaning that insurers prefer raising their mortgage rates and thereby boost their profits over trying to win market shares from banks. We highlight this finding as the third core result of our paper. One might as well have expected unchanged or lower prices in an attempt to underbid banks (given the existing literature on leakage). Indeed, after the activation many banks complained publicly that the CCB would disadvantage them vis-à-vis insurers.

Column (2) distinguishes between different banking groups and suggests that insurers have raised their rates relatively more than cantonal banks (difference (a)-(c); plus 13.38 bp), foreign banks (difference (a)-(d); plus 7.57 bp) and other banks foreign banks (difference (a)-(e); plus 6.19 bp). The comparison among banking groups hence reveals that cantonal banks which are mostly endowed with an explicit government guarantee[35], raise mortgage rates less than subsidiaries[36] of foreign banks and the residual group of other banks. Our results on the subsample of very risky mortgages in Columns (3) and (4) accommodates these findings. The Wald test in Column (3) suggests that insurers have raised their rates by on average 10.41 bp more than banks on these high LTV ratios. The distinction between different banking groups also replicates the previous finding that cantonal banks have increased their rates relatively less than

[35] Our estimation sample includes 8 cantonal banks. Just one of these banks (BEKB) does not enjoy a government guarantee.

[36] In Switzerland, the subsidiaries included in our sample are also subject to the CCB's increased capital requirements.

foreign banks and even less than other banks. In general however, all banking groups and insurers have raised their rates on very risky mortgages a bit more than on average mortgages

To further assess the robustness of these findings, we rerun these estimations on the subsamples of new mortgages and rollover requests and further cluster standard errors by individual requests. Again, the Online Appendix reports our results which always retain the suggested ranking among insurers and banking groups as well as within banking groups. Yet, all lenders raise their prices a little less on rollovers (plus 7 bp for insurers) than on new mortgages (plus 10.34 bp for insurers). Clustering standard errors by request confirms our previous findings.

Our results provide tentative evidence that insurers have decided to raise prices to boost their profits, instead of seeking to gain market share from banks. We provide three possible arguments that in a certain combination might help to explain our findings. First, portfolio limits might play a key role in the asset allocation of insurers. They aim for a low-risk, well diversified asset portfolio that suits the maturity structure of their liabilities. This contrasts sharply with a "leakage effect" as obtained by Aiyar et al (2012): They find that foreign banks not subjected to bank-specific capital requirements in the UK did increase their market share and hence caused "policy leakage". Second, the low interest rate environment and scarce profitable investment prospects on financial markets might have encouraged insurers to boost their per-unit profits on mortgages while sticking to the portfolio limits. Third, the *signaling channel* might be at work in that insurers might interpret the CCB as the regulators waving a red flag to signal considerably more credit risk in the market than previously priced in the mortgage rates. Against the background of the specifically low-risk investment strategy pursued by insurers, insurers might raise their prices even more than banks.

5. Conclusions

This paper examines how Swiss lenders price mortgages before and after the activated *Countercyclical Capital Buffer (CCB)* imposes higher capital requirements on banks. Since Switzerland was the first country to activate a CCB in the style of Basel III, this is, to the best of our knowledge, the first empirical evaluation of this macroprudential tool.

Our dataset on multiple independent offers per individual mortgage request allows us to separate mortgage demand and mortgage supply. To shed light on mortgage supply, we examine how individual bank balance sheet characteristics shape mortgage pricing before and after the shock to capital requirements. To shed light on how mortgage demand traits interact with tighter capital requirements, we analyze critical loan-to-value (LTV) ratios, as risk-weighting schemes link the riskiness of individual borrowers to regulatory bank capital requirements. Indeed, these risk-weighting schemes may be expected to amplify the CCB effects. To put our results into perspective, we contrast banks that are subject to higher capital requirements with insurers that are exempt from it, but compete with banks as suppliers in the Swiss mortgage market. Our paper hence goes beyond estimating some average aggregate CCB effects and studies how distinct features of mortgage demand and supply on the individual level of market participants interact with the CCB instead.

Three core findings emerge. First the CCB changes the *composition of mortgage supply*: *Capital-constrained* banks with small *capital cushions* raise their rates relatively more after the CCB activation. This reflects a bank's tradeoff between approaching the now even closer intervention threshold and reaping additional profits, as pointed out in the *capital cushion theory*. Further, banks which are very *specialized* in mortgage lending do also increase their offered mortgage rates relatively more. Thus, as higher capital requirements apply both to new mortgages and to the stock of issued mortgages listed on balance sheets, banks roll over the extra costs of previously issued mortgages to their new customers. We hence infer that the CCB alters the composition of mortgage supply in that banks with a high exposure to the regulatory design of the CCB substantially adjust their offered mortgage prices. This change in the composition of mortgage supply also aligns with a *signaling mechanism* in that more exposed banks feel even more alarmed by the signal.

Our second finding relates to the pricing of very risky mortgages demanded before and after the CCB's activation. *Risk-weighting schemes* put an extra capital levy on very risky mortgages with LTV ratios above 66% and 79%. We hence find that banks generally charge more on very risky mortgages, but these risk-weighting schemes do not amplify the CCB effects. This suggests that the nexus between the customer's leverage and regulatory risk weights may still be relatively weak. We provide two possible explanations for this finding. On the one hand, higher risk weights apply only to the tranche of lending above the respective LTV threshold rather than to the entire mortgage amount. This shrinks the average risk-weight effect for the whole mortgage. On the other hand, LTV threshold indictors might just flesh out very risky mortgages inducing lenders to charge a risk premium. In this light, LTV thresholds linked to regulatory risk-weighting schemes prove ineffective when interacted with the CCB's shock to capital requirements. This finding aligns well with a *signaling mechanism* that pertains to the entire mortgage market, but not very risky mortgages in particular.

Third, both banks and insurers as competitors in the mortgage market *increase* their average mortgage rates after the CCB's activation. Yet insurers raise rates by on average 9.05 bp more than banks despite being exempt from the CCB and any Basel III capital standards. Hence, policy leakage, in the sense of underbidding by insurers exempt from the CCB, does not seem to be an issue in the Swiss mortgage market. Two lines of argument might rationalize this finding. First, insurers might follow an investment strategy that accommodates their liability structure.

Changing their asset composition might contrast with their targeted well-diversified, low-risk portfolio such that they refrain from expanding their market share and instead also raise their mortgage rates. As a side benefit, insurers might welcome higher profits to compensate for low returns on rather safe assets on financial markets. Second, the signaling mechanism might be at work that equally applies to both types of lenders, banks and insurers. Lenders then might interpret the CCB as regulators waving a red flag to signal considerably more risk in the market than previously reflected in offered rates. To account for this surge in risk premia, both banks and insurers would the substantially raise their mortgage rates.

Our paper informs the debate on macro- and micro-prudential regulation. It contributes to a better understanding of how tighter capital requirements impact mortgage pricing in general and against the CCB's background as the macroprudential tool of Basel III. As we can separate mortgage demand and supply, our analysis can shed light on changes in the composition of mortgage supply which a standard analysis of market outcomes could not detect. Our dataset features the entire spectrum of mortgage offers and links them to the submitting bank's balance sheet characteristics. This enables policy makers to extrapolate and form ideas about possible shifts in the allocation of new mortgage lending to distinct banks. Comprehensive information on borrower risk traits allows us to test the effectiveness of risk-weighting schemes that have been frequently discussed under different approaches of different types of banks. Our results that risk-weighting schemes do not amplify the effect of tighter capital requirements might encourage policy makers to strengthen the link in order to discourage banks from making risky mortgages and hence "lean against the wind". Finally, our comparison of CCB-subjected banks with CCB-exempt insurers allows us to track possible leakage effects and hints at the necessity to draft all-encompassing policy measures that bear spillover effects on other market participants.

To sum up, the CCB has the potential to shift mortgage lending to more resilient banks, but with the current risk-weighting schemes it does not lead banks to price with the aim of substituting low- for high-LTV customers.

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DEFINITIONS OF VARIABLES

Dependent Variable	
Offered Mortgage Rate	Tranche-weighted offered mortgage interest rate measured in basis points and winsorized at the 1st and 99th percentile.
Refinancing Control	
Swap Rate 10y	10 year Swiss interbank swap rate.
Mortgage Characteristics	
LTV	Loan to value ratio as specified by the customer.
LTV67	Indicator of whether the LTV equals or exceeds the value of 67%.
LTV80	Indicator of whether the LTV equals or exceeds the value of 80%.
Bank Sensitivity Measures	
Capital Cushion	Capital Cushions are measured as the percentage deviation of the bank's capital to risk weighted assets ratio from that ratio below which FINMA would intervene.
Constrained (0/1)	Indicator equal to one if the Capital Cushion is *below* the sample median.
Capital Coverage Ratio	Actual Capitalization as defined in FINMA (2011).
Liquid (0/1)	Indicator equal to one if the Liquidity Ratio is *above* the sample median.
Liquidity Ratio	Share of liquid assets to total assets.
Mortgages/Equity Capital	Ratio of mortgages to Equity Capital. Equity Capital is defined as CET1 capital and can be decomposed into corporate capital and capital reserves.
Specialized (0/1)	Indicator equal to one if Mortgages/Equity Capital is above the median.
Customer Controls	
Income	Annual household income as specified by the customer expressed in ln.
Wealth	Wealth including retirement savings as specified by the customer expressed in ln.
Debt	Indicator of whether the customer reports any kind of debt.
Age	Age of the customer.

APPENDIX

Figure 1: Back of the Envelope Computation of a bank's expected additional cost

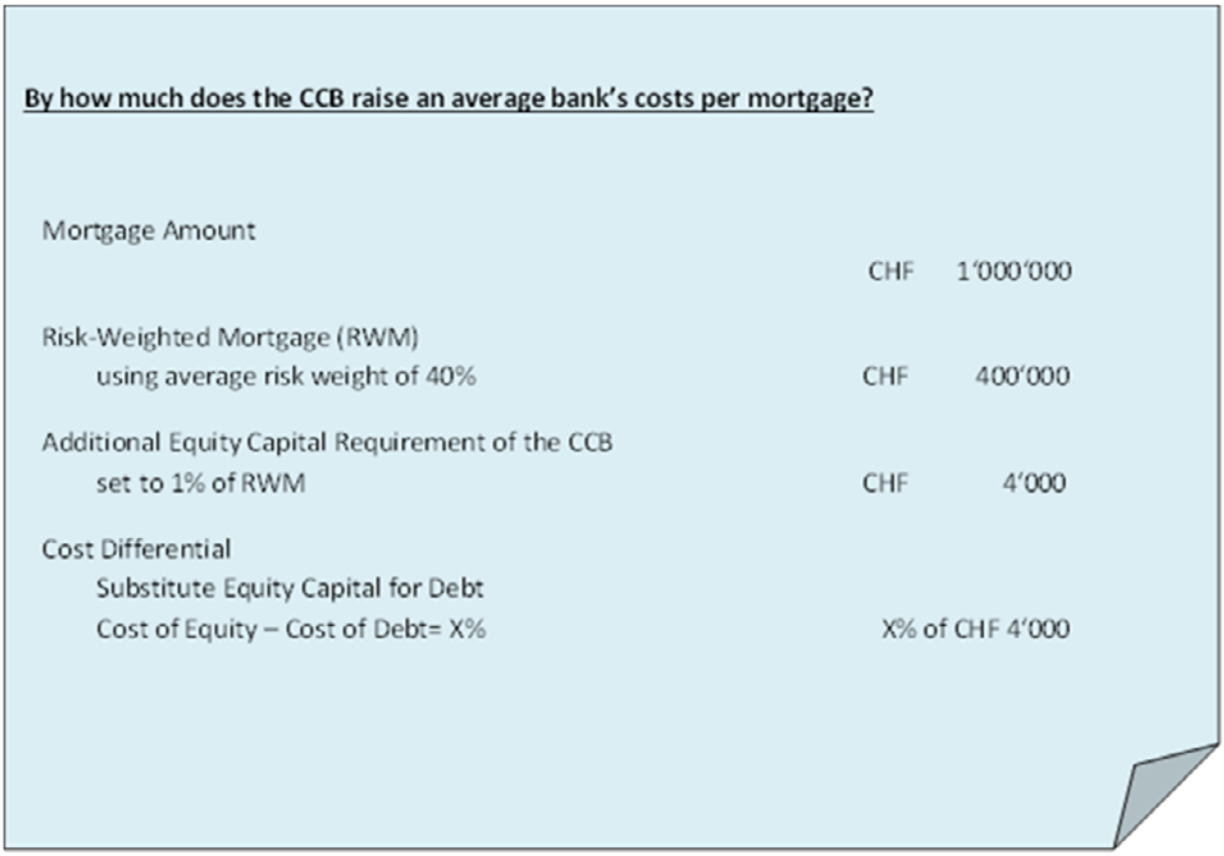

Figure 2: Our Sample Period and the Sequence of Events relevant to Mortgage Pricing

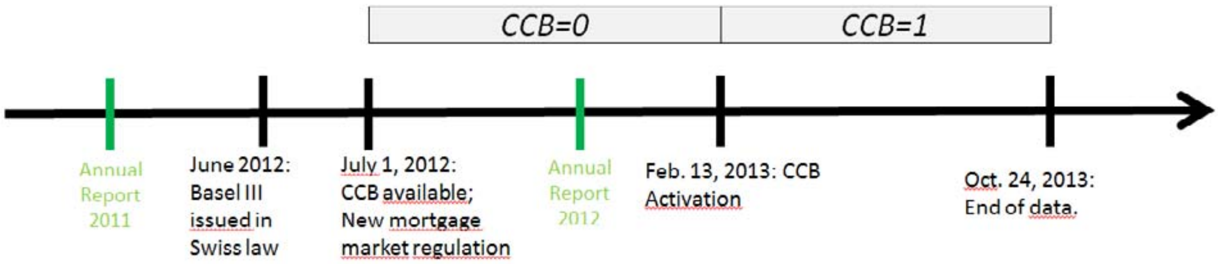

Figure 3: Mortgage Tranche and Mortgage Total Average Risk Weights as Functions of the Loan to Value (LTV) Ratio

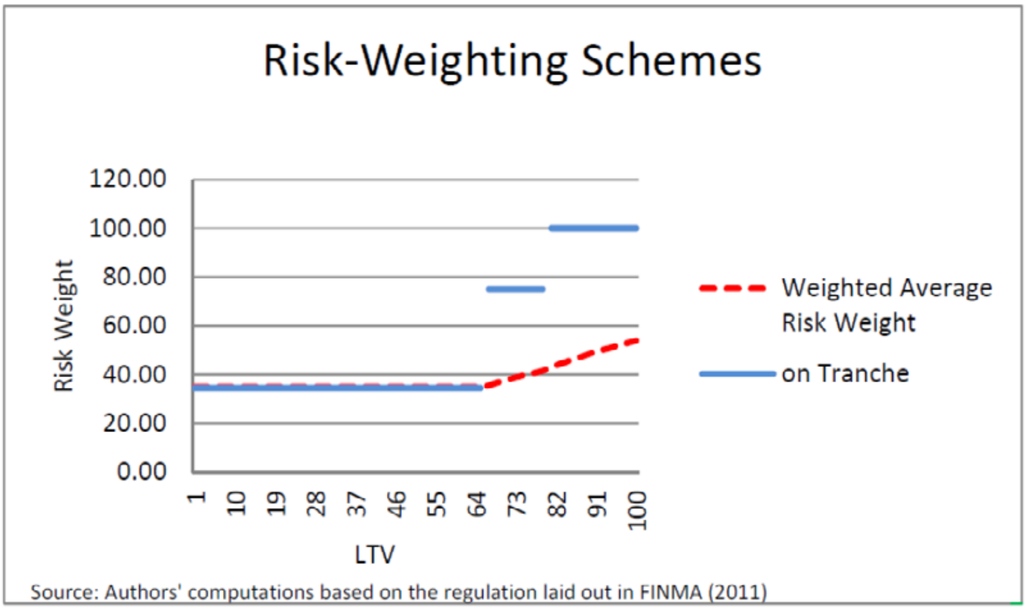

Table 1: Mortgage Demand and Supply Participation

		CCB=0	CCB=1
Mortgage Demand			
Number of Requests		661	516
Applicant's LTV		65.66	65.42
Mortgage Supply			
Number of Answers	all	3'873	2'461
	by banks	2'744	1'865
	by insurers	1'129	596
Number of Offers	all	3'313	2'146
	by banks	2'390	1'655
	by insurers	923	491
Number of Rejections	all	560	315
	by banks	354	210
	by insurers	206	105
Offered Mortgage Rate	all	192.26	223.59
	by banks	195.39	226.36
	by insurers	184.18	214.24

Notes: This table presents our database in terms of mortgage demand and supply participation. It focuses on requested 10-year fixed rate mortgages only. The underlying average offered mortgage interest rates result from the tranche-weighted offered mortgage interest rates.

Table 2: Descriptive Statistics of Offered Mortgage Rate Regressions including Sensitivity Measures with Banks only

	mean	p50	sd	min	max	N
1120 requests; 22 bank						
offered mortgage rate (in bp)	208.08	201.20	24.68	159	277.5	4'045
Swap Rate 10y (in %)	1.09	1.03	0.21	0.82	1.70	4'045
CCB (0/1)	0.41	0.00	0.49	0	1	4'045
LTV (in%)	65.17	70.00	15.73	7	100	4'045
LTV67 (0/1)	0.56	1.00	0.50	0	1	4'045
LTV80 (0/1)	0.20	0.00	0.40	0	1	4'045
Income (in CHF tsd)	176.71	155.00	92.65	15.00	1400.00	4'045
Wealth (in CHF tsd)	521.40	313.00	967.57	5.00	20000.00	4'045
Income (ln)	11.98	11.95	0.44	9.62	14.15	4'045
Wealth (ln)	12.64	12.65	1.01	8.52	16.81	4'045
Debt (0/1)	0.16	0.00	0.37	0	1	4'045
Age	44.60	44.00	9.36	20	79	4'045
Bank Sensitivity (above/below median)						
Constrained (0/1)	0.61	1	0.49	0	1	4'045
Specialized (0/1)	0.47	0	0.50	0	1	4'045
Liquid (0/1)	0.62	1	0.49	0	1	4'045
Bank Sensitivity (levels)						
Constrained:						
Excess Capitalization (in %)	40.58	44.79	21.82	8.29	119.61	3'129
Specialized:						
Mortgages/Equity Capital (in %)	974.40	902.60	220.30	379.73	1785.48	4'045
Liquid:						
Liquid Assets/TA (in %)	5.45	4.30	3.64	0.75	17.32	4'045

Notes: This table exhibits descriptive statistics of our regressions with banks only. We express the dependent variable offered mortgage interest rate in basis points and winsorize it at the 1st and 99th percentile. LTV67 [LTV80] stands for an indicator of whether this LTV exceeds the value of 67 [80]. All Bank Sensitivity measures (above/below median) in the second panel feature (0/1) indicators of whether the bank is above the median among all participating banks in a given year (except for Constrained which refers to Excess Capitalization being *below* the median). All Bank Sensitivity measures in the third panel feature ratios. Constrained draws on excess capitalization in percent, measured as the distance between the bank's capital coverage ratio and the target ratio relative to the target ratio. Specialized refers to the ratio of mortgages to equity capital. Liquid reflects the percentage share of liquid assets to total assets. Please refer to the Descriptions of Main Variables for more details.

Table 3: Mortgage Rate Regression with Sensitivity Measures for Banks only

Offered Mortgage Rate

	Full Sample				New	Rollovers
	(1)	(2)	(3)	(4)	(5)	(6)
Sensitivity Measures						
Constrained	9.19			2.74	-3.33	17.98*
	(6.01)			(6.29)	(6.87)	(9.77)
CCB*Constrained	4.26***			2.72**	3.10*	2.76
	(0.90)			(1.20)	(1.62)	(1.71)
Specialized		3.93		4.03	4.82	2.84
		(2.49)		(2.52)	(3.04)	(4.53)
CCB*Specialized		6.11***		5.57***	6.00***	4.72**
		(0.92)		(1.26)	(1.66)	(1.92)
Liquid			-2.61	-4.21**	-4.69**	-4.86
			(1.72)	(1.83)	(2.24)	(3.29)
CCB*Liquid			-2.08**	0.49	0.48	-0.10
			(0.89)	(1.33)	(1.77)	(1.90)
Constant	190.32***	194.81***	201.26***	191.07***	194.14***	179.95***
	(6.17)	(2.84)	(1.42)	(6.85)	(7.74)	(10.68)
Observations	4,045	4,045	4,045	4,045	2,511	1,534
R-squared	0.83	0.83	0.83	0.83	0.82	0.86

Notes: This table shows the results of an OLS regression with the offered mortgage rate as dependent variable. The offered mortgage rate is measured in basis points and winsorized at the 1st and 99th percentile. C***onstrained*** indicate whether a bank reports excess capitalization below or equal to the median of all banks in a given year. **Specialized *(Liquid*)** indicates whether whether a bank reports a ratio of mortgages on balance sheet to equity capital (liquid assets to total assets) that equals or exceeds the median of all banks in a given year. Columns (1) to (4) feature the full sample, whereas Columns (5) and (6) show subsamples of new mortgages and rollover requests, respectively. Please refer to Table 3 and the Descriptions of Main Variables for more details. All regressions include fixed effects for each request and for each offering bank. Heteroskedasticity consistent standard errors in parentheses with ***, ** and * denoting significance at the 1%, 5% and 10% level.

Table 4: Mortgage Rate Regression with Threshold LTVs for Banks only

Offered Mortgage Rate	(1)	(2)	(3)	(4)	(5)
Mortgage Characteristics					
LTV	0.03	0.03	0.03	0.03	0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
LTV67 (0/1)	2.13***	2.58***	2.39***	2.38***	2.35***
	(0.70)	(0.69)	(0.70)	(0.70)	(0.70)
LTV80 (0/1)	1.81**	1.85**	1.57**	1.56**	1.54**
	(0.75)	(0.74)	(0.75)	(0.75)	(0.75)
CCB*LTV67 (0/1)	-1.50	-1.49	-1.49	-1.49	-1.52*
	(0.92)	(0.91)	(0.91)	(0.91)	(0.91)
CCB*LTV80 (0/1)	0.87	1.34	1.45	1.46	1.48
	(1.17)	(1.15)	(1.15)	(1.15)	(1.15)
Refinancing Control					
Swap Rate 10y	73.69***	75.11***	74.41***	74.37***	74.27***
	(4.69)	(4.66)	(4.66)	(4.67)	(4.67)
Request Controls					
Income		-3.91***	-3.14***	-3.15***	-3.20***
		(0.47)	(0.51)	(0.51)	(0.52)
Wealth			-0.84***	-0.84***	-0.81***
			(0.22)	(0.22)	(0.23)
Debt (0/1)				0.14	0.18
				(0.54)	(0.54)
Age					-0.02
					(0.02)
Constant	131.33***	174.16***	177.18***	176.75***	177.47***
	(23.03)	(23.35)	(23.33)	(23.35)	(23.38)
Observations	4,045	4,045	4,045	4,045	4,045
R-squared	0.76	0.76	0.76	0.76	0.76

Notes: This table shows the results of an OLS regression with the offered mortgage rate as left-hand side variable. The offered mortgage rate is measured in basis points and winsorized at the 1st and 99th percentile. LTV67 [LTV80] stands for an indicator of whether this LTV exceeds the value of 67 [80]. CCB*LTV67 [CCB*LTV80] refers to the interaction of the CCB with the LTV67 [LTV80] variable. To control for the general level of refinancing costs, we add the 10-year interest swap rate. Please refer to Table 3 and the Descriptions of Main Variables for more details. All regressions include fixed effects for the offering bank, the month of submission (while February 2013 is split into a pre and post February 2013 dummy), the request's property type and domiciled canton. Heteroskedasticity consistent standard errors in parentheses with ***, ** and * denoting significance at the 1%, 5% and 10% level.

Table 5: Offered Mortgage Rate Regression Comparing Banks or Banking Groups with Insurers

Offered Mortgage Rate	Full Sample		Only LTV>66	
	(1)	(2)	(3)	(4)
(a) CCB*NONB	67.72***	69.44***	97.79***	63.03***
	(3.13)	(3.09)	(3.93)	(3.62)
(b) CCB*BANK	58.66***		87.38***	
	(2.99)		(3.79)	
(c) CCB*KANTONALBANK		56.06***		47.85***
		(2.95)		(3.49)
(d) CCB*FOREIGNBANK		61.87***		54.17***
		(3.05)		(3.62)
(e) CCB*OTHERBANK		63.25***		55.57***
		(3.03)		(3.58)
Constant	203.23***	205.96***	147.67***	148.66***
	(12.85)	(13.92)	(2.83)	(2.84)
Observations	5,459	5,459	3,053	3,053
R-squared	0.82	0.82	0.81	0.81
Wald Estimates				
DID estimate (a)-(b)	9.05***		10.41***	
Wald test (a)-(b) p-value	0.00		0.00	
DID estimate (a)-(c)		13.38***		15.18***
Wald test (a)-(c) p-value		0.00		0.00
DID estimate (a)-(d)		7.57***		8.86***
Wald test (a)-(d) p-value		0.00		0.00
DID estimate (a)-(e)		6.19***		7.46***
Wald test (a)-(e) p-value		0.00		0.00

Notes: This table shows the results of an OLS regression with the offered mortgage rate as left-hand side variable. This offered rate is measured in basis points and winsorized at the 1st and 99th percentile. CCB*BANK [CCB*NONB] refers to the interaction of the CCB with an indicator BANK [NONB] of whether the offering institution is a bank [insurer]. KANTONALBANK, FOREIGNBANK and OTHERBANK are dummy variables indicating the banking group to which the Swiss National Bank assigns a bank. All regressions include bank and request fixed effects. Request fixed effects account for risk traits of the individual non-repeated request which implicitly pick up the time fixed effect of the date when the requestor receives the lender's response. As linear combinations of these request and lender fixed effects add up to the CCB dummy and distinct groups of lenders, we focus on the interaction effects of group indicators with the CCB. We then test for the difference between these interaction effects to identify a differential impact of the CCB on distinct groups of lenders. Hence, the diagnostic section reports the DID estimate and its p-value from the Wald test under the H0 that, for instance, the difference between for instance banks and insurers equals zero (denoted as (a)-(b). Heteroskedasticity consistent standard errors in parentheses with ***, ** and * denoting significance at the 1%, 5% and 10% level.