

Higher Bank Capital Requirements and Mortgage Pricing: Evidence from the Counter-Cyclical Capital Buffer*

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** Any views expressed are those of the authors and need not correspond to those of the Bank for International Settlements (BIS), ETH Zurich University or the **Swiss Financial Market Supervisory Authority FINMA**.*

Outline

- 1 **Motivation**
- 2 Context, Data and Sample Construction
- 3 CCB Effects and Possible Amplifiers
- 4 Empirical Approach
- 5 Results
- 6 Summing Up

1. The Counter Cyclical Buffer (CCB) as the macroprudential tool of Basel III

Basel II

- 8% minimum capital requirements (MCR) based on risk-weighting scheme
- Capital requirements turned out to be **pro-cyclical** : Lower (higher) in booms (busts)
- Swiss implementation in 2007

Basel III (implemented in Swiss law on June 1, 2013)

- 8% minimum capital requirements (MCR) based on risk-weighting scheme
- Capital Conservation Buffer: In Switzerland 2.5-6.4% of RWAs
- **On top, authorities can temporarily activate Countercyclical Capital Buffer**
 - Extra equity for up to 2.5% of RWA
 - Goals (with equal weights in e.g. Swiss law):
 - 1. more** equity to bear potential losses
 - 2. slow down** total lending growth

CCB: Interesting tool when monetary policy already committed to pursue consumer price stability or when a country enjoys no monetary autonomy.

1. Switzerland and the CCB

The Counter-Cyclical Capital Buffer (CCB) ...

- became policy *option* from July 2012
- (globally) first *activation* on February 13, 2013:
 - extra equity worth 1% of Risk-Weighted Assets (**RWA**) **secured by domestic *residential mortgages***
 - (transition period until September 2013)
- raised to 2% in January 2014
(not investigated here)

1. Research Questions

Examine how CCB effect on pricing (and willingness to offer) in Switzerland varies...

1. ... with **bank capitalization** (-> *capital buffer theory*)
2. ... with a bank's **mortgage specialization** (-> «*back-book effect*»)
3. ... with **risk weights** (capital requirements) associated with an application
4. ... **between banks and insurers** : Looks at «*policy leakage*» as insurers do not need to comply with the CCB, but operate in the same market...

1. Our Key Findings

1. Banks with low capital buffers (actual minus required capital) raise prices more after CCB activation.
In line with capital buffer theory.

2. Banks specializing in mortgages (high mortgages/TA) raise prices more after CCB activation.

Cost of «Back-book effect» passed on to new customers.

Higher mark-ups possible, as market not perfectly competitive (...).

3. LTV Thresholds: **Banks** charge extra on high LTVs with high risk weights, but risk-weighting schemes do **not amplify** CCB effects.

4. Insurers (not CCB subjected) raise rates not less, but more than banks. => No «Leakage»
(**No** differential CCB effect on the **willingness** to make mortgages)

1. Literature Review

Bank Capitalization and Lending

Theory: Boot et al. (1993), Sharpe (1990), Rajan (1992), and Diamond & Rajan (2000), Gersbach & Rochet (2012)

Empirical: Banks with low capital ratio charge higher rates. (Hubbard et al., 2002; Steffen & Wahrenburg, 2008)

Less well capitalized banks are more sensitive to their customers' characteristics than better capitalized ones. (Santos & Winton, 2010)

Liquidity and capitalization shape the response to monetary policy shocks. (Kashyap & Stein ; Kishan and Opiela, 2000)

Not capitalization per se, but the **deviation** from regulatory threshold matters. (Gambacorta and Mistrulli, 2004)

Banks with low **capital buffers** (deviations) **reduce** RWA when prompted to increase their capital. (Jokipii and Milne, 2011)

Quantitative Impact Studies on the effect of **capital requirements** on loan **pricing**

A 1 percentage point (pp) increase in the equity capital ratio raises the spread of lending over the refinancing rate by an estimated **4.8 - 28 bp**, with most estimates ranging between **12 and 15 bp**.

(Hanson et al., 2011, King 2010; Cournede & Slovik, 2011; Cosimano & Hakura, 2011; Elliot, 2009) **pricing**

Simulation of the CCB effects on bank lending: the CCB slows down credit growth. (Drehmann and Gambacorta, 2012)

Micro-level Analyses on Macro/Micro-Prudential Policy Tools

On UK: **Highly capitalized banks are unresponsive** to regulation; **leakage** (Aiyar et al., 2014) **lending growth by bank j**

On Spain: Counter-cyclical provisioning helps to smoothen the credit cycle. (Jimenez et al., 2012) **loan granting, micro-level**

1. Our Contributions

1. first empirical paper on how **CCB** affects loan *issuance* and *pricing*
2. Disentangle *borrower* (demand) and *lender* (supply) determinants, especially *bank* balance sheet *characteristics*. (Sensitivity Measures)
3. Assess effectiveness of *risk-weighting schemes*. (LTV Thresholds)
4. Investigate possible policy *leakage* ...

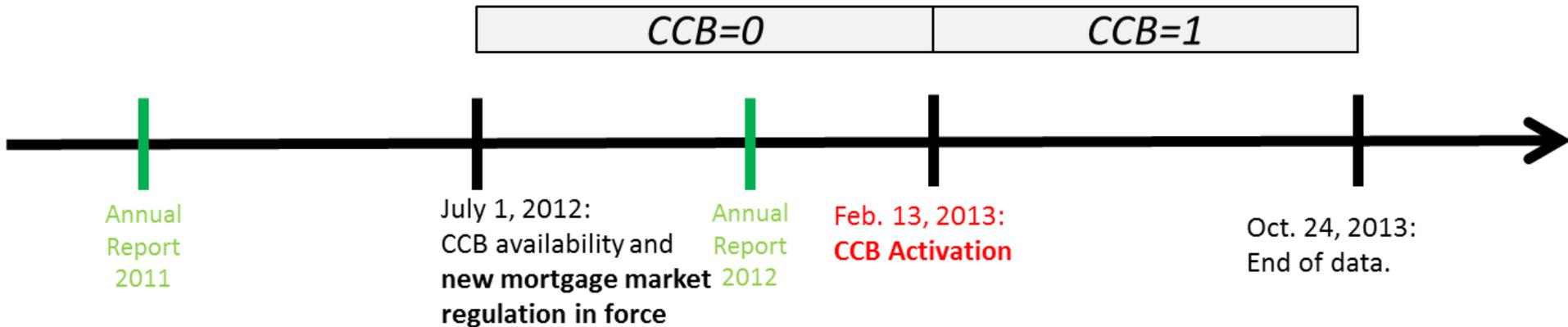
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2. Swiss Housing & Mortgage Markets

- Internationally **low ownership rate** (<1/3 until 1990s, slightly >40% by now)
- Ownership neutral tax regime
 - Full taxation of imputed rent also for owner-occupiers
 - **Full tax deductibility of interest payments -> incentives for slow repayment**
- Households amortize slower than maturity, balloon payment through refinancing
-- in our sample 50% new mortgages, 50% refinancings
- Swiss **mortgage debt / GDP has increased continuously** for past 15 yrs. (now at 140%)
- So have house prices
- Joint boom partly due to low interest rates, partly to increased housing demand facing inelastic housing supply ([Basten & Koch 2014a](#))

2. Timing of policy changes



- Focus on CCB *activation* (Feb. 13, 2013) rather than *availability* (July 1, 2012)
- Clean of other changes (Basel III law adoption, new mortgage market regulation)
- *Activation* also more policy-relevant:
 - National regulators have discretion about activation, not about availability
 - Availability happens only once, activation can be adjusted whenever useful
- Consider general Basel III provisions effective at latest upon definite adoption, not only upon entering into force (Jan. 1, 2013), though the latter would also work for our identification (month FE; 2 separate FE for Feb 2013, one before and one after 13th)
- Focus more on heterogeneity by lender type and by borrower type than just on some *average* effect of the CCB

2. Data on Swiss Mortgage Market

Online mortgage platform www.comparis.ch

Customer ...

- provides data on financial situation, real estate property, requested mortgage amount, requested maturity
- pays CHF 148 (about USD 160)

Lenders (banks and insurers) ...

- Get anonymized customer data (the same we see): hard information only.
- submit offers or rejections
- if offer: Interest rates on (tranches of) the mortgage,
- cannot see the responses of competitors

Comparis

- collects responses and sends them to the customer

2. Data: Our Sample

Representativeness:

- **Supply side:** All banking groups (cantonal, regional, cooperative, foreign), except for the 2 G-SIBs; Insurers also represented.
- For 2 G-SIBs domestic mortgages no core business
- Plus they use IRB rather than Standardized Approach risk weights
- **Demand side:** Sample largely representative on all variables by which could compare: LTV distribution, geographical distribution, household gross income

Sample use:

- Focus on 10-year Fixed Rate Mortgages
- Outcome variables:
 - Offer (0/1)
 - Tranche-weighted offered mortgage interest rate
- Yields: 1'177 requests and 6'334 responses (5'459 offers)

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3. «Back of the Envelope»

By how much does the CCB raise banks' financing costs per mortgage unit?

i) New Mortgages: Computing the Cost Differential

Mortgage Amount:	CHF 1'000'000
Risk-Weighted Assets @ 40% average risk weight:	CHF 400'000
Requirement @1% CCB: Hold extra equity worth:	CHF 4'000
Extra costs @ (Cost of Equity – Cost of Debt= 3.84%):	CHF 154
Extra costs relative to the mortgage amount:	bp 1.54

Banks may pass on to *new* customers:

1. Less to underbid competitors.
2. Exactly this amount.
3. More (->costs of mortgages already on the balance sheet)

3. Bank Sensitivity as Amplifier

Which banks exhibit the highest sensitivity to the CCB?

The CCB applies to ...

- mortgages on balance sheets
- new mortgage issuance

To comply with the CCB, a bank can...

- reject more requests,
- **pass on** higher costs to **new** mortgage customers => charge more ,
- **raise** equity capital.

ASSETS	LIABILITIES
Cash	Debt Deposits Other Debt
Securities	Bonds
Loans Mortgages Other Loans	Equity
Other Assets	Other Liabilities
Total	Total

3. Bank Sensitivity as Amplifier

Which banks exhibit the highest sensitivity to the CCB?

Our Sensitivity measures:

Capitalization

- **«Capital Constrained»** (= below-median capital buffer)
- Equity/TA
- Corporate Capital/TA
- Reserves/TA
- Δ Equity
- Return On Equity (proxies profitability, but also cost of equity)

Business Model

- **«Specialization» = Mortgages/Equity**
- Δ Mortgages
- Customer Funds/Mortgages

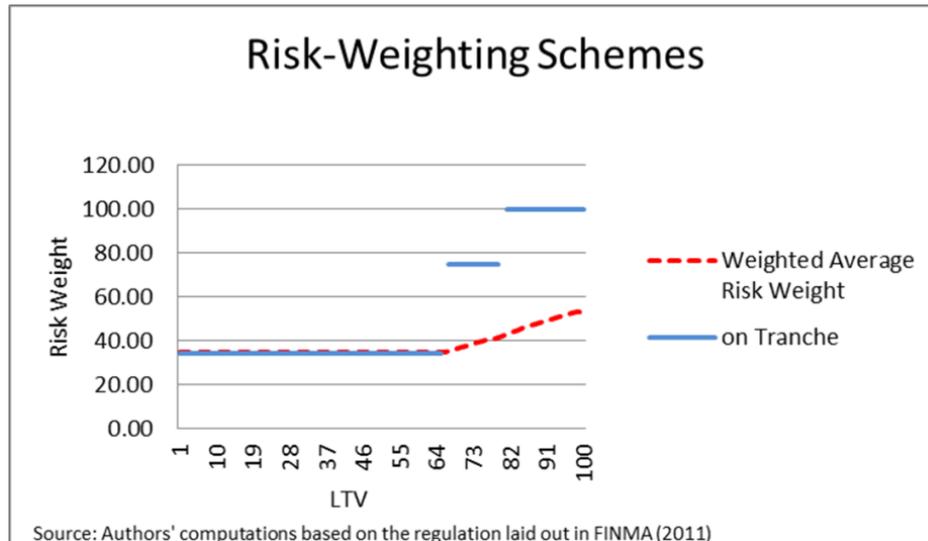
ASSETS	LIABILITIES
Cash	Debt Deposits Other Debt
Securities	Bonds
Loans Mortgages Other Loans	Equity
Other Assets	Other Liabilities
Total	Total

3. Risk-Weighting Schemes as Amplifier?

Risk weights and hence capital requirements depend on Loan-to-value (LTV) ratio:

- **35%** risk weight on tranches with **LTV ≤ 66**
- **75%** risk weight on tranches with **66 < LTV ≤ 80**
- **100%** risk weight on tranches with **LTV > 80**

=> **Weighted average** risk weight function has two kink points at LTV=67 and at LTV=80



LTV threshold effects might ensue from:

- Risk-weighting schemes
- Lenders pricing *risk* discontinuously to simplify => **both** lenders demand high LTV premium

3. Policy objectives covered

Goals of the CCB as stated by Swiss law (and the BCBS):

1. Increase resilience: more equity to bear potential losses.

=> Assess whether banks which have **raised** more equity **behave differently**.
(lagged Public Annual Reports)

2. «Leaning against the wind» by slowing down lending during booms. Our main focus.

=> Examine the **willingness** to lend and the **pricing** of loans.

3. Possible further policy benefits

Incentive Effect I: Given that CCB requirements depend on risk weights, CCB could ***discourage very risky (high LTV) borrowers*** and thus render pool of mortgages safer.

Incentive Effect II: If CCB slows down lending growth especially for undercapitalized banks, then CCB could ***improve average risk-bearing capacity of lenders***.

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4. Bank Sensitivity Measures

Which *characteristics* render a bank particularly *sensitive* to the CCB effects?

$$\text{Rate}_{ijt} = \alpha + \beta_1 \text{SENS}_{j201x} + \beta_2 \text{CCB}_t * \text{SENS}_{j201x} + \text{FE_request}_i + \text{FE_bank}_j + \varepsilon_{ijt}$$

With

- SENS_{j201x} as balance sheet data from the past annual report.
- Customer i , lender j , time t
- $\text{CCB}_t = 1$ if $t > \text{Feb } 13, 2013$ and 0 otherwise
- Using ***FE_request_i***, implicitly controls for individual customer risk, time, property type, location and macroeconomic developments.
- Everywhere Robust Standard Errors (not clustered due to unequal cluster sizes)

4. LTV Threshold Effects

Do LTV thresholds amplify the CCB effect for banks?

$$\text{Rate}_{ijt} = \alpha + \beta_1 \text{LTV}_{it} + \beta_2 \text{LTV67}_{it} + \beta_3 \text{LTV80}_{it} + \beta_4 \text{CCB} * \text{LTV67}_{it} + \beta_5 \text{CCB} * \text{LTV80}_{it} \\ + \gamma_0 * \text{refin}_t + \gamma_1 \text{`Custom}_i + \text{FE} + \varepsilon_{ijt}$$

With

- $\text{LTV67}_{it} = I(\text{LTV}_{it} \geq 67)$ and $\text{LTV80}_{it} = I(\text{LTV}_{it} \geq 80)$
- refin_t is the Swiss 10y swap rate
- $\text{`Custom}_i = (\text{income}_{it}; \text{wealth}_{it}; \text{debt}_{it}; \text{age}_{it})$
- $\text{FE} = (\text{FE_lender}_j; \text{FE_month}_t; \text{FE_type}_i; \text{FE_canton}_i)$

4. Banks versus Insurers

Does CCB differentially affect mortgage offers & pricing by banks and insurers?

$$\text{Rate}_{ijt} = \alpha + \beta_1 * \text{CCB}_t * \text{BANK}_j + \beta_2 * \text{CCB}_t * \text{NONB}_j + \gamma_0 * \text{refin}_t + \gamma_1 \text{`Mortg}_{it} + \gamma_2 \text{`Custom}_{it} + \text{FE} + \varepsilon_{ijt}$$

With

- $\text{BANK}_j = 1$ if lender is a bank and 0 otherwise
- $\text{NONB}_j = 1$ if lender is an insurer and 0 otherwise
- Test for the difference between β_1 and β_2 (Puri et al., 2011)
- $\text{Mortg}_{it} \text{`} = (\text{LTV}_{it}; \text{LTV67}_{it}; \text{LTV80}_{it})$

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sensitivity Measures									
Constrained	6.8883 (5.9641)								
CCB*Constrained	6.2789*** (0.9325)								
Mortgages/Equity Capital		-7.6884*** (0.8925)							
CCB*Mortgages/Equity Capital		6.5307*** (0.9604)							
Equity Capital/TA			1.0708 (3.4065)						
CCB*Equity Capital/TA			-8.8509*** (0.9922)						
Corporate Capital/TA				-4.9685** (2.3202)					
CCB*Corporate Capital/TA				8.3259*** (0.8766)					
Capital Reserves/TA					-11.5118 (12.4785)				
CCB*Capital Reserves/TA					-8.7294*** (0.9274)				
ΔEquity Capital						-4.7533*** (0.7278)			
CCB*ΔEquity Capital						2.5683** (1.2662)			
ΔMortgages							-2.2854*** (0.7056)		
CCB*ΔMortgages							0.8470 (1.1763)		
Customer Funds/Mortgages								-22.3350** (11.3287)	
CCB*Customer Funds/Mortgages								-0.1036 (1.1002)	
ROE									-1.1818 (2.0306)
CCB*ROE									-1.8902** (0.8741)
Constant	242.7159*** (7.3538)	246.7853*** (6.1920)	199.6107*** (6.5295)	242.9582*** (5.3274)	249.4647*** (3.5127)	200.9042*** (6.2541)	219.6279*** (5.4697)	252.3132*** (4.0835)	243.3556*** (5.8023)
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Request Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045
R-squared	0.8281	0.8297	0.8306	0.8305	0.8309	0.8277	0.8255	0.8248	0.8252

5. Bank Sensitivity Measures

Cross-sectionally:

Cheaper rates offered by banks with

- High mortgage specialization
- High corporate capital
- High reserves/ta
- High recent equity growth
- High recent mortgage growth
- Funding mostly through customer funds

Effects of the CCB

CCB causes larger rate increases for:

- Capital constrained banks
- Mortgage-Specialized banks
- Banks with low equity capital
- Banks with high corp. capital
- Banks with low capital reserves
- Banks with high equity growth
- Banks with high RoE

5. Sensitivity results: Interpretation

Cross-sectional results:

Cheaper rates offered by banks with

- High corporate capital - > Can afford to offer better rates.
- High reserves/ta -> Can afford to offer better rates.
- High recent equity growth -> Can afford to offer better rates.

- High mortgage specialization -> Economies of scale
- High recent mortgage growth -> Recent growers remain aggressive
- Funding mostly through customer funds -> Banks close to retail clients.

Results on interaction with the CCB:

CCB causes **larger rate increases for:**

- Capital constrained banks -> **In line with capital buffer theory**
- Banks with low equity capital -> Low buffers.
- Banks with high corporate capital -> Reserves more relevant buffer part.
- Banks with low reserves -> Low buffers.
- Banks with high equity growth -> typical «low-buffer» banks: split adjustment
- Banks with low ROE -> ROE as proxy for profitability more than COE

- Mortgage-Specialized banks -> costs of **back-book effect passed on...**

5. LTV Threshold Pricing of BANKS

Find:

(1) LTV per se *insignificant*,
but
banks charge extra for
LTV>66 and LTV> 80.

(2) **LTVs Thresholds** do *not*
amplify the CCB effect.

⇒ *Suggests* thresholds are
used as proxies of risk,
but risk weights do not
reinforce this.

⇒ With this risk-weight
scheme, CCB not risk-
sensitive

Dependent Variable: Offered Mortgage Rate (in bps)

	(1)	(2)	(3)	(4)	(5)
Mortgage Characteristics					
LTV	0.0282 (0.0206)	0.0261 (0.0205)	0.0264 (0.0204)	0.0267 (0.0205)	0.0251 (0.0207)
LTV67 _(0/1)	2.1329*** (0.6950)	2.5814*** (0.6923)	2.3856*** (0.6954)	2.3825*** (0.6960)	2.3527*** (0.6966)
LTV80 _(0/1)	1.8084** (0.7500)	1.8488** (0.7441)	1.5700** (0.7462)	1.5591** (0.7476)	1.5391** (0.7476)
CCB*LTV67 _(0/1)	-1.4976 (0.9193)	-1.4916 (0.9122)	-1.4856 (0.9111)	-1.4931 (0.9108)	-1.5161* (0.9115)
CCB*LTV80 _(0/1)	0.8679 (1.1688)	1.3353 (1.1508)	1.4530 (1.1509)	1.4593 (1.1516)	1.4828 (1.1516)
Refinancing Control					
Swap Rate 10y	73.6928*** (4.6923)	75.1129*** (4.6574)	74.4085*** (4.6616)	74.3725*** (4.6695)	74.2675*** (4.6725)
Request Controls					
Income		-3.9127*** (0.4673)	-3.1353*** (0.5086)	-3.1514*** (0.5114)	-3.2027*** (0.5191)
Wealth			-0.8430*** (0.2241)	-0.8406*** (0.2240)	-0.8085*** (0.2278)
Debt _(0/1)				0.1442 (0.5425)	0.1768 (0.5434)
Age					-0.0158 (0.0227)
Constant	120.4573*** (8.7060)	166.4232*** (9.8368)	168.8237*** (9.8425)	185.1407*** (9.9337)	186.3524*** (10.0654)
Bank FE:	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
House Type & Canton FE	Yes	Yes	Yes	Yes	Yes
Observations	4,045	4,045	4,045	4,045	4,045
R-squared	0.7593	0.7635	0.7643	0.7644	0.7644

5. LTV Threshold Pricing of INSURERS (NOT in current paper)

Find:

(1) While on average insurers are cheaper, we see that now:

- LTV **significantly positive**.
- Insurers charge far more extra for **LTV > 66 and LTV > 80**.

-> Insurers far more risk-sensitive.

(2) **LTV Thresholds** do **not** amplify the CCB effect.

=> *Corroborates* that LTV Thresholds relevant as a proxy for risk, but that risk weights do not strengthen this.

	(1)	(2)	(3)	(4)	(5)
Mortgage Characteristics					
LTV	0.1507*** (0.0348)	0.1499*** (0.0345)	0.1475*** (0.0341)	0.1483*** (0.0341)	0.1478*** (0.0341)
LTV67 (0/1)	6.6847*** (1.0847)	6.9681*** (1.0828)	6.5557*** (1.0786)	6.5349*** (1.0776)	6.5224*** (1.0917)
LTV80 (0/1)	3.6740*** (0.9723)	3.7831*** (0.9744)	3.1694*** (0.9672)	3.1527*** (0.9694)	3.1436*** (0.9700)
CCB*LTV67 (0/1)	0.8544 (1.4874)	0.9346 (1.4838)	0.8412 (1.4743)	0.8499 (1.4739)	0.8482 (1.4745)
CCB*LTV80 (0/1)	0.5225 (2.0359)	0.8913 (2.0383)	1.3460 (2.0267)	1.2923 (2.0310)	1.2966 (2.0310)
Refinancing Control					
Swap Rate 10y	61.3407*** (7.4244)	61.5667*** (7.4073)	59.9856*** (7.3323)	59.7529*** (7.3466)	59.7382*** (7.3547)
Request Controls					
Income		-2.4769*** (0.7591)	-0.8542 (0.8249)	-0.9247 (0.8338)	-0.9366 (0.8382)
Wealth			-1.6483*** (0.3626)	-1.6483*** (0.3620)	-1.6414*** (0.3664)
Debt (0/1)				0.7108 (0.7995)	0.7220 (0.7961)
Age					-0.0044 (0.0367)
Constant	91.5392*** (11.2571)	121.7826*** (14.4120)	126.3001*** (14.1873)	126.7725*** (14.2044)	127.0520*** (14.4077)
Bank FE:	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
House Type & Canton FE	Yes	Yes	Yes	Yes	Yes
Observations	1,414	1,414	1,414	1,414	1,414
R-squared	0.7789	0.7807	0.7841	0.7843	0.7843

5. Simple DiD:

Do **banks or insurers** make fewer offers?

Find

Banks always *more* likely to *offer*.

If at all, banks and insurers become more likely to offer.

No DiD effect of the CCB.

=> No negative effect on the willingness to make loans

	<i>OFFER(0/1)</i>		
	Banks (1)	Insurers (2)	Difference (1)-(2)
CCB=0	0.8710*** (0.0064)	0.8175*** (0.0115)	0.0535*** (0.0132)
CCB=1	0.8874*** (0.0074)	0.8238*** (0.0156)	0.0636*** (0.0172)
Difference	0.0164* (0.0097)	0.0063 (0.0194)	0.0101 (0.0217)

5. Simple DiD:

Do **banks or insurers** raise prices more?

Find

Insurers are on average 11.5 bp **cheaper**.

After the **CCB's** activation, on average:

- Banks charge 30.4 bp more.
- Insurers charge 29.9 bp more.

The **pricing gap** remains constant however.

=> **But, not controlling for demand, supply or time effects.**

	<u>Offered Mortgage Rate</u>		
	Banks (1)	Insurers (2)	Difference (1)-(2)
CCB=0	195.647*** (0.294)	184.324*** (0.538)	11.323*** (0.613)
CCB=1	226.033*** (0.624)	214.274*** (1.024)	11.786*** (1.200)
Difference	30.386*** (0.690)	29.924*** (1.157)	0.463 (1.347)

5. Regressions: Do **banks or insurers** raise prices more after CCB activation?

Find:

- On average both lender types raise prices
- Average bank rise (18p) largely in line with most QIS studies (12-15bps)
- If anything slightly larger:
 - Central bank signaling
- Insurers do not cause «leakage» by seeking to underbid
- Instead they raise more, in line with:
 - Greater general caution
 - Limited competition
 - Stable market share

	<i>Offered Mortgage Rate</i>						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(a) CCB*BANK	18.1311*** (2.9282)	18.7369*** (2.9042)	18.0803*** (2.8706)	17.7655*** (2.8755)	17.8320*** (2.8842)	17.9357*** (2.8860)	
(a) CCB*KANTONALBANK							14.0554*** (2.9824)
(a) CCB*FOREIGNBANK							19.5148*** (2.9216)
(a) CCB*OTHERBANK							20.6944*** (2.8853)
(b) CCB*NONB	26.9625*** (3.0176)	27.5509*** (2.9943)	26.8791*** (2.9620)	26.5553*** (2.9652)	26.6166*** (2.9725)	26.7209*** (2.9763)	26.8837*** (2.9617)
Refinancing Control							
Swap Rate 10y	72.5580*** (4.1694)	71.9349*** (4.1393)	72.9096*** (4.1210)	71.9478*** (4.1210)	71.8929*** (4.1282)	71.8162*** (4.1309)	72.1620*** (4.0720)
Mortgage Characteristics							
LTV	0.1600*** (0.0113)	0.0476*** (0.0183)	0.0458** (0.0181)	0.0459** (0.0181)	0.0463** (0.0181)	0.0449** (0.0182)	0.0449** (0.0179)
		3.1308*** (0.5445)	3.5347*** (0.5424)	3.2709*** (0.5448)	3.2630*** (0.5450)	3.2274*** (0.5480)	3.3118*** (0.5425)
LTV80 (0/1)		2.6726*** (0.5138)	2.9084*** (0.5082)	2.6146*** (0.5103)	2.6032*** (0.5108)	2.5909*** (0.5111)	2.6349*** (0.5081)
Request Controls							
Income			-3.4705*** (0.4118)	-2.4471*** (0.4494)	-2.4696*** (0.4530)	-2.5118*** (0.4586)	-2.4437*** (0.4494)
Wealth				-1.0885*** (0.1969)	-1.0860*** (0.1969)	-1.0598*** (0.2000)	-1.0799*** (0.1954)
Debt (0/1)					0.2066 (0.4682)	0.2359 (0.4686)	
Age						-0.0136 (0.0199)	
Constant	118.6651*** (12.3072)	122.6677*** (12.5125)	162.3979*** (13.5326)	165.5466*** (13.5074)	165.6442*** (13.4919)	166.5243*** (13.5910)	166.5272*** (14.0626)
<i>Lender FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Month FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>House Type & Canton FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,459	5,459	5,459	5,459	5,459	5,459	5,459
R-squared	0.7602	0.7632	0.7664	0.7678	0.7678	0.7678	0.7702
DID estimate (a)-(b)	-8.831	-8.814	-8.799	-8.790	-8.785	-8.785	
Wald test (a)-(b) p-value	0	0	0	0	0	0	

Outline

- 1 Motivation
- 2 Context, Data and Sample Construction
- 3 CCB Effects and Possible Amplifiers
- 4 Empirical Approach
- 5 Results
- 6 **Summing Up**

6. Key Conclusions

(1) **Average effect** in present Swiss case **limited**, likely due to:

- **Low calibration:** Only 1% of Residential Mortgage RWAs

- **High capitalization:**

Role of capitalization confirmed by sensitivity of identified effects to capitalization.

Yet still slightly larger than expected based on capital costs alone: **Signalling channel.**

(2) **Back-book effect:** Some costs of old mortgages passed on to new customers

-> The «right» bank characteristics matter: CCB has potential to slow down growth precisely for those banks considered most risky (under-capitalized, high mortgage exposure)

(3) **Risk-weighting schemes** (**LTV Thresholds**) do not amplify the CCB.

=> very risky mortgages still granted

(4) **Leakage** NOT a problem here, quite to the contrary.

→ May reflect insurers' caution and limited competitive pressures.

Thank you!

Appendix

7. Some Robustness Checks

- **Offer:** no significant CCB effects in regressions with control variables
- Use 10y Swiss government bonds instead of 10y swap rate.
Find: i_BANK and i_NONB estimates are if anything a bit bigger.
- Triple Effects with LTV Threshold, Sensitivity and CCB.
Find: no significant triple effects.
- Sensitivity Measures:
 - cost if external & internal finance, liquidity, ROA, size, guarantee
 - Using levels instead of medium reveals mainly similar results
- LTV Threshold effects:
 - i_LTV67 even negative and significant with 10y Swiss government bonds or without refinancing control.
 - LTV67 and 80 is also significant for insurers, but no interaction effect with CCB.
- Most **aggressive** bidders: Banks that make the best offers before the CCB continue this strategy after it.
- Different FE and clusters.
- Checked 5y fixed rate mortgages: comparable results.
- Use 10y Swiss government bonds instead of 10y Swap rates.

7. Simple DiD: Do accepted LTV ratios change?

Find

- **No** significant difference between ***banks*** and ***insurer***.
- **No** significant change over ***time***.
- **No DiD** effect.

=> Demand seems to be unaltered.

	<i>Requested LTV</i>		
	Banks (1)	Insurers (2)	Difference (1)-(2)
CCB=0	64.983*** (0.329)	65.791*** (0.473)	-0.8080 (0.576)
CCB=1	65.451*** (0.374)	65.418*** (0.653)	0.0330 (0.752)
Difference	0.4670 (0.498)	-0.3730 (0.806)	0.8410 (0.947)

7. Approximating the Costs of Equity and Costs of Debt

- Parameters computed from the 2011 public balance sheet data for the banks in our sample:
 - Cost of Equity (COE) = Dividends/Equity = 2.3%
 - Cost of Debt (COD) = InterestExpenses/Debt = 1.0%
- Using Return on Equity (ROE, Profits/Equity) for COE:
 - For sample in 2011 get ROE=4.8%, so ROE-COD=3.8%, CCB costs = 1.6BP
 - Note that according to SNB data the ROE is higher (8.75%) for all Swiss banks, driven by the riskier big banks not in our sample; Yet the CCB costs need not be higher for the big banks, as they also have lower average risk weights.

7. Descriptive Statistics: All

	mean	p50	sd	min	max	N
1123 requests; 22 bank; 3 insurers						
offered spread (in bp)	204.62	200	25.09	159	277.5	5459
CCB (0/1)	0.39	0	0.49	0	1	5459
LTV (in%)	65.30	70	15.40	7	100	5459
Kink67	5.59	4	5.98	0	34	5459
Kink80	0.25	0	0.80	0	21	5459
Income (in CHF tsd)	178.60	157.5	94.23	15	1400	5459
Wealth (in CHF tsd)	527.22	320	946.54	5	20000	5459
Income (ln)	11.99	11.97	0.44	9.62	14.15	5459
Wealth (ln)	12.66	12.68	1.01	8.52	16.81	5459
Debt (0/1)	0.17	0	0.37	0	1	5459
Age	44.58	44	9.33	20	79	5459

7. Descriptive Statistics: Banks Only

	mean	p50	sd	min	max	N
1120 requests; 22 bank						
offered mortgage rate (in bp)	99.33	98.96	13.54	65.00	139.04	4045
CCB (0/1)	0.41	0.00	0.49	0	1	4045
LTV (in%)	65.17	70.00	15.73	7	100	4045
Kink67	5.67	4.00	6.03	0	34	4045
Kink80	0.27	0.00	0.90	0	21	4045
Income (in CHF tsd)	176.71	155.00	92.65	15.00	1400.00	4045
Wealth (in CHF tsd)	521.40	313.00	967.57	5.00	20000.00	4045
Income (ln)	11.98	11.95	0.44	9.62	14.15	4045
Wealth (ln)	12.64	12.65	1.01	8.52	16.81	4045
Debt (0/1)	0.16	0.00	0.37	0	1	4045
Age	44.60	44.00	9.36	20	79	4045
<i>Bank Sensitivity (above/below median)</i>						
Constrained (0/1)	0.61	1	0.49	0	1	4045
Mortgages/Equity (0/1)	0.47	0	0.50	0	1	4045
Equity/TA (0/1)	0.34	0	0.47	0	1	4045
Corporate Capital/TA (0/1)	0.56	1	0.50	0	1	4045
Reserves/TA (0/1)	0.37	0	0.48	0	1	4045
ΔEquity (0/1)	0.60	1	0.49	0	1	4045
ΔMortgages (0/1)	0.57	1	0.50	0	1	4045
Customer Funds/Mortgages (0/1)	0.78	1	0.41	0	1	4045
ROE (0/1)	0.61	1	0.49	0	1	4045
<i>Bank Sensitivity (levels)</i>						
Excess Capitalization	40.58	44.79	21.82	8.29	119.61	3129
Mortgages/Equity	974.40	902.60	220.30	379.73	1785.48	4045
Equity/TA	7.30	7.36	1.19	4.91	13.96	4045
Corporate Capital/TA	1.59	1.28	1.13	0.00	3.72	4045
Reserves/TA	5.40	5.07	1.84	2.57	12.91	4045
ΔEquity	6.64	4.39	11.75	0.17	146.48	4045
ΔMortgages	8.59	8.35	7.33	1.57	94.42	4045
Customer Funds/Mortgages	115.87	110.68	32.90	37.14	202.95	4045
ROE	4.69	6.10	2.56	0.17	9.54	4045

7. Sample representative of Swiss market?

Canton	Share of Issued Mortgages in Switzerland 2012	Share of Requested Mortgage Volumes (Sample)	Share of Requets (Sample)
Zurich	19.19	25.59	22.51
Berne	10.77	11.69	13.25
Aargau	8.73	10.26	11.47
Vaud	8.07	11.73	10.96
St.Gallen	5.73	4.61	5.52
Geneva	5.06	2.70	1.78
Ticino	4.73	2.52	2.21
Lucerne	4.64	4.42	4.33
Basel Land	3.86	2.94	2.80
Valais	3.59	1.77	2.29
Thurgau	3.48	3.81	3.91
Solothurn	3.37	2.93	3.31
Graubünden	3.33	1.56	1.87
Fribourg	3.23	3.13	3.82
Schwyz	2.37	2.74	2.46
Zug	2.04	1.82	1.27
Basel Stadt	1.92	1.64	1.53
Neuchatel	1.53	1.03	1.19
Schaffhausen	0.94	0.41	0.68
Jura	0.75	0.41	0.59
Appenzell AR	0.62	0.36	0.59
Nidwalden	0.54	0.61	0.42
Obwalden	0.47	0.75	0.59
Glarus	0.44	0.43	0.42
Uri	0.40	0.16	0.17
Appenzell IR	0.18	0.00	0.00

$$\chi^2 = 5.59, v=25, 5\% \text{ critical value} = 37.65.$$

7. Sample representative of Swiss market?

	Share of Issued Mortgages in Switzerland 2012	Share of Requested Mortgage Volumes (Sample)
LTV<67	92.47	91.00
67<=LTV<80	5.66	8.20
LTV>=80	1.87	0.79

LTV brackets split by tranches of all mortgages.