The capital constraints channel of collateral eligibility: evidence from a credit support exit policy

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Disclaimer

The views and conclusions presented in this paper are exclusively those of the authors and do not necessarily reflect the position of the Central Bank of Chile or the Board members.

Motivation

- Ongoing debate on how to improve bank liquidity regulation (BIS, 2025)
  - Strengthen liquidity requirements vs central bank liquidity support
- Optimal level balances stability and credit supply (Sundaresan and Xiao, 2024)
  - Higher liquidity requirement $\rightarrow \Delta^{-}$ excessive liquidity transformation
  - Vs. inducing *crowding out* effect in lending when using balance sheet space
- Interplay between bank liquidity and capital constraints plays a central role
- **This paper:** What is the impact of tighter liquidity constraints on credit supply in the presence of capital constraints during normal times?

What we do

- Exploit three Covid-19 exit policies in 2022 in Chile
  - Change in collateral eligibility for a cheap credit line $\rightarrow$ liquidity constraints
  - Anticipated increased in capital requirements due to Basel III
  - Unanticipated increased in capital requirement due to activation of CCyB
- Data
  - Chile's excellent credit registry from bank regulator (CMF)
  - Public information from CMF on compliance of Basel III
  - Collateral and lending facility use by bank from the Central Bank of Chile (CBC)
- Empirical design
  - Exposure measures to tightening in liquidity and capital requirements $\rightarrow$ unrelated
  - Causal effect on credit supply $\rightarrow$ Khwaja and Mian (2008)
  - Additional results: risk taking, credit conditions, firm-level (not today)

What we find

- Changes in collateral eligibility may reduce credit supply by forcing banks to maintain higher levels of liquid assets
- Due to interaction between liquidity and capital constraints
  - Change in collateral policy affected only those banks with relatively less capital
- Interaction is not "symmetric":
  - Capital requirements had an effect even in less liquidity constrained banks but larger in those more constrained
- When weighted by loan size, the effects appear insignificant, suggesting only mild aggregate impacts
  - More constrained banks shift lending towards larger firms
  - More liquidity and capital constrained banks adjust by reducing risk taking
  - Smaller and single-banks are more negatively affected

Roadmap

1. Institutional framework: credit support policies during and after Covid-19
2. Data and sample
3. Empirical strategy: measurement and identification challenges
4. Main results
5. Heterogeneity in size and risk taking

Credit support measures in Chile during Covid-19

1. *Facilidad de Crédito Condicional al Incremento de las Colocaciones* (FCIC)
   - CBC's credit line expiring Jul. 24 at fixed rate of 0.5% conditional on SME lending
   - In tandem with government's partial credit guarantees program (≈10% GDP) ▸ FCIC
   - Allowed banks to pledge commercial loans as collateral

2. Government's expansion of partial credit guarantee program (FOGAPE)
   - In tandem with FCIC ≈10% of GDP

3. Basel III rescheduled to 2021-2025$\rightarrow \Delta^{+}$ capital 0.5% to 0.75% of RWA annually

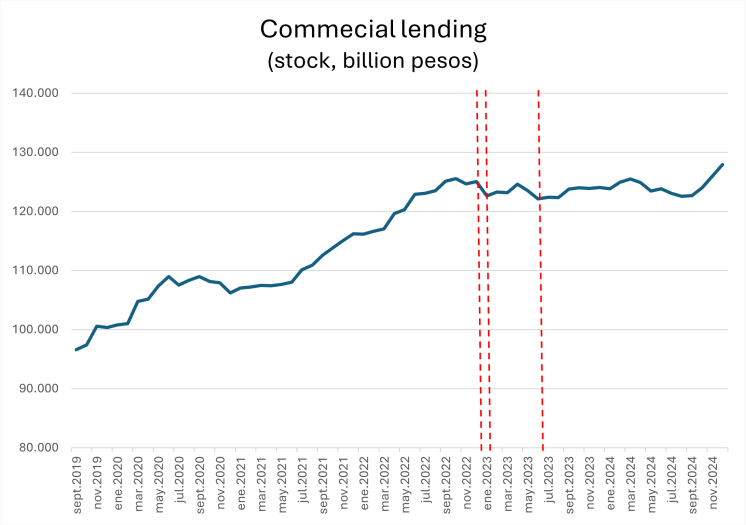
Policies after Covid-19

1. Change in collateral eligibility for the FCIC
   - In preparation for the end of the FCIC
   - Announced Nov. 2022, effective Jan. 2023
   - Replacement of commercial loans by liquid assets 1/18 per month ▸ Collaterals

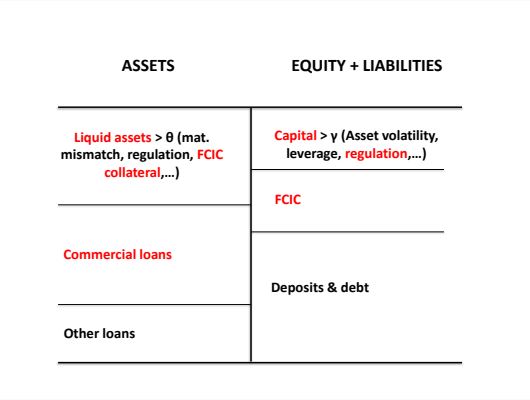
2. Basel III: additional capital requirement of 0.5% of RWA
   - December 2022 (announced in 2020)

3. Activation of CCyB at 0.5% of RWA
   - Announced May. 2023, effective Jun. 2024

Aggregate commercial lending and timing of post Covid-19 policy changes



How does a change in collateral eligibility affect credit supply?



- Unconstrained banks can use liquidity and capital surplus to adjust
- Δ^+ leverage reduced effect on credit supply; but could tighten its capital constraint
- Reducing commercial loans alleviates both constraints, yet it remains unprofitable

Data and sample (August 2022)

Variable	Mean	SD	p25	p75	Obs
Panel A. Banks					
Total capital surplus	6.70	1.92	5.75	8.28	10
η (capital surplus over capital)	41.50	7.75	33.56	47.98	10
CollExp. (% loans as collateral)	9.41	3.66	6.35	11.21	10
Log total loans	16.46	1.00	15.74	17.19	10
% commercial loans	0.65	0.16	0.51	0.76	10
Panel B. Firms					
Multibank	0.33	0.47	0.00	1.00	174,785
Outstanding debt (MM pesos)	357	5088	3.96	70.26	174,785
N. workers	19.65	186.50	2.00	10.00	174,785
Firm size category based on sales	1.82	0.80	1.00	2.00	173,059
Group risk	0.90	0.29	1.00	1.00	144,163
% loan provisions	0.06	0.15	0.00	0.03	162,109
New loan amount (MM pesos)	494.41	4049.46	10.99	142.77	13,449
Interest rate (monthly)	13.4580	4.3092	11.8839	16.7000	13,449
Maturity (months)	28.55	47.02	2.22	37.30	13,449

▸ Eta

Two bank groups based on capital surplus usage

$$\eta_{bt} = 1 - \frac{\kappa_{bt} \sum_i \bar{w}_i a_{ibt}}{C_{bt}}$$

▸ Leverage ▸ Assets

Effect of interplay between liquidity and capital constraints on credit supply: ideal setting

$$\Delta^{\%} C_{ibt} = C + \beta Liquidity_b + \delta Capital_b + \psi \ Liquidity_b \times Capital_b + \varepsilon_{ibt}$$

- Randomize liquidity and capital requirements such that $Liquidity_b = 1$ if bank has to increase liquid assets by X% (low liquidity), 0 otherwise; $Capital_b = 0$ if bank has to increase capital over RWA by Y% (low capital), 1 otherwise.
- Compare evolution of credit supply between 4 groups of banks:
  - (Low capital; high liquidity) $\rightarrow$ C
  - (Low capital; low liquidity) $\rightarrow$ C + β
  - (High capital; high liquidity) $\rightarrow$ C + δ
  - (High capital; low liquidity) $\rightarrow$ C + δ + β + ψ

Measurement and identification challenges

- Measures of liquidity and capital constraints
  - $CollExp.^{Aug22} \rightarrow$ loans as collateral over total loans in base period
  - $\eta^{Aug22} \rightarrow$ capital surplus over capital in base period. Robust to different measures.
  - Binary $\rightarrow D^{Liq} = 1$ if $CollExp.^{Aug22} > p50$; $D^{Cap} = 1$ if $\eta^{Aug22} > p50$

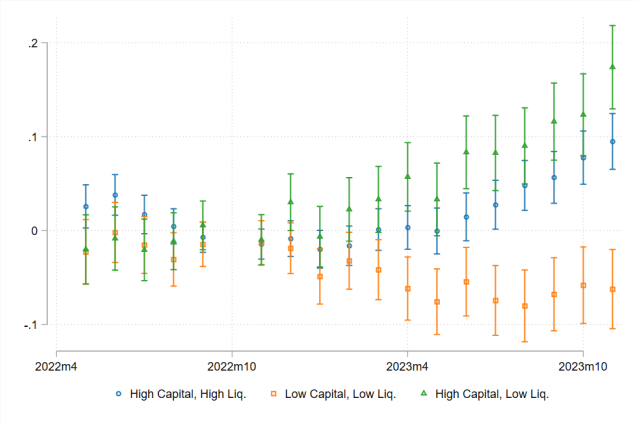
- Unobservable credit demand shocks potentially correlated with η
  - firm-time FE (Khwaja and Mian, 2008) for multi-bank firms

- No anticipation (in lending) to additional capital requirements of Basel III

- Liquidity and capital constraints measures not correlated

No evidence of anticipation in lending

$$LogC_{ibt} = \alpha_{it} + \delta_{ib} + \sum_{s\in\{-m,\ldots,0,\ldots,n\}} \gamma_s^{l} D_{b,t-s}^{Liq} + \sum_{s\in\{-m,\ldots,0,\ldots,n\}} \gamma_s^{c} D_{b,t-s}^{Cap} + \sum_{s\in\{-m,\ldots,0,\ldots,n\}} \gamma_s^{lc} (D_{b,t-s}^{Liq} \times D_{b,t-s}^{Cap}) + \varepsilon_{ibt}$$



Exposure to both type of shocks leads to significant differences in credit supply

$$\Delta^{\%} C_{ibt+h} = \alpha_{it+h} + \delta_{t+h} D_b^{Cap} + \beta_{t+h} D^{Liq}{}_b + X_b^{Aug22}\ \lambda_{bt+h} + \varepsilon_{ibt+h}$$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Before CCyB (+6)			After CCyB (+12)			After CCyB (+18)		
D^{Cap}	2.616***		2.637***	8.310***		8.352***	9.230***		9.624***
	(0.488)		(0.488)	(0.587)		(0.588)	(0.733)		(0.734)
D^{Liq}		-2.754***	-2.788***		-3.012***	-3.193***		-3.232***	-3.384***
		(0.584)	(0.584)		(0.672)	(0.749)		(0.913)	
Obs.	128,695	128,695	128,695	120,237	120,237	120,237	107,423	107,423	107,423
FirmXMonth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

- No correlation between collateral eligibility exposure and capital surplus
- Effect of liquidity stable over time; capital effect increases after CCyB

Differences in credit supply across groups are significant before and after CCyB

$$\Delta^{\%} C_{ibt+h} = \alpha_{it+h} + \delta_{t+h} D_b^{Cap} + \beta_{t+h} D^{Liq}{}_b + \psi_{t+h} D_b^{Cap} \times D^{Liq}{}_b + X_b^{Aug22}\ \lambda_{bt+h} + \varepsilon_{ibt+h}$$

	(1) Before CCyB (+6)	(2) After CCyB (+12)	(3) After CCyB (+18)
(High Capital, High Liquidity)	1.458***	6.747***	8.220***
	(0.516)	(0.678)	(0.859)
(High Capital, Low Liquidity)	1.176	6.970***	6.994***
	(0.774)	(0.990)	(1.212)
(Low Capital, High Liquidity)	0	0	0
	-	-	-
(Low Capital, Low Liquidity)	-4.768***	-5.881***	-5.140***
	(0.726)	(0.949)	(1.173)
Obs.	128,695	120,237	107,423
FirmXMonth	Yes	Yes	Yes
Bank Level Controls	Yes	Yes	Yes

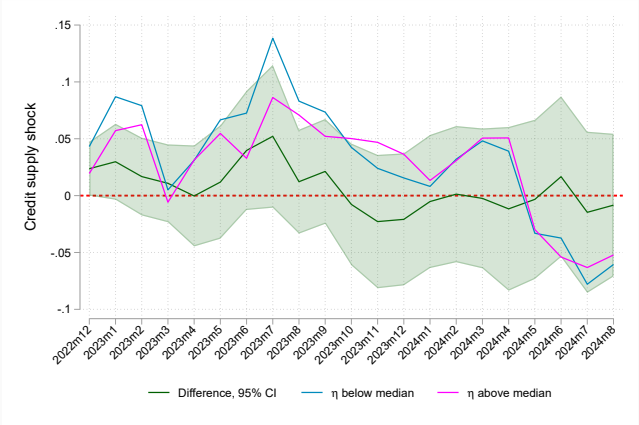
Interaction of liquidity and capital constraints is not symmetric

$$\Delta^{\%} C_{ibt+h} = \alpha_{it+h} + \delta_{t+h} D_b^{Cap} + \beta_{t+h} D^{Liq}{}_b + \psi_{t+h} D_b^{Cap} \times D^{Liq}{}_b + X_b^{Aug22}\ \lambda_{bt+h} + \varepsilon_{ibt+h}$$

	(1) Before CCyB (+6)	(2) After CCyB (+12)	(3) After CCyB (+18)
Low liquidity effect | Low capital	-4.768***	-5.881***	-5.136***
	(0.726)	(0.949)	(1.173)
Low liquidity effect | High capital	-0.28	0.22	-1.23
	(0.822)	(1.032)	(1.253)
Low capital effect | Low liquidity	-5.944***	-12.851***	-12.131***
	(0.877)	(1.121)	(1.363)
Low capital effect | High liquidity	-1.458***	-6.747***	-8.220***
	(0.516)	(0.678)	(0.859)

- Conditional on being capital unconstrained, liquidity effect is insignificant
- Capital effect is always significant and larger for tighter liquidity constraints
- Comparing estimates before and after CCyB reinforces this idea

Insignificant effects when weighting by loan size suggests mild aggregate impact



- Shift in lending toward larger firms by more capital constrained banks ▸ Het: size
- Consistent with larger effects on single bank firms ▸ Single bank

Banks facing tighter constraints reduce risk-taking

	(1) Before CCyB (+6)	(2) After CCyB (+12)	(3) After CCyB (+18)
Panel A: Risk taking across groups			
(High Capital, High Liquidity) × High Risk	0.59	6.250***	10.277***
	(0.661)	(0.835)	(0.990)
(High Capital, Low Liquidity) × High Risk	2.79***	8.36***	11.70***
	(0.968)	(1.202)	(1.395)
(Low Capital, High Liquidity) × High Risk	0	0	0
	–	–	–
(Low Capital, Low Liquidity) × High Risk	-6.38***	-6.19***	-6.01**
	(1.168)	(1.470)	(1.696)
Panel B: Risk taking within group			
(High Capital, High Liquidity)	-3.194***	-3.654***	-5.343***
	(1.051)	(1.309)	(1.537)
(High Capital, Low Liquidity)	3.418*	5.388*	4.65*
	(1.975)	(2.309)	(2.565)
(Low Capital, High Liquidity)	-6.954***	-11.775***	-26.613***
	(1.470)	(1.816)	(2.150)
(Low Capital, Low Liquidity)	-4.84***	-1.738***	-6.585***
	(1.506)	(1.866)	(2.168)

Conclusion

- We study how the interaction between bank capital and liquidity constraints influences credit supply under normal economic conditions.
- Our results indicate that tightening liquidity requirements influenced credit supply at the loan level via capital constraints.
- Our findings suggest an asymmetric interplay between liquidity and capital constraints, with liquidity constraints impacting credit supply only when capital constraints bind, whereas capital constraints always affect credit supply, more so when liquidity constraints bind.

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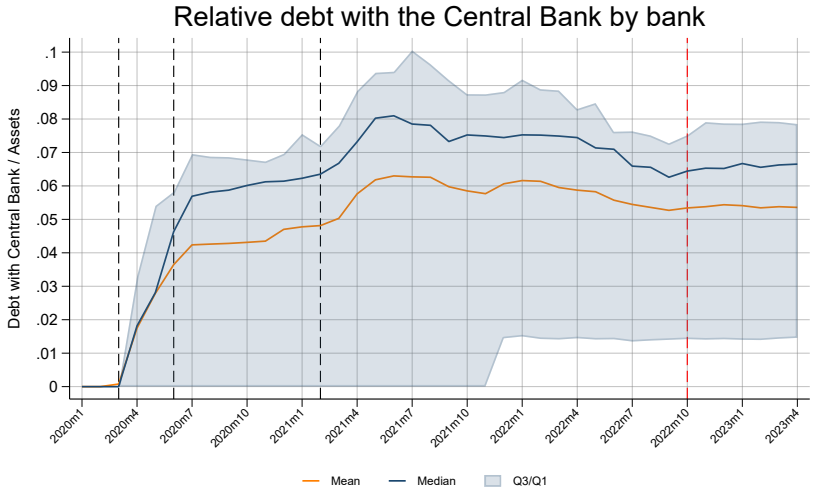
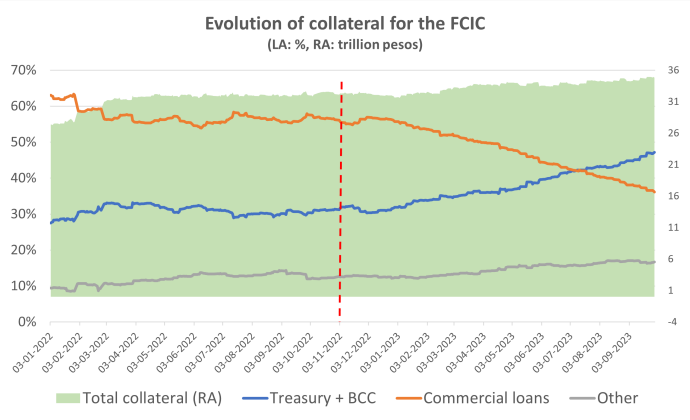
FCIC represented ≈ 7% of total assets for the medium bank after Covid-19



* Black lines represent the different stages of the FCIC. The red line represents the announcement of collateral normalization

The change in collateral eligibility prompted banks to replace commercial loans with traditional liquid assets



Back

An observable measure of bank capital constraints is capital surplus

- Capital surplus normalized by RWA $= \dfrac{C_{bt}}{RWA_{bt}} - \kappa_{bt}$
- Capital surplus normalized by bank capital (η):

$$\eta_{bt} = 1 - \frac{\kappa_{bt} \sum_i \bar{w}_i a_{ibt}}{C_{bt}}$$

$$\eta_{bt} = 1 - \underbrace{\kappa_{bt}}_{\text{Capital requirement}} \underbrace{\frac{A_{bt}}{C_{bt}}}_{\text{Leverage}} \underbrace{\sum_i \bar{w}_i \omega_{ibt}}_{\text{Risk}}$$

$$\Delta\eta_{bt} = \underbrace{(\eta_{bt} - 1)}_{<0}[\Delta^{\%}\kappa_{bt} + \Delta^{\%} Lev_{bt} + \Delta^{\%} Risk_{bt}]$$

Back

More capital constrained banks maintain their surplus by decreasing leverage

$$\Delta\eta_{bt} = \underbrace{(\eta_{bt} - 1)}_{<0}[\Delta^{\%}\kappa_{bt} + \Delta^{\%}Lev_{bt} + \Delta^{\%}Risk_{bt}]$$

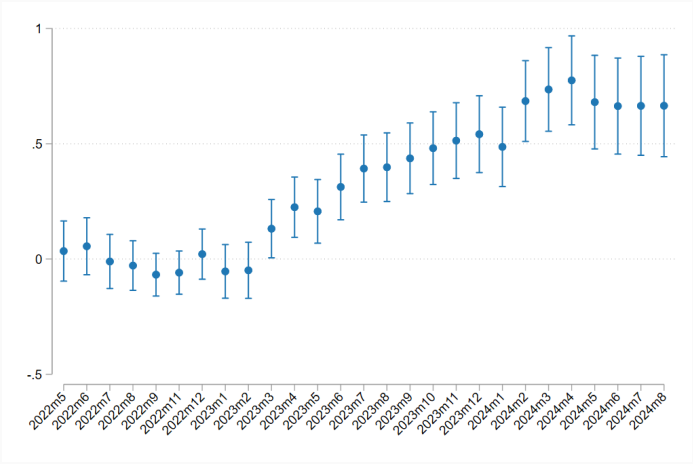
Back

... and decrease leverage by accumulating capital faster than asset growth

Back

No evidence of anticipation to announced capital requirements

$$LogC_{ibt} = \alpha_{it} + \delta_{ib} + \sum_{s\in\{-m,\ldots,0,\ldots,n\}} \gamma_s \eta^{Aug22}_{b,t-s} + \varepsilon_{ibt} \text{ (outstanding debt, multi-bank)}$$ Back



Heterogeneity: more capital constrained banks shift lending towards larger firms

$$GC_{ibt+h} = \alpha_{it+h} + \delta_{t+h}\ \eta_b^{Aug22} + \beta_{t+h}\ \eta_b^{Aug22} \times Size_i^{Aug22} + X_b^{Aug22}\ \lambda_{t+h} + \varepsilon_{ibt+h}$$

	Collateral eligibility		Collateral eligibility + CCyB announcement		
	+3	+6	+9	+12	+18
η (aug-22)	0.0392	0.2923***	0.4998***	0.6475***	0.9176***
	(0.0311)	(0.0369)	(0.0410)	(0.0448)	(0.0510)
η (aug-22) $\times$ Large$_i$	-0.0509	-0.2293***	-0.3378***	-0.2521***	-0.3713***
	(0.0692)	(0.0809)	(0.0878)	(0.0952)	(0.1083)
Obs.	144,421	144,418	144,418	144,417	144,410
Bank Level Controls	Yes	Yes	Yes	Yes	Yes

Back

Effect is larger on single-bank firms

$$GC_{ibt+h} = ILST_{it+h} + \beta_{it+h}\ \eta_b^{Aug22} + X_b^{Aug22}\ \lambda_{bt+h} + \varepsilon_{ibt+h}$$

	Months after event									
	+3		+6		+9		+12		+18	
Weighted Avg. Eta	-0.065*	0.180***	-0.029	0.458***	0.066	0.577***	0.119*	0.663***	0.087	0.634***
	(0.037)	(0.038)	(0.050)	(0.044)	(0.059)	(0.049)	(0.067)	(0.053)	(0.082)	(0.060)
Weighted Avg. FCIC Exposure	-0.598***	-0.932***	-0.778***	-1.106***	-0.832***	-1.130***	-0.721***	-1.174***	-0.702***	-1.209***
	(0.129)	(0.192)	(0.168)	(0.218)	(0.197)	(0.238)	(0.223)	(0.253)	(0.270)	(0.282)
Obs.	44,857	102,876	44,857	102,876	44,857	102,872	44,857	102,870	44,857	102,867
Multibank	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

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