



# Motivation

The COVID-19 shock has propagated to economies through various channels

One strand of literature: how firms coped with this shock & role of policies (see Alfaro et al. 2020; Gourinchas et al. 2021; Albagli et.al 2021, among others)

Another strand: large movements in cross-border capital flows brought about by the pandemic, (Kalem Ozcan 2020; BIS 2020/21, IMF 2020/21, among others)

How did firms react to the sudden drying out of international capital markets? Were they able to adjust their finance mix between international and domestic finance? To what extent was this related to credit support policies implemented?

# Motivation

Providing answers to these questions is of first order importance for small open economies: **Chile's case** provides a good illustration

# What we do

We provide answers to these questions using data on Chilean firms and economic theory:

**Empirical analysis:** Unique administrative dataset that allow us to study the full spectrum of the finance mix for the universe of firms in Chile & the effect of credit support policies via RDD analysis

**Theoretical analysis:** Model with heterogeneous firms and financial frictions to rationalize the key channels behind drivers of firms' finance mix in the wake of COVID and the role played by credit support policies

# What we find

## Empirical analysis:

Change in the finance mix : firms moved away from foreign debt into domestic debt

Causal link from credit policies , namely firms' eligibility to loans with sovereign guarantees

## Theoretical analysis:

Model stresses the role of financial frictions in the mechanism of debt substitution

Underscores the role of policies also complementarity between liquidity provisions by the central bank & sovereign guarantees on bank loans to firms

# Data

Massive effort by the CBCh in a repository with (anonymized) administrative datasets for policy & research:

**Capital In flows:** universe of borrowing transactions (bonds & loans) between firms and foreign lenders (spreads, loan amounts, etc)

**Credit registry:** Universe of domestic stock and flows of firms' bank debt (rates, loan amounts, etc.). **Includes loans under credit support programs after COVID**

**Bond Issuance:** universe of firms' bond issuance in the domestic financial market.

**Production:** tax forms for the universe of firms' sales and expenditures

Monthly merged dataset, 2012-2020: 2M observations; 300.000

firms

Filters

Descriptive Stats

# Credit Support Policies

Credit support was an essential element of the policy package deployed to minimize the economic scarring effects of COVID in Chile

Two pillars of the credit support programs were

**FCIC:** a novel credit line facility from the central bank to commercial banks conditional on the growth of credit issuance, particularly to small and medium firms

The facility provided USD40 billions to commercial banks and accounted for the unprecedented 10% GDP increase of the CB balance sheet

**FOGAPE-COVID:** sovereign guarantees on commercial banks' loans to firms below a chosen pre-determined size

# Credit Support Policies: FOGAPE-COVID

FOGAPE dates back to 1980, through which government resources are used as a fraction of collateral for credits taken by small firms

Eligibility to borrow under the program depends on yearly sales

On April 25, 2020, the government launched the FOGAPE-COVID program which included a massive recapitalization of the fund guaranteeing up to 9% of GDP in credits

Crucially, **FOGAPE-COVID relaxed the cutoff required to access** the typical FOGAPE credits



# Credit Support Policies: FOGAPE-COVID

**Table:** FOGAPE in January 2020 Vs FOGAPE-COVID in April 2020

	FOGAPE - Jan 2020	FOGAPE-COVID - April 2020
Fund capitalization (USD Millions)	100	3,000
Interest rate (CHP)	Market	MPR+3%
Max. annual sales eligibility threshold (UF)	350,000	1,000,000
	Fraction guaranteed/maximum loan value	
Sales range (UF)	Jan-20	May-20
0 - 25,000	80% - 5,000 UF	85% - 6,250 UF
25,000 - 100,000	50% - 15,000 UF	80% - 25,000 UF
100,000 - 350,000	30% - 50,000 UF	70% - 150,000 UF
350,000 - 600,000	Non eligible	70% - 150,000 UF
600,000 - 1,000,000	Non eligible	60% - 250,000 UF
> 1,000,000	Non eligible	Non eligible

# Descriptive Stats.

Figure: Firms' Finance Mix in Chile: Before & During COVID

# Regression Discontinuity Design (RDD) Analysis

RDD: causal effect of **becoming eligible** to receive a FOGAPE-COVID credit on firms' domestic debt share mix

Natural approach: exogenous changes in the sales' thresholds required for eligibility to FOGAPE-COVID credits

Firms with annual sales up to 1,000,000UF suddenly became eligible (treated): quasi-randomly assigned around the new eligibility threshold

No self-selection: assignment variable (2019 sales) is observable & depends on a threshold in the past

Continuity test

Sorting test

We ran the following spec. between May and July of 2020:

$$\frac{D_i^{\text{domestic}}}{D_i^{\text{total}}} = \alpha_0 + \alpha_1 \text{Log}(\text{sales}_i^{2019}) + \text{Eligible}_i + \epsilon_i \quad (1)$$

# Regression Discontinuity Design (RDD) Analysis

significant at 5-10%: eligibility increased domestic debt share by 9-14%

Macro implications : sales of newly eligible firms are 18% of GDP; their increase in domestic credit was about 1% of GDP

# SOE Model's Key Elements

What are the channels behind the debt substitution results?

Key elements that we want to model/understand:

Endogenous domestic-foreign debt finance mix

Heterogeneous finance mix across firms - financial frictions

More evidence

Endogenous interest rate differential with  $R > R^*$  Evidence

Credit supply affected by risk aversion

A COVID Shock & Policies akin to FCIC and FOGAPE

# SOE Model - Environment

Two period  $t = 1; 2$ , small open economy, **real** model (no exchange rate), single good

Agents: Identical households; **heterogeneous firms**; government (policies); foreign lenders; banks

# Model - Collateral Constraints

Collateral constraints (CC) a la Caballero-Krishnamurthy but with **heterogeneity** in Intl. collateral  $d_{2,f}^i \in U[0; \bar{d}]$ :

$$R^? d_{1,f}^i = d_{2,f}^i$$

$$R_2 d_{1,d}^i = d_{1,d}^i + Y_2^i + (d_{2,f}^i - R^? d_{1,f}^i)$$

Where  $Y_2^i = A_2(k_2^i)$  and  $k_2^i = d_{1,d}^i + d_{1,f}^i$

Without CC, rst-best level of capital for all firms equals:

$$(A_2)^{\frac{1}{1-\alpha}} = k^?$$

$k^?$ , target level of capital all firms wish to finance.

# Model - Two Groups of Firms

Because  $k^? & R > R^? \Rightarrow$  most firms have some domestic debt & all firms borrow up to their Intl. Collateral

This gives rise to **two kinds of firms**:

Domestically **unconstrained** firms with **high**  $i_{2,f}^i$ : can finance  $k^?$ ; slack domestic CC

Domestically **constrained** firms with **low**  $i_{2,f}^i$ : cannot finance  $k^?$ ; borrow domestically up to their pledgeable income ( $dA_2(k^i)$ ); binding CC



# Model - Equilibrium $R_2$

The market clearing condition in the domestic credit market pins down  $R_2$ :

$$\underbrace{Z^{\wedge} d_{1;d}^? \left( \begin{matrix} i \\ 2;f \end{matrix} \right)}_{\text{Demand from constrained rms}} + \underbrace{Z^{\wedge} k^? \left( \begin{matrix} i \\ 2;f \end{matrix} \right)}_{\text{Demand from unconstrained rms}} = e_T$$

where  $e_T$  is total credit supply and  $Z^{\wedge}$  is the endogenous cut-off that separates constrained from unconstrained rms. Expression

# Model - Credit Supply

Need a minimal structure on the credit supply side to talk about **risk aversion** amid crisis & effects of **policies**

Credit supply has two parts: Central Bank ( $\epsilon_{CB} < 1$ ) and households ( $\epsilon_H$ ):

$$\epsilon_T = \epsilon_{CB} + \epsilon_H \quad (2)$$

$$= e^{R^? - 1} (\dots) \quad (3)$$

where  $\dots$  captures risk-aversion from shocks to capital markets

If  $\dots > 1$  then **excess reserves** in "banks" are accumulated:

$$\epsilon_{CB} \quad \epsilon_{CB}$$

# Model - Quantitative Experiments

We use the model to run two quantitative experiments:

A **COVID shock** that impacts world capital markets and make EMEs riskier:  $R^?$  increases

Two policies

**FCIC-type** as an increase central bank liquidity:

$$e_{CB} > 0$$

**FOGAPE-type** as a relaxation of collateral:

$$d > 0$$

# Quantitative Experiment No. 1: COVID Shock

## Demand channel:

Less foreign debt: collateral constraint becomes tighter for firms

Unconstrained firms substitute debt by borrowing more at home: "  $R_2$

Constrained firms forced to borrow less as domestic pledgeable output falls and domestic interest rates increase

## Supply channel:

Banks' risk aversion increases: Market supply shifts left because "

# Quantitative Experiment No. 1: COVID Shock

# Quantitative Experiment No. 2: Policies

$$e_T = e_{CB} + e_H$$

$$= e^{R^? - 1} \quad (d)$$

## Central Bank liquidity (FCIC) alone:

The higher the risk aversion in banks the less effective

Liquidity likely to flow only to few large safe firms

## Sovereign Guarantees (FOGAPE) alone:

Unlocks credit supply by reducing risk aversion

But the boost in credit demand may be larger, thus increasing rates

## Joint FCIC & FOGAPE: Complementarity

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# Quantitative Experiment No. 2: Policies

# Takeaways

We show evidence of debt substitution by firms at the onset of COVID, away from foreign and into domestic debt

RDD evidence shows debt substitution fostered by credit support policies

A heterogeneous firms model with financial frictions allows us to rationalize these findings, stressing the complementarity between policies, namely sovereign guarantees and central bank liquidity



# Thanks

THANK YOU!

# Question 2: Theoretical analysis - Domestic debt share

## Debt substitution

A global shock  $\# d_{1,f}$  for all rms. Unconstrained can substitute.

Policies that  $\# R_2$ , "  $d_{1,d}$  for constrained rms.

## Share of unconstrained rms

A global shock shrinks share of unconstrained rms.  
Intuitively, having less  $d_{1,f}$ ,  $\#$  output, tightening domestic CC.

Policies that  $\# R_2$ , expand share of unconstrained rms.  
Intuitively,  $R_2$   $\#$  alleviates domestic CC.

Global shock    FOGAPE

# Covid Shock and Capital Flows

There was a sharp decrease in credit flows to Chile, and a sharp increase in the spreads of newly-issued foreign debt.

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# Data Iters

Firms that borrow abroad we keep only non-trade credit loans and bond issuance.

Foreign credits in either U.S. Dollar, Euros, Japanese Yens or Chilean Pesos.

Credits with positive spreads

Firms that reports F29 ( about 40% of total external borrowing, and its behavior is highly correlated with that of the full sample).

We consider the period between April 2012 and December 2020. [Back](#)

# Leverage and $\beta$ size

# Descriptive Stats

Table: Descriptive statistics - Merged Dataset

	Domestic loans	Foreign loans	Domestic interest rate (CHP -%)	Foreign interest rate (USD - %)	Foreign interest rate (CHP Ex-Post UIP - %)
Mean	150166 USD	39530 USD	13.2	3.3	10.2
Standard Deviation	1164683 USD	184548 USD	8.8	2.3	9.1
Total yearly loans (% GDP)	34.59	32.13			
Number of loans	1972626	9872			
	Domestic loans only	Foreign loans only	Domestic and Foreign Debt	All rms	
Total yearly sales (% GDP)	122.2	2.8	32.7	157.7	
Total yearly sales (% F29 total sales)	56	1.3	14.9	72.3	
Number of rms	282922	465	703	284090	

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# Descriptive Stats.

Table: Interest rates 2020 vs 2019

	March - July 2019	March - July 2020
Mean $i$ (CHP - %)	15.9	5
Mean $i^?$ (USD - %)	4.3	3.5
Mean $i^?$ (CHP Ex-Post UIP - %)	11.5	22.6
CEMBI (USD %)	2.5	5.1
Number of firms ( $i$ )	59479	174010
Number of firms ( $i^*$ )	64	75
Mean 2019 sales UF ( $i$ )	16153	14587
Mean 2019 sales UF ( $i^*$ )	864459	1360514

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# FOGAPE details

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# RDD Estimates

**Table:** Estimate - Regression Discontinuity Design

	Baseline (degree 0, tri)	Alternative 1 (degree 1, tri)	Alternative 2 (degree 0, epa)	Alternative 3 (degree 0, epa)
Treatment estimate	0.09205*	0.12213*	0.09758**	0.13603*
Standard Error	0.05363	0.06678	0.05383	0.06762
Number of Observations	653	653	653	653

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# RDD Sorting Test

Cataneo et al. (2020) manipulation test.

We find no evidence of manipulation (sorting) in our sample.

**Figure:** Manipulation test around the cuto

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# RDD Continuity Test

We test for continuity in absence of the treatment.

We use as a placebo sample May-July 2019 instead of 2020 for the domestic debt share.

We find no evidence of discontinuity at the cutoff in absence of the treatment.

	Baseline (degree 0, tri)	Alternative 1 (degree 1, tri)	Alternative 2 (degree 0, epa)	Alternative 3 (degree 0, epa)
Treatment estimate	0.00814	0.02325	0.01852	0.02954
Standard Error	0.04981	0.08466	0.05144	0.08478
Number of Observations	632	632	632	632

**Table:** Domestic debt share vs Sales - Estimated polynomial May to July of 2019

# Parameters

Parameters used in the baseline quantitative exercise			
Parameter	Value	Parameter	Value
$R^?$	1	$e_{1;H}$	$1.4768e_{1;CB}$
$A_2$	3	$d$	0.25
	$\frac{1}{2}$	$e_{1;CB}$	0.5
$k^?$	2.25		10
—	0	$e_{CB}$	0.05
	$k^? \quad 0:2$	$d$	0.05

$e_{1;T}$  is chosen so that  $R_2 = 1:1$  in the baseline equilibrium (consistent with empirical evidence on domestic rates).

$d$  is chosen to ensure leverage is increasing throughout firm size:  $\dot{u} > \dot{c}$ .

# Expression for $\hat{A}$

$$\hat{A} = R^? \quad k^? \quad \frac{dA_2 k^?}{R_2}$$

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# Effects of a global shock in more detail

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