The COVID-19 Shock and Firm Financing: Government or Market? Or Both?

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[1]Disclaimer: views do not correspond to those of the Central Bank of Chile or its board members, nor those of the IMF, its executive board, or IMF management.

Motivation

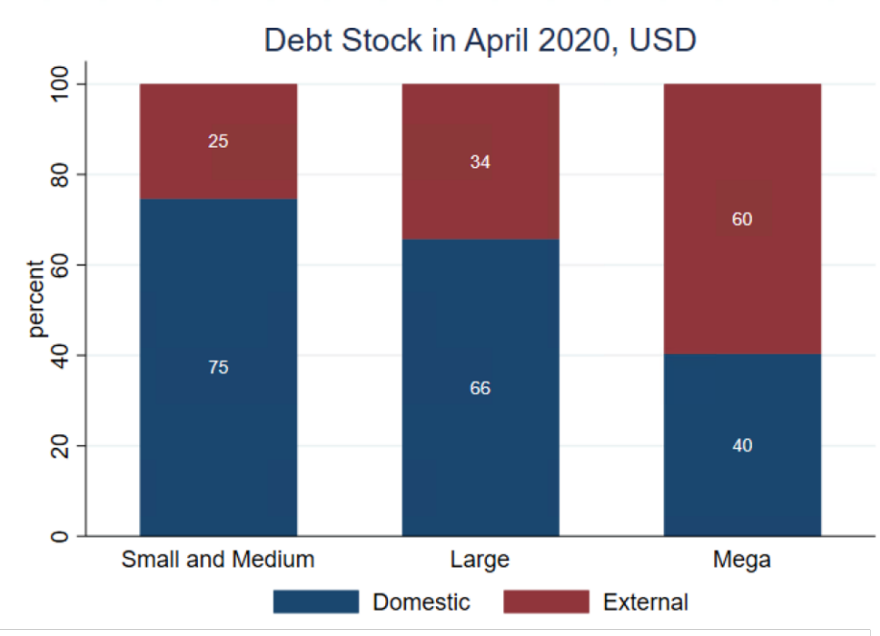
- How does **COVID-19 shock** propagate to small open economies?
- So far literature focused on domestic policies (limited fiscal space) and/or capital outflows Literature
- We focus on the effect of domestic government policies making it easier for firms to switch from international to domestic finance, or not?

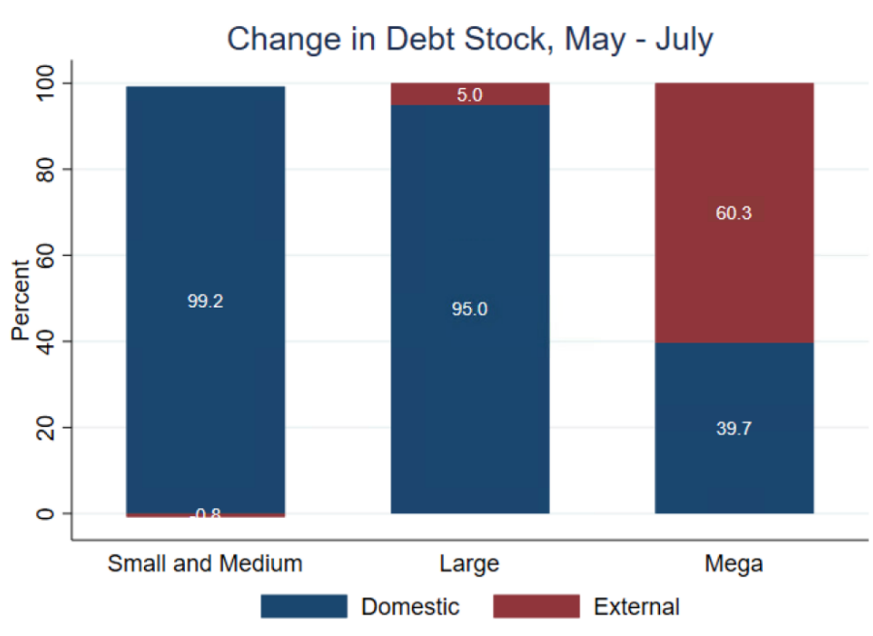
What we do

- We provide both evidence an theory:
  1. Empirical analysis: Unique administrative dataset that allow us to study the **full spectrum of the nance mix for the universe of rms** in Chile & the **e ect of credit support policies** via RDD analysis
  2. 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**

Key Result

Figure: **Firms' Finance Mix in Chile: Before & During Policies**





What we find

- Empirical analysis:
  1. **Change in the nance mix**: firms moved away from foreign debt into domestic debt
  2. **Causal link from credit policies**, namely firms' eligibility to loans with sovereign guarantees
- Theoretical analysis:
  1. Model stresses the role of **nancial frictions** in the mechanism of debt substitution
  2. 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:

1. Capital Inflows: universe of borrowing transactions (bonds & loans) between firms and foreign lenders (spreads, loan amounts, etc)
2. Credit registry: Universe of domestic stock and flows of firms' bank debt (rates, loan amounts, etc.). Includes loans under credit support programs after COVID
3. Bond Issuance: universe of firms' bond issuance in the domestic financial market.
4. 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
  1. 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
  2. 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 elegible	70% - 150,000 UF
600,000 - 1,000,000	Non elegible	60% - 250,000 UF
> 1,000,000	Non elegible	Non elegible

Regression Discontinuity Design (RDD) Analysis

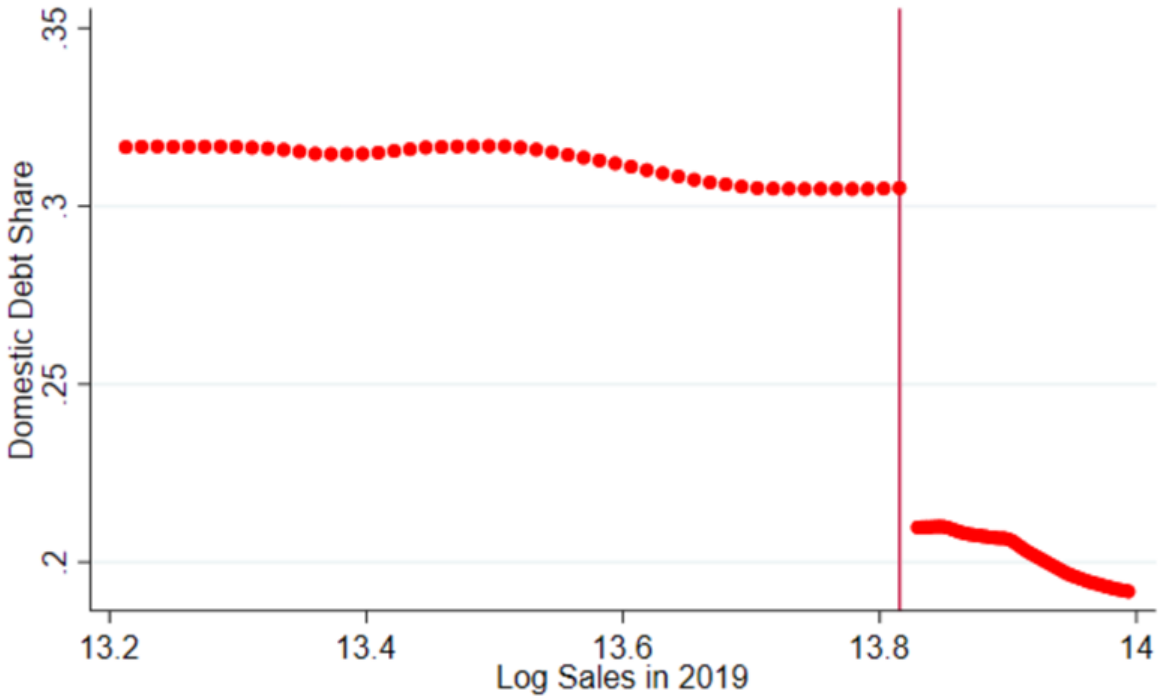
- RDD: causal effect of becoming eligible to receive a FOGAPE-COVID credit on firms' domestic debt share mix
- Natural approach: **exogenous changes** in the sales' thresholds required for eligibility to FOGAPE-COVID credits
- Firms with annual sales up to 1,000,000UF suddenly became eligible (treated): **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:

$$\frac{D_i^{domestic}}{D_i^{total}} = \ _0 + \ _1 Log(sales_i^{2019}) + \ Eligible_i + \ _i \qquad (1)$$

Regression Discontinuity Design (RDD) Analysis

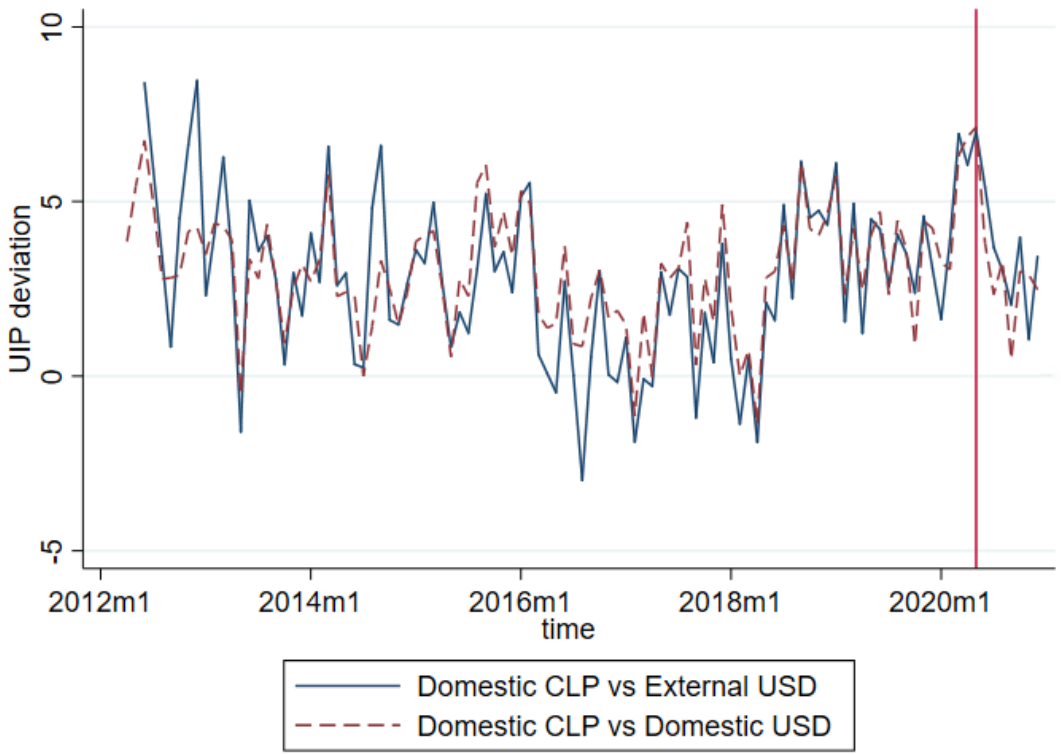
- significant at 5 10%: eligibility increased domestic debt share by 9 14%
- **Macro implications**: sales of newly eligible firms are 18% of GDP; their increase in domestic credit was about 1% of GDP



RDD Results

Mechanism: The Role of Interest Rates

- The previous analysis is focused on **volumes**, yet it is silent about **prices**
- We study the **role of interest rates** in the mechanism driving debt substitution, as suggested by the following observed fall in the mean firm-level UIP premium



Mechanism: The Role of Interest Rates

UIP premium is local currency premium, it is always cheaper to borrow in dollars than local currency in EM (UIP never holds) and even cheaper during bad times (U'IPVIX ").
We:

- Document aUIP premium in normal times
- Document theUIP premium during the crisis
- Study the role of policy over the UIP premium

For 1) and 2), we estimate:

$$i_{f;b;d;m} = \quad _{f;b} + \quad Trend_m + \quad FX_{f;b;d;m} + \quad _1X_{f;m} + \quad _2Z_{b;m} + \quad _3Macro_{m\ 1} + \quad _{f;b;d;m}$$

For 3), we estimate:

$$i_{f;b;d;m} = \quad _{f;b} + \quad Trend_m + \quad FX_{f;b;d;m} + \quad E_{f;m}FX_{f;b;d;m} + \quad _1X_{f;m} + \quad _2Z_{b;m} + \quad _3Macro_{m\ 1} + \quad _{f;b;d;m}$$

Mechanism: The Role of Interest Rates

Table: Interest Rate Regression, UIP Premium and policy e ect

Variables	(1) Until Sept 2019	(2) March to July 2020	(3) March to July 2020
Fx	-0.0395***	0.00115	-0.00377*
	(0.00345)	(0.00131)	(0.00215)
Fx elegible			0.0117***
			(0.00239)
Macro Controls	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes
Observations	5,929,453	348,550	348,550
R-squared	0.869	0.646	0.646

Clustered standard errors in parentheses
*** p < 0.01, ** p< 0.05, * p< 0.1

Mechanism: The Role of Interest Rates

During normal times, there is a UIP premium of 4 pp

The UIP premium fades away during the crisis

The disappearance of the UIP premium is explained by those rms eligible to FOGAPE-COVID credits

Changes in domestic interest rates{enacted by eligibility to COVID-FOGAPE credits{were crucial in the mechanism behind debt substitution

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 nance mix

Heterogeneous nance mix across rms - nancial frictions

More evidence

Endogenous interest rate di erential with $R^* > R^?$ Evidence

Credit supply a ected by risk aversion

A COVID Shock & Policies akin to FCIC and FOGAPE

SOE Model - Environment

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

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

Model - Collateral Constraints

Collateral constraints (CC) a la Caballero-Krishnamurthy but with heterogeneity in Intl. collateral $\overset{i}{}_{2;f}$ U[0;]:

$$R^{?}d^{i}_{1;f} \qquad \overset{i}{}_{2;f}$$

$$R_2 d^{i}_{1;d} \qquad {}_{d} \quad Y^{i}_{2} + (\quad \overset{i}{}_{2;f} \quad R^{?}d^{i}_{1;f})$$

Where $Y^{i}_{2} = A_2(k^{i}_{2})$ and $k^{i}_{2} = d^{i}_{1;d} + d^{i}_{1;f}$

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

$$(A_2 \quad)^{\frac{1}{1}} \qquad k^{?}$$

$k^{?}$, target level of capital all rms wish to nance

Model - Two Groups of Firms

Because $< k^? \ \& \ R > R^?$: most rms have some domestic debt & all rms borrow up to their Intl. Collateral. This yields two types of rms:

Domestically unconstrained rms with with high $i_{2;f}$

Domestically constrained rms with low $i_{2;f}$

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

$$\underbrace{\int_0^{\hat{}} d^?_{1;d}(i_{2;f})}_{\text{Demand from constrained rms}} + \underbrace{\int_{\hat{}}^{} k^?(i_{2;f})}_{\text{Demand from unconstrained rms}} = e_T$$

e_T is total credit supply and $\hat{}$ is the endogenous cut-o that separates constrained from unconstrained rr

Expression

Model - Credit Supply

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

Credit supply has two parts: Central Bank ($e_{CB} < 1$) and households (e_H):

$$e_T = e_{CB} + e_H \quad (2)$$

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

where captures risk-aversion from shocks to capital markets

If > 1 then excess reserves in \banks" are accumulated: e_{CB} e_{CB}

Quantitative Experiments - No. 1: COVID Shock

A COVID-19 Shock that impacts capital markets and makes EMEs riskier: " $R^?$

Demand channel:

Less foreign debt: collateral constraint becomes tighter ad r rms

Unconstrained rms substitute debt by borrowing more at home: " R_2

Constrained rms 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 Experiments - No. 1: COVID Shock

Quantitative Experiment - No. 2: Policies

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

$$= e^{R^? \ 1} \qquad (\quad _d)$$

Central Bank liquidity (FCIC) alone:

The higher the risk aversion in banks the less e ective

Liquidity likely to ow only to few large safe rms

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

Quantitative Experiments - No. 2: Policies

Conclusion

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

RDD evidence shows debt substitution fostered by credit support policies through a lower UIP premium driven by lower domestic interest rates

A heterogeneous rms model with nancial frictions allows us to rationalize these ndings, stressing the complementarity between policies, namely sovereign guarantees and central bank liquidity

Literature

One strand of literature: howrms 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 ows brought about by the pandemic, (Kalemli-Özcan 2020; BIS 2020/21, IMF 2020/21, among others)

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 in ows to Chile, and a sharp increase in the spreads of newly-issued foreign debt

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Data lters

For rms 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 ofthe full sample)

We consider the period between April 2012 and December 2020 Back

Leverage and rm size

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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	3953000 USD	13.2	3.3	10.2
Standard Deviation	1164683 USD	18454800 USD	8.8	2.3	9.1
Total yearly loans (% of 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	

Back - Data Back - Model

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 rms (i)	59479	174010
Number of rms (i*)	64	75
Mean 2019 sales UF (i)	16153	14587
Mean 2019 sales UF (i*)	864459	1360514

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	-0.09422**	-0.12271*	-0.09773**	-0.13589*
Standard Error	0.05115	0.06666	0.0505	0.06699
Number of Observations	665	665	665	665

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RDD Sorting Test

Cataneo et al. (2020) manipulation test

We nd no evidence of manipulation (sorting) in our sample

Figure: Manipulation test around the cuto

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 nd no evidence of discontinuity at the cuto 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	-0.00131	0.00144	0.0003	-0.0023
Standard Error	0.05025	0.04697	0.0856	0.08585
Number of Observations	652	652	652	652

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

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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
	$k^?$ 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 rm size: $`_U > `_C$

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Expression for ^

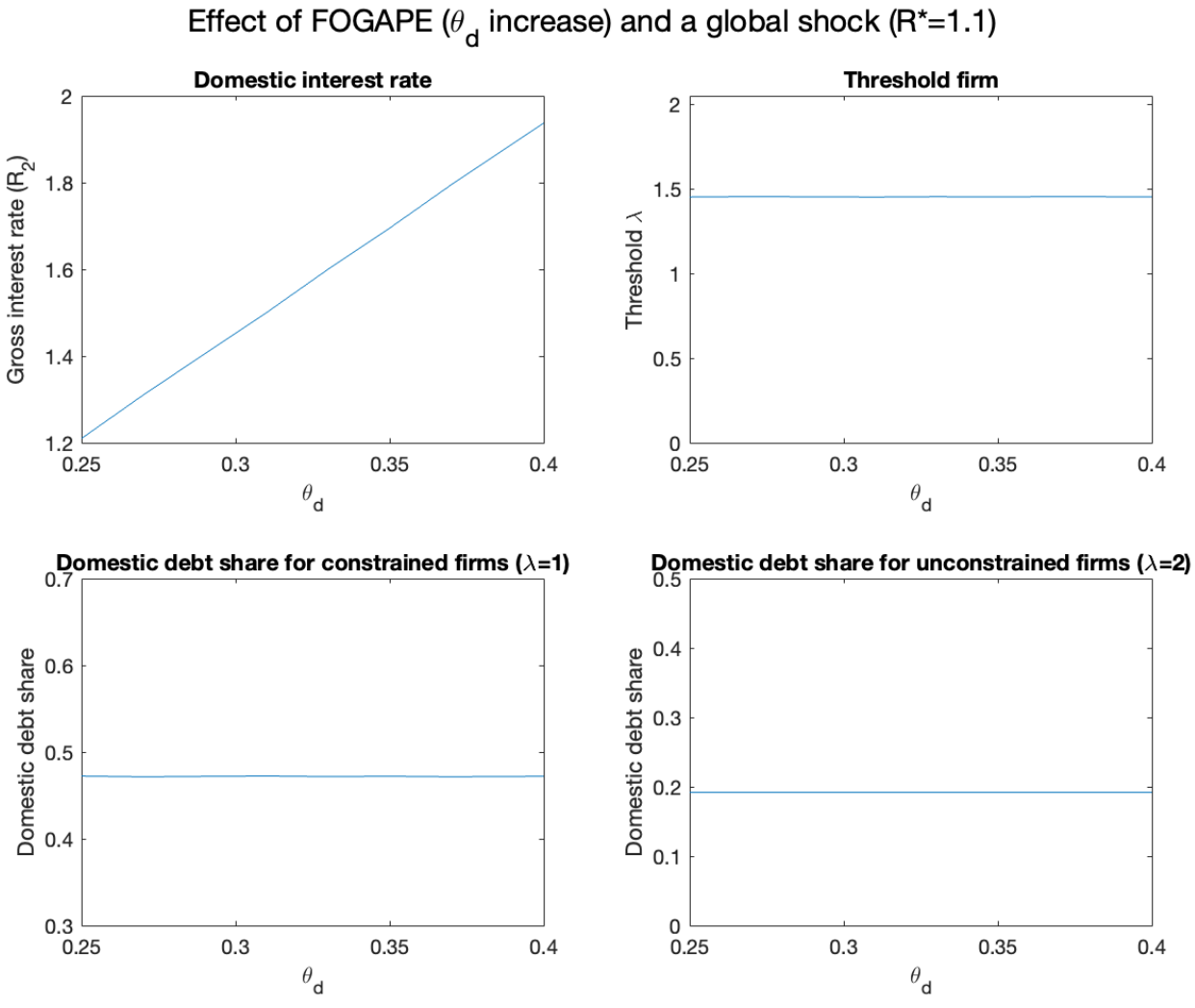
$$^{} = R^{?} \quad k^{?} \quad \frac{{}_{d}A_2 k^{?}}{R_2}$$

Back

E ects of a global shock in more detail

Back to all shocks Back to domestic debt share

Effects of FOGAPE in more detail (without supply effect)



Back to all shocks Back to domestic debt share