The Distribution of Crisis Credit:
Effects on Firm Indebtedness and Aggregate Risk[a]

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[a]The views and opinions expressed are those of the authors alone and do not necessarily reflect those of the Central Bank of Chile, the Financial Market Commission of Chile (CMF), or the World Bank.

Motivation

- During crises, governments seek to help firms to survive by providing "crisis credit"
  - Popular example from COVID-19: Public credit guarantees implemented through banks
- These programs often face a standard trade-off between micro credit access and macro risks
  - They seek to create incentives and conditions to support many viable firms in need
  - $\Rightarrow$ Potential adverse selection $\Rightarrow$ Potential high indebtedness, debt overhang, and macro risks
- What is the impact of the distribution of crisis credit on micro indebtedness and macro risks?
  1. How does credit (suddenly available) get allocated across the full range of firms?
  2. How do incentives and economic environment influence demand, supply, and equilibrium allocation?
  3. How does micro-level indebtedness get aggregated, affecting macro risks?
- Study credit guarantee program in Chile during COVID-19 (a.k.a. *FOGAPE-COVID* in Chile)
  - Policy coverage: 24% of eligible firms and 4.6% of GDP (formal firms: 3.6% of GDP)

What We Do

- Chile offers unique opportunity to study the complete crisis credit allocation
  - Novel financial and real data from Chile's universe of formal firms and bank transactions
- Policy experiment
  - Large, sudden program to assist firms
  - Public credit guarantee program (FOGAPE COVID-19) disburses $\approx$ 4.6% of GDP in few months
  - Concurrent alternative policy, i.e. employment protection program
  - Results not driven by COVID-19 pandemic, yielding general lessons
- Micro analyses
  - Evaluate applications and approvals to study demand and supply roles
  - Examine impact of program on firm leverage and credit flows by size, risk, and other firm attributes
  - Attempt to assess causality of the program and pandemic (dynamic lockdowns, RDD)
- Macro risk assessment
  - Empirically via aggregation of micro data and impact of risk for banks and the government
  - Quantitatively via counterfactual model simulations

What We Find

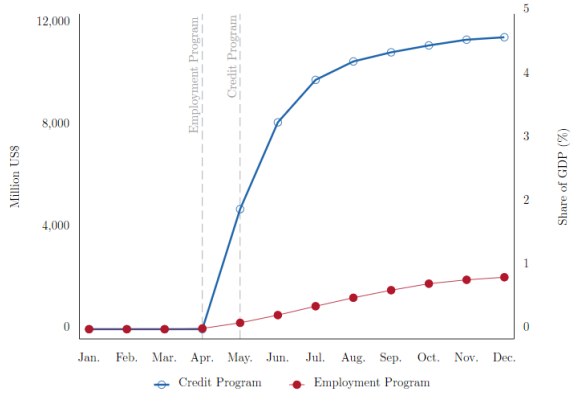
- Government program works as intended: Increases debt rapidly, substantially, broadly across firms
- Large (4.6% of GDP) credit allocation with adverse selection, but consequences for total aggregate indebtedness and risk remain small (0.44% of GDP)
- Lessons on mitigated aggregate risk
  1. Incentives for firms and banks
     - Firms respond to opportunities for cheap credit, especially risky ones
     - Banks disburse loans, engaging with risky clients, but also contain risk taking
  2. Economic environment
     - Low levels of default risk
     - Safe firms constitute mass of bank loans
     - Banking sector solvency improves
  3. Policy features
     - Forbids participation of riskiest tail
     - Risk sharing between government and banks (skin in the game): Only partial guarantees, mostly tail risk
     - Lower maximum interest rate makes credit attractive, but also triggers more screening
- Aggregate risk could be sizable with even larger, protracted GDP contraction and higher defaults

Policy and Data

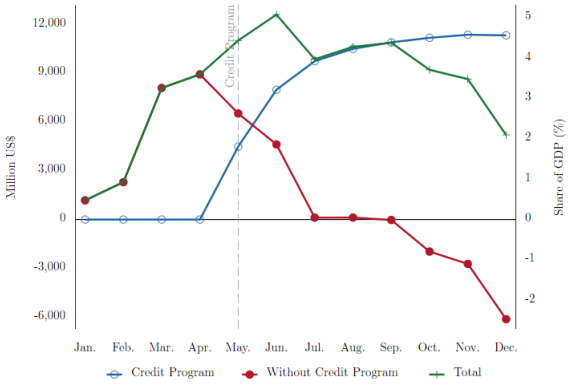
Institutional Details of the Public Credit Guarantee Program

- Expand credit guarantee program: Fiscal injection of US$3 billion (1.1% of GDP)
- Started April 24, 2020
- Goal: Finance working capital up to 3 months of pre-pandemic sales
- Basic eligibility: Pre-pandemic sales $<$ US$35 million
- Attractive conditions for firms
  - Nominal interest rate cap: Monetary policy rate (0.5%) + inflation target (3%)
  - 6-month grace period + payment horizon of 24-48 months
  - Loan could not to be used to repay pre-existing debt, which needs to be restructured
- Some details on mitigating factors of policy design
  - Past due days $<$ 30
  - Guarantee rate: 85% for small, 80% for medium, 70% for medium-large, and 60% for large firms
  - Deductible: 5% for small, 3.5% for medium, 2.5% for medium-large, and 2.5% for large firms

Speed and Scale of Public Programs



Countercyclical Evolution of Corporate Debt



Data Sources

1. Credit flows and stocks from financial regulator (Financial Markets Commission, CMF), 2012-2020
   - Transaction-level loans, interest rates, credit outstanding, default behavior
2. Applications and approvals of credit guarantee loans during 2020 $\Rightarrow$ Unique!
   - Transaction-level information, including loans requested, bank responses, approved amounts
3. Firm-level real and employment data from tax authority, 2005-2020
   - Sales, net worth, assets, liabilities, materials, number of workers, sector, municipality
4. Firm-level use of employment protection program (unemployment insurance administrator)

- Samples of firms Summary Statistics
  1. Formal firms $\Rightarrow$ 602,874 firms
  2. Active: Formal Firms + positive sales $\Rightarrow$ 449,615 firms (92% of employment, 82% of credit)
  3. Selection and Leverage Models: Active + observables $\Rightarrow$ 119,153 firms
  4. Eligible: Selection and Leverage Models + sales $<$ US\$35 MM + past due days $<$ 30 $\Rightarrow$ 114,606 firms

Micro Credit Allocation

Extensive Margin: Demand Stronger than Supply

Default Model

$$\textit{Banked Firms}: \Pr(\textit{Program Use}_i = 1) = \Phi(\alpha_s + \alpha_c + \beta_1 \textit{Risk}_i + \beta_2 X_i + \epsilon_i) \quad (1)$$

	Public Credit Guarantee				Employment Protection
	Applications	Approvals	Use	Use	Use
	(1)	(2)	(3)	(4)	(5)
Risk	0.538***	−0.257***	**0.337*****	**0.147*****	−0.016
	(0.035)	(0.021)	(0.034)	(0.033)	(0.022)
Increase in Sales Dummy	0.186***	0.019***	0.195***	0.210***	0.053***
	(0.008)	(0.006)	(0.008)	(0.008)	(0.007)
Decrease in Sales Dummy	0.188***	0.019***	0.193***	0.211***	0.112***
	(0.007)	(0.006)	(0.008)	(0.008)	(0.006)
Use Employment Protection	0.117***	−0.010***	0.095***	0.095***	
	(0.005)	(0.004)	(0.005)	(0.005)	
Use Public Credit Guarantee					0.056***
					(0.003)
Dependent Variable Mean	0.649	0.918	0.505	0.483	0.185
Dependent Variable Std. Dev.	0.477	0.275	0.500	0.500	0.389
Number of Firms	62,848	35,918	62,871	67,240	62,102
R^2	0.061	0.033	0.045	0.043	0.081
Industry FE and Municipality FE	Yes	Yes	Yes	Yes	Yes
Sample	Eligible	Eligible	Eligible	Selection Model	Eligible

Intensive Margin: Demand Stronger Only in Guaranteed Credit

$$\textit{Credit Guarantee Users Sample}: \quad \frac{\Delta Debt_i}{Sales_{i,2019}} = \alpha_s + \alpha_c + \beta_1 Risk_i + \beta_2 X_i + \epsilon_i \tag{2}$$

	Δ Guaranteed Debt / Sales 2019		Δ Non-guaranteed Debt / Sales 2019	
	(1)	(2)	(3)	(4)
	Banked	Unbanked	Banked	Unbanked
Risk	0.095***	0.171***	-0.065***	-0.020
	(0.007)	(0.019)	(0.011)	(0.014)
Increase in Sales Dummy	-0.003	0.010**	0.007**	0.006**
	(0.002)	(0.004)	(0.004)	(0.003)
Decrease in Sales Dummy	-0.007***	0.004	0.004	0.004
	(0.002)	(0.004)	(0.004)	(0.003)
Dependent Variable Mean	0.138	0.116	-0.013	0.015
Dependent Variable. Std. Dev.	0.076	0.079	0.128	0.062
Number of Firms	31,782	9,119	31,782	9,119
R^2	0.033	0.091	0.029	0.066
Industry FE and Municipality FE	Yes	Yes	Yes	Yes

▸ Eligible Sample

Macro Risk Assessment

Indebtedness Decomposition: From Micro to Macro Debt-to-Sales Ratio

- Consider a partition G of firms into groups indexed by g (e.g., risk levels Other Groupings):

$$\underbrace{\sum_{g \in G} \left(\underbrace{\frac{D_{gt} - D_{gt-1}}{Y_{gt-1}}}_{\text{Within Change}} \underbrace{\omega_{gt-1}}_{\text{Weights}} \right)}_{\text{Group Change}} = \underbrace{\frac{\Delta D_t}{Y_{t-1}}}_{\text{Aggregate Change}} \tag{3}$$

	ΔDebt/Sales (1) Within Change (p.p.)	(2) Weights (%)	ΔDebt/Sales (3) Group Change (p.p.) (= (1) × (2))
Risk Groups			
High Risk	4.34	1.8	0.08
Medium Risk	3.18	4.1	0.13
Medium-Low Risk	2.26	8.4	0.19
Low Risk	-0.15	59.3	-0.09
No Risk Data	0.48	26.4	0.13
Aggregate		100.0	0.44

Expected Loss: Banks and the Government

Risk Groups	(1) Total Public Credit Guarantee Program (Million USD)	(2) Total Public Credit Guarantee Program (%)	(3) Default Probability (%)	(4) Effective Guarantee (%)	(5) Expected Loss/GDP (=(2)×(3)/GDP) (%)	(6) Government's Expected Loss/GDP (=(4)×(5)) (%)	(7) Bank's Expected Loss/GDP (=(5)-(6)) (%)
High Risk	606	8	18.17	35.8	0.04	0.01	0.03
Medium Risk	1,085	14	9.86	32.3	0.04	0.01	0.03
Medium-Low Risk	1,867	25	5.68	28.2	0.05	0.01	0.04
Low Risk	3,975	53	2.05	21.1	0.03	0.01	0.03
No Risk Data	1,489	17	18.17	35.8	0.11	0.04	0.07
Total	9,022 (3.6% GDP)	100	7.48	27.3	0.27	0.09	0.18

- Credit allocation across risk is proportional to size distribution of firms Figure
- Aggregate expected loss of 0.27% of GDP, an order of magnitude lower than size of the program
- Majority (2/3) of expected loss is taken by banks, but unexpected loss is taken by government

Macroeconomic Risk and Mitigating Factors

- Despite micro adverse selection, macro risk stays relatively small due to several mitigating factors:
  1. Riskiest firms in the economy were excluded, even when program targets SMEs ▸ Risk Samples
  2. Partial guarantee + deductible $\Rightarrow$ Banks screened firms (more for large firms) ▸ Rejections
  3. Deductible cushions banks from tail risk: Higher default risk $\Rightarrow$ Higher effective guarantee ▸ Simulation
  4. Most credit flows toward large and safe borrowers
  5. Low ex-ante and ex-post default risk (so far), partially due to weight of safer firms
  6. Solvency of the banking industry increases by $\uparrow$ capital, $\downarrow\downarrow$ risk-weighted-assets (RWA) ▸ Solvency
- Combination of mitigating factors by policy design (1-3) and by equilibrium outcomes (4-6)
- Policy facilitator: Central bank backs lending by banks through liquidity support ▸ Liquidity Support

Model Counterfactuals

Model Overview

- Develop standard quantitative default model to
  - Motivate empirical predictors of risk
  - Quantify policy factors and aggregate outcomes under standard theory
  - Simulate systemic shock counterfactuals
  - Quantify *actual* government burden

- Model environment: Covas and Den Haan (2012) with Chilean banking institutional details
  - Static, partial equilibrium model of firm credit
  - Competitive banking sector with government regulations
  - Abstract from informational frictions
  - Endogenous default based on firm net worth

Firm Problem

- Firm profits, π, depend on productivity, z, capital, $k = e + b$, and a shock, ε:

$$\pi = \varepsilon z \left(e + b\right)^{\alpha} \tag{4}$$

- Default when net worth is negative:

$$\varepsilon z \left(e + b\right)^{\alpha} + \left(1 - \delta\right)\left(e + b\right) - \left(1 + r_b(b; e, z)\right) b < 0. \tag{5}$$

- This defines threshold shock for default:

$$\underline{\varepsilon}\left(b; e, z\right) = \frac{\left(\delta + r_b(b; e, z)\right) b - \left(1 - \delta\right) e}{z \left(e + b\right)^{\alpha}}. \tag{6}$$

- Choose b to maximize expected net worth given default behavior

Bank's Problem

- Competitive firms face constant cost of capital, $r = \tilde{r} + c$, and proportional default cost, μ
- Under default firm earns:

$$\varepsilon z \left(e + b\right)^{\alpha} + \left(1 - \delta\right)\left(e + b\right) - \mu z \left(e + b\right)^{\alpha},$$

- Zero expected profit implies:

$$r_b(b; e, z) = r + \frac{z\left(e + b\right)^{\alpha}}{b}\left(\Phi\left(\underline{\varepsilon}(b; e, z)\right)\mu + \left(1 - \chi\right)\int_0^{\underline{\varepsilon}(b;e,z)} \left(\underline{\varepsilon}(b; e, z) - \varepsilon\right)\Phi(d\varepsilon)\right) \leq \bar{r}_b \tag{7}$$

  - $\bar{r}_b$ is institutional interest rate cap
  - χ is partial government guarantee

Simulation Approach

- Consider FOGAPE program as three-pronged policy:
  1. Introduce guarantee of χ=0.8
  2. Decrease max lending rate from $\bar{r}_b = 0.25$ to $\bar{r}_b = 0.035$
  3. Decrease in c of 1.9 p.p.

- Calibrate joint distribution of z, e, σ_ε^2 to moments of credit, leverage, default, sales distributions

- Simulate systemic shock as surprise decrease in $E(\varepsilon)$ and increase in $V(\varepsilon)$

Counterfactuals

Table 1: Simulated Impacts of Policies Relative to Benchmark

Relative to Benchmark:	(1) Combined Policy (%)	Policy Components (2) No Increased Willingness to Lend (%)	(3) No Interest Rate Cap Reduction (%)	(4) No Credit Guarantee (%)
Δ Credit	9.8	-7.8	16.8	6.0
Δ Interest Rate	-2.5	-1.3	-1.5	-2.6
Typical Year Repayment (% Total Credit)				
Govt. Expected Credit Loss	2.9	1.9	4.3	0.0
Actual Burden	0.2	0.1	0.5	0.0
Systemic Shock Repayment (% Total Credit)				
Govt. Expected Credit Loss	10.0	8.3	11.7	0.0
Actual Burden	1.2	0.9	1.7	0.0

Robustness Analyses

Robustness Analyses

- A number of robustness tests performed
  - Variations in specifications ▸ Default Model ▸ Spread
  - Different samples ▸ Unbanked Firms
  - Different aggregations ▸ Risk Sharing

- Results are not COVID-19-specific
  - Comparisons with the employment protection program
  - Effect of firm performance since the onset of the pandemic (sales change)
  - Effect of lockdown policies ▸ Maps ▸ RD Results ▸ RD Sales

Conclusions

Conclusions

- Despite a large credit program that reaches many firms in a couple of months and features micro adverse selection (extensive and intensive margins), macro risks remain contained
  - Due to mitigating factors by policy design and by equilibrium outcome
  - Identification of micro elasticities and aggregate macro outcomes only possible due to rich financial+real admin data
- The crisis is not over yet
  - Default rates could end up being larger, though banks are cushioned by deductible and guarantees
  - Necessary to continue to monitor these risks as the recovery moves forward
- Results feed into academic and policy debate on trade-off between financial access and macro risks

Thank you!

Credit Default Probability Model

Return

$$\textit{Baseline Sample}: \ \Pr(\textit{Default}_{i,t} = 1) = \Phi(\alpha_s + \alpha_c + \beta \textit{Characteristics}_{i,t-1} + u_{i,t}) \tag{8}$$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(Net Worth)	-0.011***	-0.010***	-0.010***	-0.010***	-0.009***	-0.009***	-0.008***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Value Added / Number of Workers)	-0.021***	-0.020***	-0.018***	-0.018***	-0.019***	-0.019***	-0.017***	-0.017***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm Age	-0.001***	-0.001***	-0.001***	-0.001***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Wage Bill)	-0.009***	-0.009***	-0.008***	-0.008***	-0.008***	-0.008***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Annual Sales)	0.007***	0.006***	0.002**	0.002***	0.000	-0.000	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Credit Stock)					0.013***	0.013***	0.013***	0.013***
					(0.001)	(0.001)	(0.001)	(0.001)
Spread Ex-ante					0.003***	0.003***	0.003***	0.003***
					(0.000)	(0.000)	(0.000)	(0.000)
Number of Firms	96,424	96,424	96,424	96,424	96,424	96,424	96,424	96,424
R^2	0.051	0.061	0.064	0.073	0.095	0.103	0.104	0.112
Industry FE	No	No	Yes	Yes	No	No	Yes	Yes
Municipality FE	No	Yes	No	Yes	No	Yes	No	Yes
Pred. Default Prob. Banked Firms	0.088	0.088	0.088	0.088	0.089	0.089	0.089	0.089
Pred. Default Prob. Unbanked Firms	0.113	0.113	0.107	0.107				

Policy Design Mitigates Adverse Selection: Including Non-Eligible Firms

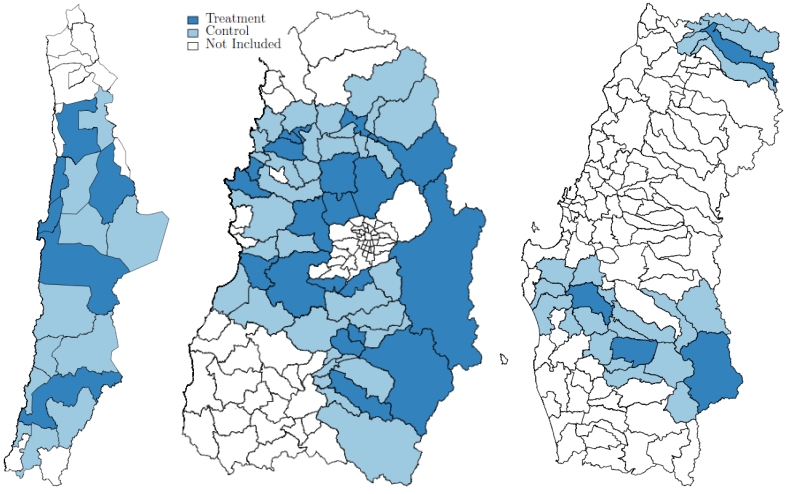
Return

$$\textit{Banked Firms} + \textit{Different Samples}: \ \Pr(\textit{Program Use}_i = 1) = \Phi(\alpha_s + \alpha_c + \beta_1 \textit{Risk}_i + \beta_3 X_i + u_i) \tag{9}$$

	Used Public Credit Guarantee			
	(1) Only Eligible Firms	(2) Eligible Firms + Firms with Overdue Payment	(3) Eligible Firms + Mega Firms	(4) All Firms
Risk	0.337***	0.084***	0.412***	0.147***
	(0.034)	(0.032)	(0.034)	(0.033)
Increase in Sales Dummy	0.195***	0.206***	0.193***	0.210***
	(0.008)	(0.008)	(0.008)	(0.008)
Decrease in Sales Dummy	0.193***	0.208***	0.190***	0.211***
	(0.008)	(0.008)	(0.008)	(0.008)
Use Employment Protection	0.095***	0.088***	0.098***	0.095***
	(0.005)	(0.005)	(0.005)	(0.005)
Dependent Variable Mean	0.505	0.478	0.498	0.483
Dependent Variable Std. Dev.	0.500	0.500	0.500	0.500
Number of Firms	62,871	66,407	63,758	67,240
R^2	0.045	0.039	0.048	0.043
Industry FE and Municipality FE	Yes	Yes	Yes	Yes
Predicted Default Probability:				
Banked Firms	0.084	0.087	0.083	0.086

Dynamics Lockdowns and Spatial RD Design: Maps

Return



(a) Northern (b) Central (c) Southern

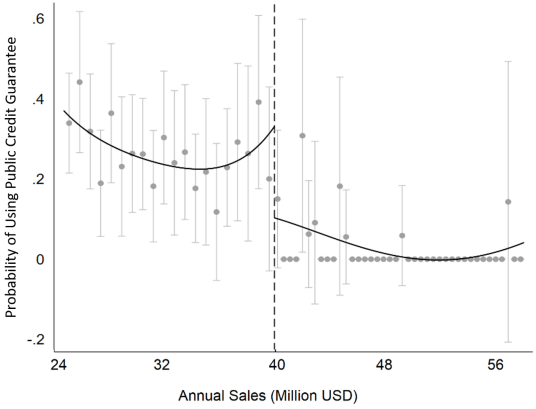
Dynamics Lockdowns and Spatial RD Design: Results

Return

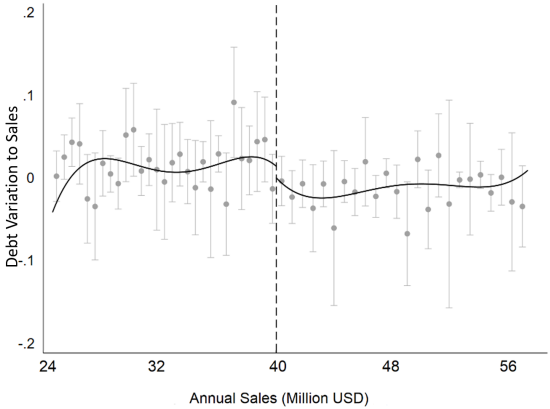
	Public Credit Guarantee			Employment Protection
	(1)	(2)	(3)	(4)
	Use Public Credit Guarantee	Public Credit Guarantee Applications	Public Credit Guarantee Approvals	Use Employment Protection
Panel A: Region Fixed Effects				
Post	0.025***	0.019***	0.098***	-0.009***
	(0.004)	(0.003)	(0.005)	(0.001)
Lockdown	-0.002	-0.000	-0.022*	0.022
	(0.002)	(0.004)	(0.010)	(0.014)
Lockdown × Post	0.005	0.012***	0.008	0.019***
	(0.003)	(0.002)	(0.004)	(0.000)
Number of Observations	103,932	103,932	32,238	110,439
Number of Firms	11,483	11,483	3,569	12,202
R^2	0.009	0.007	0.065	0.010
Panel B: Municipality Border: Neighboring Municipalities Fixed Effects				
Post	0.028***	0.014***	0.099***	0.002
	(0.003)	(0.003)	(0.007)	(0.004)
Lockdown	0.090***	0.033***	-0.132***	0.068***
	(0.005)	(0.004)	(0.009)	(0.003)
Lockdown × Post	0.007	0.024***	0.010	0.028***
	(0.008)	(0.007)	(0.015)	(0.005)
Number of Observations	14,796	13,419	3,978	17,172
Number of Firms	1,644	1,491	442	1,908
R^2	0.013	0.013	0.075	0.012

RDD: Positive Effect of Credit Guarantee on Indebtedness

Return



(d) Use Credit Guarantee



(e) Leverage: Debt-to-Sales

Banked (Unbanked): Non-Guarantee Credit Complement (Substitute)

Return

$$\textit{Eligible Sample}: \frac{\Delta Debt_i}{Sales_{i,2019}} = \alpha_s + \alpha_c + \beta_1 \textit{Program Use}_i + \beta_2 \textit{Sales Growth}_i + u_i \quad (10)$$

	Δ Guaranteed Debt / Sales (2019)		Δ Non-guaranteed Debt / Sales (2019)	
	(1)	(2)	(3)	(4)
	Banked	Unbanked	Banked	Unbanked
Use Credit Guarantee	0.139***	0.118***	0.008***	0.011***
	(0.000)	(0.001)	(0.001)	(0.001)
Use Employment Protection	0.001***	0.000*	0.008***	0.001***
	(0.000)	(0.000)	(0.002)	(0.001)
Use Employment Protection	-0.003**	-0.009***	-0.010**	-0.006***
× Use Credit Guarantee	(0.001)	(0.002)	(0.003)	(0.001)
Increase in Sales Dummy	-0.001	0.001**	0.023***	0.002***
	(0.001)	(0.000)	(0.003)	(0.001)
Decrease in Sales Dummy	-0.002**	0.000	0.021***	0.002***
	(0.001)	(0.000)	(0.003)	(0.000)
Dependent Variable Mean	0.070	0.020	-0.018	0.007
Dependent Variable Std. Dev.	0.087	0.055	0.140	0.045
Number of Firms	62,927	51,679	62,927	51,679
R^2	0.628	0.645	0.021	0.020
Industry FE and Municipality FE	Yes	Yes	Yes	Yes

Decomposition of Macro Debt-to-Sales Ratio

Return

	ΔDebt/Sales		ΔDebt/Sales	
	(1) Within Change (p.p.)	(2) Weights (%)	(3) Group Change (p.p.) (= (1) × (2))	(4) Group Change (%)
(i) Active Firms				
Panel A: Used Public Credit Guarantee Program				
Users	9.71	13.9	1.35	100.0
Non-users	-1.06	86.1	-0.91	
Aggregate		100.0	0.44	100.0
Panel B: Banked Status				
Banked	0.49	85.2	0.41	52.6
Newly Banked	11.45	3.2	0.37	47.4
Newly Unbanked	-10.14	3.4	-0.35	
Unbanked Firms	0.00	8.2	0.00	
Aggregate		100.0	0.44	100.0
Panel C: Firm Size				
Small	5.25	8.0	0.42	44.7
Medium	4.14	7.6	0.31	33.0
Medium-Large	1.48	13.9	0.21	22.3
Large	-0.23	4.6	-0.01	
Mega	-0.75	65.9	-0.49	
Aggregate		100.0	0.44	100.0

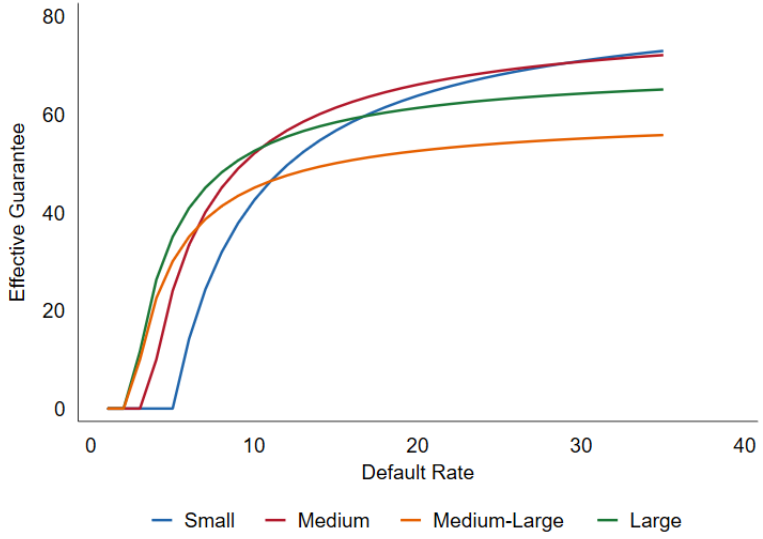
Probability of Approval Diminishes with Firm Size

Return

	Public Credit Guarantee Approvals			
	(1)	(2)	(3)	(4)
	All	Small	Medium	Large
Panel A: Probit Estimation				
Risk	-0.257***	-0.246***	-0.439***	-0.755***
	(0.021)	(0.025)	(0.082)	(0.238)
Increase in Sales Dummy	0.019***	0.022***	0.008	-0.010
	(0.006)	(0.008)	(0.019)	(0.035)
Decrease in Sales Dummy	0.019***	0.022***	0.005	0.002
	(0.006)	(0.007)	(0.019)	(0.034)
Use Employment Protection	-0.010***	-0.008*	-0.015*	-0.026
	(0.004)	(0.004)	(0.008)	(0.020)
Dependant Variable Mean	0.918	0.913	0.918	0.902
Dependant Variable Std. Dev.	0.275	0.282	0.275	0.298
Number of Firms	35,918	26,623	5,916	1,392
R^2	0.033	0.036	0.082	0.171
Industry FE and Municipality FE	Yes	Yes	Yes	Yes
Panel B: Predicted Default Probability				
Banked Firms	0.09	0.102	0.061	0.036

Effective Guarantee Simulation

Return



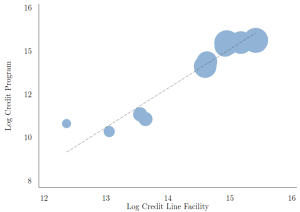
Solvency of the Banking Industry Increases During the Pandemic

Return

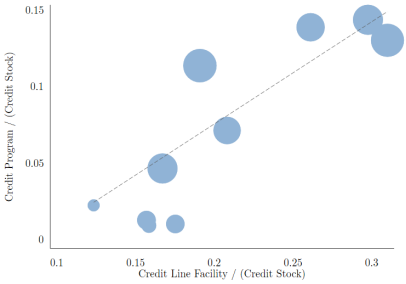
	2019	2020	Change
Capital/Total RWA	12.8%	14.7%	1.8%
Capital (MM USD) =	37,514	41,275	3,761
Common Equity Tier 1	28,645	30,163	1,519
+ Subordinated Bonds	8,050	9,423	1,373
+ Additional Provisions	820	1,689	869
Total RWA (MM USD) =	292,292	281,554	-10,738
RWA 1 (0%)	0	0	0
+ RWA 2 (10%)	1,969	4,562	2,592
+ RWA 3 (20%)	4,867	3,849	-1,018
+ RWA 4 (60%)	66,675	68,726	2,052
+ RWA 5 (100%)	218,781	204,417	-14,364
Total Assets (Million USD) =	373,931	383,825	9,894
Assets 1	0	0	0
+ Assets 2	19,690	45,620	25,920
+ Assets 3	24,335	19,245	-5,090
+ Assets 4	111,125	114,543	3,418
+ Assets 5	218,781	204,417	-14,364

Liquidity Support and Guaranteed Loans

Return



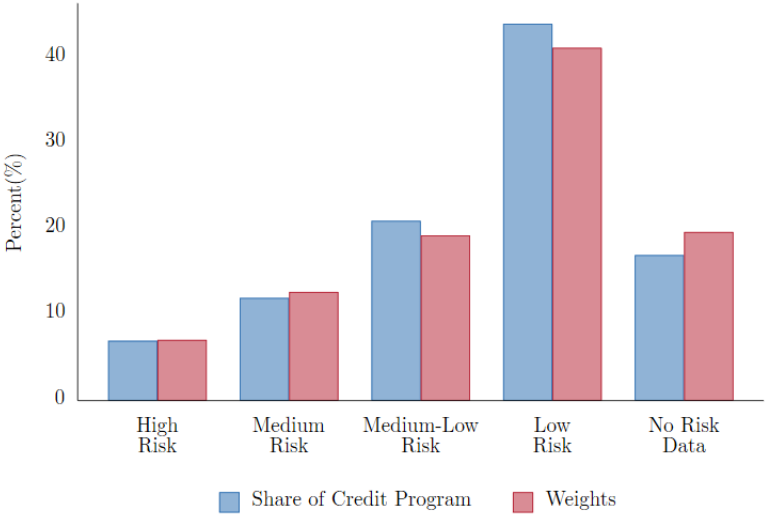
(f)



(g)

Allocation of Crisis Credit and Firm Size

Return



Default Probability Model: Different Regressors and Samples

Return

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Probit Estimation								
Log(Net Worth)	−0.010***	−0.009***	−0.009***	−0.007***	−0.010***	−0.006***	−0.010***	−0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Value Added/Number of Workers)	−0.018***	−0.017***	−0.015***	−0.014***	−0.018***	−0.011***	−0.017***	−0.016***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm Age	−0.001***	−0.002***	−0.001***	−0.001***	−0.001***	−0.002***	−0.002***	−0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Wage Bill)	−0.008***	−0.007***	−0.006***	−0.006***	−0.008***	−0.004***	−0.009***	−0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Annual Sales)	0.002***	−0.003***	0.005***	−0.003***	0.002**	0.000	0.007***	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Credit Stock)		0.013***		0.012***		0.010***		0.012***
		(0.001)		(0.001)		(0.001)		(0.001)
Spread Ex-Ante		0.003***				0.001***		0.003***
		(0.000)				(0.000)		(0.000)
Spread 2018				0.004***				
				(0.000)				
Default Probability						0.226***		
						(0.002)		
Sales Variation							−0.040***	−0.034***
							(0.002)	(0.002)
Dependent Variable Mean	0.088	0.088	0.080	0.080	0.089	0.089	0.090	0.090
Dependent Variable Std. Dev.	0.284	0.284	0.271	0.271	0.284	0.284	0.286	0.286
Number of Firms	96,424	96,424	69,317	69,317	95.928	95.928	92,802	92,802
R^2	0.073	0.112	0.068	0.117	0.073	0.284	0.092	0.124
Industry FE and Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Predicted Default Probability								
Banked Firms	0.088	0.089	0.079	0.079	0.089	0.089	0.090	0.091
Unbanked Firms	0.107		0.091		0.108		0.097	

Probaility of Firms Using Public Programs: Including Unbanked Firms

Return

	Public Credit Guarantee			Employment Protection
	(1)	(2)	(3)	(4)
	Applications	Approvals	Use	Use Employment
Unbanked Firms Risk	0.395***	−0.291***	**0.302***	**-0.049**
	(0.040)	(0.039)	(0.040)	(0.030)
Banked Firms Risk	0.543***	−0.265***	**0.308***	**-0.024**
	(0.033)	(0.022)	(0.028)	(0.020)
Banked	0.313***	0.022***	0.299***	0.022***
	(0.005)	(0.005)	(0.005)	(0.004)
Increase in Sales Dummy	0.165***	0.020***	0.157***	0.058***
	(0.005)	(0.006)	(0.006)	(0.005)
Decrease in Sales Dummy	0.171***	0.022***	0.159***	0.111***
	(0.005)	(0.006)	(0.005)	(0.005)
Use Employment Protection	0.109***	−0.008**	0.083***	
	(0.004)	(0.003)	(0.004)	
Use Public Credit Guarantee				0.054***
				(0.002)
Dependent Variable Mean	0.911	0.357	0.481	0.165
Dependent Variable Std. Dev.	0.285	0.479	0.500	0.371
Number of Firms	47,630	114,542	114,566	118,090
R^2	0.030	0.135	0.155	0.080
Industry FE and Municipality FE	Yes	Yes	Yes	Yes
Predicted Default Probability				
Unbanked Firms	0.094	0.104	0.094	0.093
Banked Firms	0.084	0.090	0.084	0.086

Probability of Firms Using Public Programs: Ex-Ante Spread

Return

	Public Credit Guarantee			Employment Protection
	(1)	(2)	(3)	(4)
	Applications	Approvals	Use	Use
Spread Ex-Ante	0.003***	−0.001***	**0.002*****	**-0.001**
	(0.001)	(0.000)	(0.001)	(0.000)
Increase in Sales Dummy	0.133***	0.015*	0.143***	0.046***
	(0.010)	(0.008)	(0.011)	(0.009)
Decrease in Sales Dummy	0.136***	0.015*	0.141***	0.105***
	(0.009)	(0.008)	(0.011)	(0.009)
Use Employment Protection	0.112***	−0.010**	0.087***	
	(0.007)	(0.005)	(0.007)	
Use Public Credit Guarantee				0.054***
				(0.004)
Dependent Variable Mean	0.656	0.926	0.517	0.190
Dependent Variable Std. Dev	0.475	0.262	0.500	0.393
Number of Firms	36,156	20,656	36,212	37,739
R^2	0.095	0.037	0.071	0.084
Industry FE and Municipality FE	Yes	Yes	Yes	Yes
Predicted Default Probability				
Banked Firms	0.059	0.064	0.059	0.060

Allocation of Crisis Credit and Firm Size

Return

	(1) Total Public Credit Guarantee Program (Million USD)	(2) Share of Public Credit Guarantee Program (%)	(3) Default Probability (%)	(4) Effective Guarantee (%)	(5) Expected Loss/GDP (=(2)×(3))/GDP (%)	(6) Government's Expected Loss/GDP (=(4)×(5)/GDP) (%)	(7) Banks' Expected Loss/GDP (=(5)-(6)) (%)
Firm Size							
Small	2264	25	9.22	39.0	0.08	0.03	0.05
Medium	2372	27	5.97	33.0	0.06	0.02	0.04
Medium-Large	3322	37	3.45	19.0	0.05	0.01	0.04
Large	1008	11	2.49	0.0	0.01	0.00	0.01
No Sales Data	56	0	9.22	39.0	0.00	0.00	0.00
Total: Formal Firms	9022 (3.6% GDP)	100	5.47	25.6	0.20	0.06	0.14