# COVID-19, Policy Interventions and Credit: The Brazilian Experience


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**Abstract**

The COVID-19 pandemic caused a global health and economic crisis to which governments responded with massive policy interventions. Using Brazil as a testing ground, we investigate the influence of the pandemic and ensuing policy interventions on local credit markets. First, we find that the pandemic has a significantly negative impact on local credit. Second, using a novel manually collected database on the staggered municipal government policy interventions, we show heterogeneous effects of interventions: positive effects of soft interventions (e.g., social distancing and mass gathering restrictions) and late reopening, and negative effects of hard interventions (e.g., closure of non-essential services) and early reopening. Third, we find that state-owned banks grant more local credit than privately owned banks during the COVID-19 crisis, but this difference is less pronounced than it was in the 2008 Financial Crisis. We confirm our results using pre-pandemic local political preference as instrument for policy interventions and orthogonalized policy intervention indicators, and in placebo tests.


### Overview

- **Research question**: Do the COVID-19 pandemic and ensuing policy interventions impact the local credit in Brazil?
- **Identification**: the COVID-19 pandemic as an unexpected and exogenous shock to local credit markets and local governments in Brazil
- **Data**
  - COVID-19 and policy intervention data: Ministry of Health of Brazil
  - Bank data: ESTBAN data from Central Bank of Brazil (BCB)
  - Political and economic data: Superior Electoral Court, CAGED, IPEA
- **Main results and contributions**
  - Negative impact of the pandemic on local credit in Brazil
  - Heterogenous effects of interventions: positive effects of soft interventions and late reopening, and negative effects of hard interventions and early reopening
  - Clear policy implications for policy makers and financial regulators
  - The FIRST study on local credit in Brazil during the COVID-19 crisis

### Hypothesis

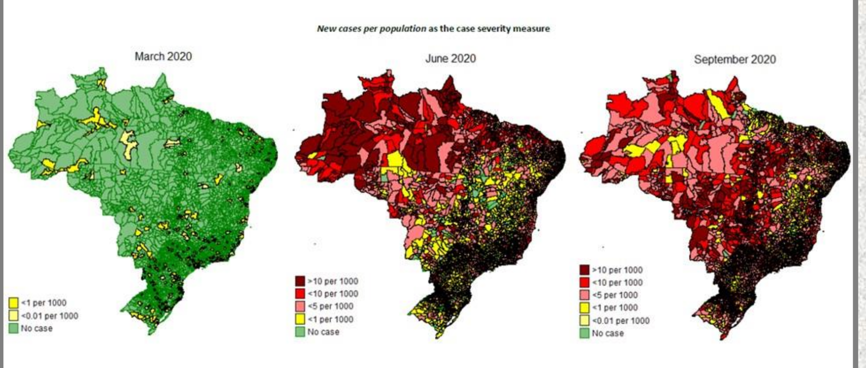
- **Hypothesis 1.** The COVID-19 pandemic has a negative impact on local credit
- **Hypothesis 2.** Policy interventions have heterogeneous effects on local credit during the COVID-19 pandemic. Soft interventions (social distancing, mass gathering restrictions and closure of schools and universities) have a positive effect (**H2a**), hard interventions (closure of public venues and/or non-essential services) have a negative effect (**H2b**), and the revoking of restrictive policy interventions (reopening) has a positive effect on local credit during the pandemic (**H2c**)
- **Hypothesis 3.** Lending by state-owned banks helps stabilize local credit during the COVID-19 crisis in Brazil

### Data sources

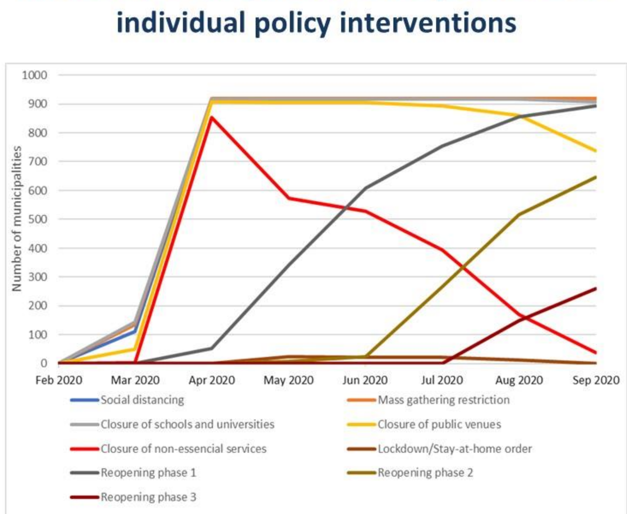
We collect the following data **from Jan 2018 to Sep 2020**:

- **COVID-19 data** (municipality level): daily number of new cases and deaths from the Ministry of Health of Brazil
- **Policy intervention data**: hand-collected for 920 metropolitan municipalities from local legislative decrees, official notices (*Diário Oficial*) and health authority/media reports
- **Bank data** (bank-municipality level): ESTBAN data for all commercial banks from Central Bank of Brazil (BCB)
- **Local political and economic data**: local political preference (as instrumental variable) from the Superior Electoral Court, IPEA data, CAGED data, and IBGE

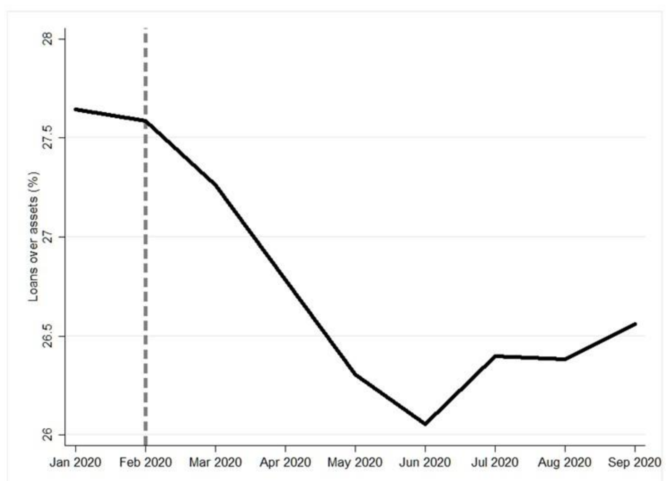
### The COVID-19 pandemic in Brazil during 2020




### Number of metropolitan municipalities under individual policy interventions




### Local credit in Brazil during Jan 2020 to Sep 2020




### Variables

**Dependent variable** (bank-municipality level):
- *Loans over assets:* ratio of lending amount of bank loans granted over total book assets

**Crisis variables** (municipality level):
- *Case severity: New cases, New cases per 1000 population, Deaths, Deaths per 1000 population*
- *Intervention: Soft intervention* (social distancing, mass gathering restrictions, closure of schools and universities), *Hard intervention* (closure of public venues or non-essential services), *Lockdown, Reopen-early phase, Reopen-late phase, Intervention intensity* index

**Control variables** (bank/municipality/state level):
- Bank controls: *Asset growth, Deposits over assets, Loan loss provision ratio, ROA, Liquidity*
- Local controls: *HHI deposit, Retail sales index, Average income, Unemployment rate, Labor turnover*

**Instrumental variable** (municipality level):
- *Political preference:* ratio of popular votes cast for Jair Bolsonaro by voters over total votes in the 2018 Brazilian general election

### Summary statistics

| | Pre-crisis period | | | During-crisis period | | |
|---|---|---|---|---|---|---|
| Variable | Mean | Std. Dev. | Number of obs. | Mean | Std. Dev. | Number of obs. |
| **Dependent variables** | | | | | | |
| *Loans over assets (%)* | 28.132 | 22.477 | 84,593 | 26.669 | 21.658 | 26,374 |
| **Crisis variables** | | | | | | |
| *New cases* | 0 | 0 | 84,593 | 1.953 | 8.058 | 26,374 |
| *New cases per population* | 0 | 0 | 84,593 | 2.810 | 4.007 | 26,374 |
| *Deaths* | 0 | 0 | 84,593 | 0.085 | 0.365 | 26,374 |
| *Deaths per population* | 0 | 0 | 84,593 | 0.077 | 0.105 | 26,374 |
| *Soft intervention (SD/MGR/CSU)* | 0 | 0 | 84,593 | 0.789 | 0.408 | 26,374 |
| *Hard intervention (CPV/CNES)* | 0 | 0 | 84,593 | 0.710 | 0.454 | 26,374 |
| *Lockdown* | 0 | 0 | 84,593 | 0.015 | 0.122 | 26,374 |
| *Reopen-early phase* | 0 | 0 | 84,593 | 0.478 | 0.500 | 26,374 |
| *Reopen-late phase* | 0 | 0 | 84,593 | 0.233 | 0.423 | 26,374 |
| *Intervention intensity* | 0 | 0 | 84,593 | 0.847 | 0.864 | 26,374 |
| **Control variables** | | | | | | |
| Bank controls: | | | | | | |
| *Asset growth* | 0.011 | 0.068 | 84,593 | 0.024 | 0.066 | 26,374 |
| *Deposits over assets* | 0.301 | 0.195 | 84,593 | 0.318 | 0.204 | 26,374 |
| *Loan loss provision ratio* | 0.005 | 0.011 | 84,593 | 0.005 | 0.011 | 26,374 |
| *ROA* | 0.014 | 0.016 | 84,593 | 0.011 | 0.013 | 26,374 |
| *Liquidity* | 0.018 | 0.056 | 84,593 | 0.016 | 0.052 | 26,374 |
| Local controls: | | | | | | |
| *HHI deposit* | 0.393 | 0.195 | 84,593 | 0.392 | 0.193 | 26,374 |
| *Retail sales index* | 97.463 | 10.722 | 84,593 | 97.923 | 16.877 | 26,374 |
| *Average income* | 2.478 | 0.543 | 84,593 | 2.732 | 0.589 | 26,374 |
| *Unemployment rate (%)* | 5.606 | 1.513 | 84,593 | 10.922 | 4.501 | 26,374 |
| *Labor turnover (%)* | 0.028 | 0.101 | 84,593 | -0.041 | 0.246 | 26,374 |
| **Instrumental variable** | | | | | | |
| *Political preference* | 0.623 | 0.166 | 84,593 | 0.623 | 0.166 | 26,374 |

### Methodology

First, we examine whether and how the COVID-19 pandemic directly affects the local credit in Brazil. We estimate our model (1):

$$Loans\ over\ assets_{i,m,t} = \beta_0 + \boldsymbol{\beta_1} Case\ severity_{m,t} + \gamma Z_{i,m,t-1} + \upsilon_{i,t} + \theta_s + \varepsilon_{i,m,t}$$

Second, we examine whether and how the COVID-19 crisis and different policy interventions jointly affect local credit across municipalities over time. We estimate the following model (2):

$$\begin{aligned} &Loans\ over\ assets_{i,m,t} \\ &= \beta_0 + \boldsymbol{\beta_1} Case\ severity_{m,t} \times Intervention_{m,t} + \beta_2 Case\ severity_{m,t} \\ &+ \beta_3 Intervention_{m,t} + \gamma Z_{i,m,t-1} + \upsilon_{i,t} + \theta_s + \varepsilon_{i,m,t} \end{aligned}$$

where $\upsilon_{i,t}$ are bank-time fixed effects; $\theta_s$ are state fixed effects; All control variables are lagged by one month to mitigate the potential endogeneity and simultaneity between bank loan lending and local socioeconomic characteristics

### Results for local credit using new cases per population and deaths per population as case severity measures

- We find that the coefficients of *Case severity* are negative and statistically significant across case severity measures and regression models
- The economic magnitude estimated of pandemic effect is large, e.g., one death per 1000 local pop. corresponds to a 4.07 percentage points drop in the loans over assets ratio (14.4 percent of the pre-crisis mean)

| Dependent variable | *Loans over assets (%)* | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | *New cases per population* | | *Deaths per population* | |
| ***Case severity*** | **-0.244***** | **-0.097***** | **-19.426***** | **-4.076***** |
| | **(0.035)** | **(0.028)** | **(1.321)** | **(0.960)** |
| Bank controls: | No | Yes | No | Yes |
| Local controls: | No | Yes | No | Yes |
| Bank-time FE | No | Yes | No | Yes |
| State FE | No | Yes | No | Yes |
| Adjusted R-squared | 0.001 | 0.705 | 0.003 | 0.705 |
| Number of obs. | 110,967 | 110,967 | 110,967 | 110,967 |

### Results for the effects of the government policy interventions on local credit

- Positive effects of the soft interventions and late-stage reopening
- Negative effects of the hard interventions and early-stage reopening

| Dependent variable | *Loans over assets (%)* | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | *New cases per population* | | *Deaths per population* | |
| *Soft intervention × Case severity* | 50.266*** | | 363.266*** | |
| | (9.414) | | (69.919) | |
| *Hard intervention × Case severity* | -0.168** | | -6.577* | |
| | (0.085) | | (3.729) | |
| *Lockdown × Case severity* | 0.190* | | 5.175* | |
| | (0.095) | | (3.231) | |
| *Reopen-early phase × Case severity* | -0.174*** | | -5.020*** | |
| | (0.059) | | (1.926) | |
| *Reopen-late phase × Case severity* | 0.108** | | 3.420 | |
| | (0.055) | | (2.219) | |
| *Intervention intensity × Case severity* | | 0.056** | | 2.080** |
| | | (0.023) | | (0.820) |
| Bank controls | Yes | Yes | Yes | Yes |
| Local controls | Yes | Yes | Yes | Yes |
| Bank-time FE | Yes | Yes | Yes | Yes |
| State FE | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.705 | 0.705 | 0.705 | 0.705 |
| Number of obs. | 110,967 | 110,967 | 110,967 | 110,967 |

### Results for the instrumental variable (IV) analysis: First stage results using *Political preference* as the instrument

We use local pre-pandemic political preference as instrument for local policy interventions, which is pre-determined thus exogenous to the pandemic

- We find *Political preference* is significantly related to policy interventions in five of six models. The signs of coefficients are all as expected
- The IV diagnosis statistics indicate the instrument is econometrically neither irrelevant nor weak

| Dependent variable | *Soft intervention* | *Hard intervention* | *Lockdown* | *Reopen-early phase* | *Reopen-late phase* | *Intervention intensity* |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ***Political preference*** | **0.003** | **-0.010**** | **-0.004**** | **0.031***** | **0.040***** | **-0.078***** |
| | **(0.002)** | **(0.004)** | **(0.002)** | **(0.006)** | **(0.006)** | **(0.010)** |
| *Case severity* | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Local controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank-time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| State FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.960 | 0.919 | 0.140 | 0.823 | 0.650 | 0.804 |
| Number of obs. | 110,967 | 110,967 | 110,967 | 110,967 | 110,967 | 110,967 |
| **IV diagnosis statistics:** | | | | | | |
| Under-identification test | | | | | | |
| Kleibergen-Paap rk LM statistic | 1.913 | 6.506 | 3.173 | 30.545 | 41.796 | 53.666 |
| Chi-square test P-value | 0.167 | 0.011 | 0.075 | <0.01 | <0.01 | <0.01 |
| Weak identification test | | | | | | |
| Cragg-Donald Wald F statistic | 0.930 | 7.861 | 3.732 | 47.375 | 74.050 | 87.276 |

### Results for the instrumental variable (IV) analysis: Final stage results with the policy intervention variables

- We confirm our main results are consistent and robust in the IV analysis

| Dependent variable | *Loans over assets (%)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | *New cases* | | *New cases per population* | | *Deaths* | | *Deaths per population* | |
| *IV-Soft intervention × Case severity* | 33.656*** | | 14.509* | | 809.388*** | | 37.586 | |
| | (11.465) | | (8.242) | | (289.095) | | (338.753) | |
| *IV-Hard intervention × Case severity* | -18.093*** | | -23.798** | | -528.927** | | -555.260 | |
| | (6.079) | | (10.358) | | (269.300) | | (419.833) | |
| *IV-Lockdown × Case severity* | -35.614** | | -8.828 | | -673.645* | | 39.480 | |
| | (15.394) | | (5.580) | | (363.900) | | (241.506) | |
| *IV-Reopen-early phase × Case severity* | -37.548** | | -10.375* | | -719.775** | | -8.689 | |
| | (15.464) | | (5.700) | | (364.053) | | (246.884) | |
| *IV-Reopen-late phase × Case severity* | 5.579* | | -1.934 | | 86.281 | | -100.306 | |
| | (2.874) | | (1.352) | | (78.051) | | (61.153) | |
| *IV-Intervention intensity × Case severity* | | 0.283 | | 0.364*** | | 6.042 | | 2.657 |
| | | (0.356) | | (0.117) | | (10.181) | | (7.042) |
| Bank controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Local controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank-time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| State FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.707 | 0.705 | 0.707 | 0.705 | 0.707 | 0.705 | 0.707 | 0.705 |
| Number of obs. | 110,967 | 110,967 | 110,967 | 110,967 | 110,967 | 110,967 | 110,967 | 110,967 |

### Further checks and robustness tests

- State-owned banks: State-owned banks grant more local credit than privately owned banks during both the 2008 crisis and 2020 crisis in Brazil, but have less pronounced effect in the 2008 Financial Crisis
- Orthogonalization test: Our results are upheld addressing the possible collinearity concern between case severity and intervention implementation
- Sectoral dependence of local credit: We find larger negative impact on local credit in the agriculture sector → a potential credit reallocation channel between rural agriculture sector and urban corporate and housing sectors under different policy interventions
- Duration and reaction speed: The effects are stronger with longer intervention duration and higher intervention speed
- Placebo tests: We show our results are not driven by unobserved contemporaneous shocks or random local and temporal confounders in the data, using placebo explanatory variables which are similarly distributed but with randomly assigned values

### Conclusions

We investigate whether and how the COVID-19 pandemic and ensuing policy interventions impact the local credit in Brazil. We find:

- Consistent evidence that the COVID-19 pandemic has a significantly negative impact on local credit
- The policy interventions in response the COVID-19 pandemic have heterogenous effects on local credit
- Positive effects of soft interventions (less restrictive interventions on individuals such as SD and MGR) and late-stage reopening
- Negative effects of hard interventions (more restrictive interventions focused on local economic activities such as CPV and CNES), and early-stage reopening
- State-owned banks grant more local credit than privately owned banks during the COVID-19 crisis, but this difference is less pronounced than it was in the 2008 Financial Crisis
- The evidence suggests clear policy implications

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