

The Impact of REACTIVA on the Real Economy and on Bank Risk-Taking*

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* Las opiniones expresadas en este estudio corresponden a los autores y no deben ser atribuidas al BCRP.

Motivation

- The Covid-19 pandemic has produced a strong negative impact on the economy.
- This challenging environment forced Central Banks to implement both conventional and unconventional policies
- In April 2020, the fiscal and monetary authority implemented the REACTIVA program (RP).
- In Peru, a large percentage of entrepreneurs belong to the tertiary and/or informal sectors (the sectors most affected by the pandemic)
- RP was important because it allowed: (i) to give cheap credit to the most affected sectors; and (ii) to preserve financial stability.

① Objective:

- We aim to study the impact of REACTIVA program on both the real economy and financial stability.
 - We use the employment level and the non-performing loans ratio.
 - To capture intensity of the program, we use a dummy or a ratio of REACTIVA loans to total loans.

② Methodology:

- We develop two empirical models to assess the impact of REACTIVA on:
 - bank risk-taking and
 - real activity (both intensive and extensive margins).
- In addition we use a DnD approach.

- ① The health crisis of Covid-19 pandemic had real impacts on the Peruvian economy:
 - Sanchez 2022
 - Durán 2021
- ② Governments worldwide deployed unconventional monetary policies. A strand of the literature analyses the real effect of such policies.
 - Acharya et al. 2019
 - Luck and Zimmermann 2020
- ③ A second branch of the literature links unconventional policies and the increment of banks' risk-taking.
 - Jiménez, Lopez, and Saurina 2013
 - Matthys, Meuleman, and Vander Venet 2020
 - Anzuini and Rossi 2022

The REACTIVA Peru Program

- REACTIVA Peru was a public guarantee program for up to S/ 60 billion (initially S/ 30 billion).
- The amount of the loans is related to working capital needs.
- The guarantee was granted according to a percentage (between 80 and 98 percent), which varied in a decreasing manner to the amount of the loan.

Table: Loans per company (in soles).

Guarantee percentage	Reactiva 1 ^{1/}	Reactiva 2 ^{2/}
98%	Up to 30,000	Up to 90,000
95%	From 30,001 to 300,000	From 90,001 to 750,000
90%	From 300,001 to 5,000,000	From 750,001 to 7,500,000
80%	From 5,000,001 to 10,000,000	From 7,500,001 to 10,000,000

^{1/} Guaranteed credits before June 1, 2020. ^{2/} Guaranteed loans after June 1, 2020.

- We work with the employment data set of the SUNAT¹ and the credit register (RCC).²
- Our universe are the companies with credit records that report the number of workers to SUNAT. This data is available from January 2010 until now.
- The number of companies represents 12 percent of the total, but the number of workers represents the third part of the total.

Table: Descriptive Statistics.

Period	Companies	Workers	Reactiva Comp.	Reactiva Workers
Dec.2019	989,631	5,594,437	-	-
May.2020	994,363	4,837,615	117,876 (11,9%)	1,698,972 (35,1%)
Dec.2020	1,005,436	5,396,457	119,280 (11,9%)	1,975,356 (36,6%)
Dec.2021	1,023,943	5,680,688	121,123 (11,8%)	2,060,467 (36,3%)

¹Tax authority.

²We thank the division of expenditure, employment and remuneration indicators for providing us with the data.

Table: Descriptive statistics for financial institution-region-time observations:
April 2020 - January 2021

Variables	Obs	Mean	S.D.	Minimum	Maximum
REACTIVA _{rbt}	2909	36,30	24,39	0,07	99,94
NPL _{rbt}	2477	8,36	11,18	0,00	89,65
NPL ^a _{rbt}	2543	11,46	13,47	0,00	89,76
NPL ^{wr} _{rbt}	2458	12,40	14,44	0,00	89,71
NPL ^{wr,a} _{rbt}	2518	16,77	16,94	0,00	89,71

Source: RCC. Own elaboration. S.D.: Standard deviation. We omit extreme values.

Thus we consider: $0 < \text{NPL}_{rbt-1} < 0.9$, $0 < \text{NPL}^a_{rbt-1} < 0.9$, $0 < \text{NPL}^{wr}_{rbt-1} < 0.9$,
 $0 < \text{NPL}^{wr,a}_{rbt-1} < 0.9$, $0 < \text{REACTIVA}_{rbt} < 100$. We omit credit information that we are able
to assign to a specific region due to lack of information.

Table: Descriptive statistics for financial institution-region-time observations: March 2020 - August 2020

Variables	Obs	Mean	S.D.	Minimum	Maximum
REACTIVA _{rbt}	7207	12,58	22,07	0,00	100,00
EG _{rbt}	7207	2,16	28,36	-198,59	198,59
n _{rbt}	7412	69,31	474,39	1,00	11 801,00

Source: RCC. Own elaboration. S.D.: Standard deviation. We exclude observations with REACTIVA_{rbt} = 1.

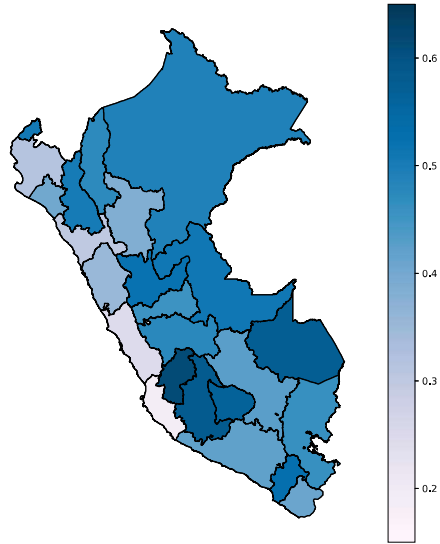
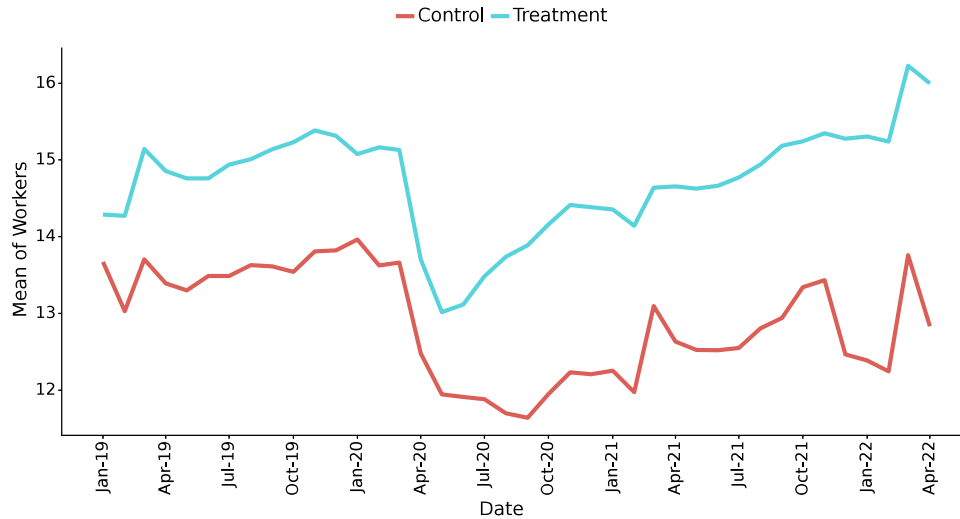


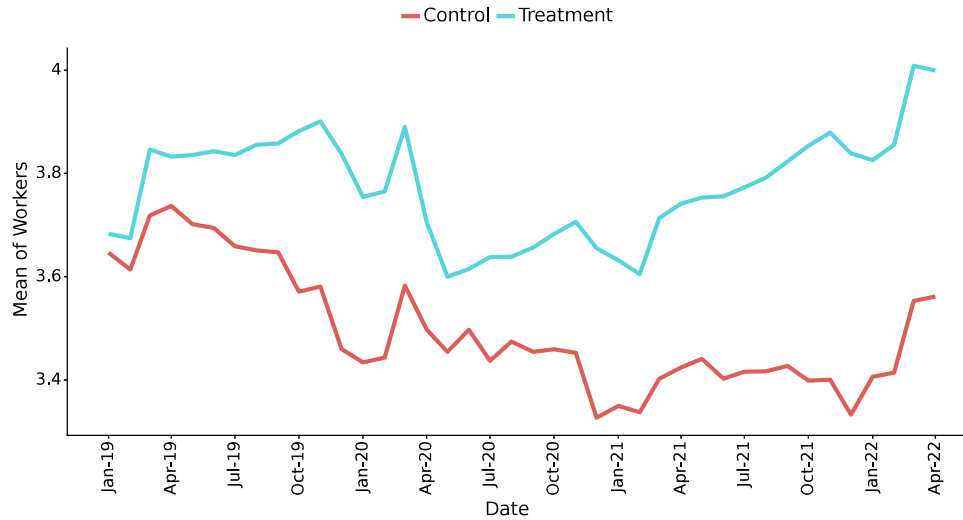
Figure: Reactiva Ratio per Region

Data: Mean of Workers



Mid-size businesses

Data: Mean of Workers



Small-size businesses

The impact of REACTIVA on the Financial and Macroeconomic Stability

Impact on risk taking

- We propose the following empirical model:

$$NPL_{rbt} = \beta_0 + \lambda_b + \omega_{rt} + \beta_1 NPL_{rbt-1} + \beta_2 REACTIVA_{rbt} + \varepsilon_{rbt}, \quad (1)$$

r :region, t : a sample month and b : a bank or non-banking institution. NPL_{rbt} : non-performing loans to total loans ratio at region-bank-time level.

- The period analyzed spans from April 2020 to January 2021.

Impact on risk taking

Table: Regression Results

	(1) NPL	(2) NPL ^a	(3) NPL ^{wr}	(4) NPL ^{wr,a}
REACTIVA _{rbt}	-0.0389***	-0.0476***	0.0266***	0.0220***
NPL _{rbt-1}	0.841***			
NPL ^a _{rbt-1}		0.870***		
NPL ^{wr} _{rbt-1}			0.926***	
NPL ^{wr,a} _{rbt-1}				0.953***
Observations	2,477	2,543	2,458	2,518
R-squared	0.903	0.928	0.928	0.941
Bank FE	YES	YES	YES	YES
Region-Time FE	YES	YES	YES	YES

*** Statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%. Robust standard errors. We omit extreme values. Thus we consider:

$0 < \text{NPL}_{rbt-1} < 0.9$, $0 < \text{NPL}_{rbt-1}^a < 0.9$, $0 < \text{NPL}_{rbt-1}^{wr} < 0.9$, $0 < \text{NPL}_{rbt-1}^{wr,a} < 0.9$,
 $0 < \text{REACTIVA}_{rbt} < 100$. We omit credit information that we are able to assign to a specific region due to lack of information. Period: 2020:M4-2021:M1.

Impact on risk taking

Table: Regression Results

	(1) NPL	(2) NPL ^a	(3) NPL ^{wr}	(4) NPL ^{wr,a}
REACTIVA _{rbst}	-0.0560***	-0.0669***	0.0131***	0.00915**
NPL _{rbst-1}	0.807***			
NPL _{rbst-1} ^a		0.827***		
NPL _{rbst-1} ^{wr}			0.919***	
NPL _{rbst-1} ^{wr,a}				0.937***
Observations	12,705	13,445	12,401	13,058
R-squared	0.855	0.876	0.885	0.910
Bank FE	YES	YES	YES	YES
Region-Time FE	YES	YES	YES	YES
Sector-Time FE	YES	YES	YES	YES

*** Statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%. Robust standard errors. We omit extreme values. Thus we consider:

$0 < \text{NPL}_{rbst-1} < 0.9$, $0 < \text{NPL}_{rbst-1}^a < 0.9$, $0 < \text{NPL}_{rbst-1}^{wr} < 0.9$, $0 < \text{NPL}_{rbst-1}^{wr,a} < 0.9$,
 $0 < \text{REACTIVA}_{rbst} < 100$. We omit credit information that we are able to assign to a specific region due to lack of information. Period: 2020:M4-2021:M1.

The impact of REACTIVA on the Financial and Macroeconomic Stability

Impact on employment

- The following specification aims to capture the impact of REACTIVA across both the intensive and extensive margins:

$$EG_{rbt} = \beta_0 + \lambda_b + \omega_{rt} + \beta_1 REACTIVA_{rbt} + \varepsilon_{rbt}, \quad (2)$$

EG_{rbt} : the monthly growth rate of workers at the region-bank-time level.

- The time period analyzed spans from March 2020 to August 2020.

Impact on employment

Table: Regression results

	All	micro	small	medium	big	corporate
Without AR(1) term						
REACTIVA _{rbt}	0.232***	0.397***	0.323***	0.108**	0.108*	-0.0337
Observations	7,207	1,147	2,351	2,228	874	581
R-squared	0.098	0.200	0.192	0.168	0.273	0.217
F test (ρ -value)	1.88e-06	3.56e-05	7.91e-07	0.0378	0.0669	0.608
With AR(1) term						
EG _{rbt-1}	-0.0646***	-0.0573*	-0.142***	-0.0448*	-0.0696	-0.0722
REACTIVA _{rbt}	0.240***	0.411***	0.359***	0.120**	0.120*	-0.0222
Observations	7,137	1,110	2,336	2,217	871	576
R-squared	0.104	0.205	0.204	0.171	0.280	0.239
F test (ρ -value)	2.76e-06	0.000339	7.25e-06	0.0397	0.0781	0.218

*** Statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%. Robust standard errors. We omit extreme values. This is we only consider: REACTIVA_{rbt} < 1 and -200 < EG_{rbt-1} < 200. In all regression, we include bank and region-time fixed effects.

- The following specification aims to capture the impact of REACTIVA across the extensive margin:

$$\log(n_{rbt}) = \beta_0 + \lambda_b + \omega_{rt} + \beta_1 \text{REACTIVA}_{rbt} + \varepsilon_{rbt}, \quad (3)$$

n_{rbt} : number of firms (in particular, micro-sized businesses) at the region-bank-time level. As usual we control by region-time effects, ω_{rt} , and by bank effects, λ_b .

- Similarly, the time period analyzed spans from March 2020 to August 2020.

Table: Regression results

	(1) All	(2) Micro	(3) Small	(4) Median	(5) Big	(6) Corp
Bank and Region-Time FE						
$\ln(n_{r_{bt-1}})$	0.979***	0.862***	0.959***	0.978***	0.991***	0.976***
$REACTIVA_{r_{bt}}$	0.00294***	0.00458***	0.00388***	0.00100***	0.00125***	-0.000825
Region and Bank-Time FE						
$\ln(n_{r_{bt-1}})$	0.980***	0.878***	0.964***	0.979***	0.987***	0.976***
$REACTIVA_{r_{bt}}$	0.00280***	0.00388**	0.00315**	0.000669**	0.00122**	-0.000286
Bank-Time and Region-Time FE						
$\ln(n_{r_{bt-1}})$	0.980***	0.896***	0.965***	0.980***	0.994***	0.980***
$REACTIVA_{r_{bt}}$	0.00282***	0.00405**	0.00311**	0.000652***	0.000914	-0.00116
Observations	5,899	755	2,136	1,823	595	309

*** Statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%. Robust standard errors. We exclude extreme values. Thus, we consider only: $n_{r_{bt-1}} > 1$

Difference-in-Differences Analysis

- Based on Callaway and Sant'Anna 2021, we propose the following equation in order to measure the effect of participating in the program:

$$\log(E_{it}) = \omega_t + \lambda_g + \sum_{e=-K}^{-2} \delta_e^{anticip} \cdot D_{it}^e + \sum_{e=0}^L \beta_e \cdot D_{it}^e + \varepsilon_{it}, \quad (4)$$

$\log(E_{it})$: natural logarithm of the number of employees of the business i at time t . ω_t : time fixed effect. λ_g : group fixed effect (firms are grouped according to the month that received REACTIVA). $\delta_e^{anticip}$ is the coefficient associated with the periods of anticipation to the treatment. $D_{it}^e = 1\{t - G_i = e\}$. β_e (if $e \geq 0$): the effect of participating in the treatment at different lengths of exposure to the treatment.

- The time period analyzed spans from January 2019 to December 2022.

Difference-in-Differences Analysis

Table: Ractiva Peru Program Treatment Effect Estimates with Non-Anticipation

(a) Using Never-Treated Comparison Group									
	Partially Aggregated								Single Parameters
Simple Weighted Average									0.034* (0.003)
Group-Specific Effects	g=May-20 0.041* (0.003)	g=Jun-20 0.034* (0.005)	g=Jul-20 0.039* (0.004)	g=Aug-20 0.024* (0.004)	g=Sep-20 0.014* (0.004)	g=Oct-20 0.016* (0.005)	g=Nov-20 0.008 (0.008)	g=Dec-20 0.036* (0.013)	0.033* (0.003)
Event Study	e=8m 0.031* (0.003)	e=14m 0.041* (0.003)	e=20m 0.048* (0.004)	e=24m 0.057* (0.004)					0.033* (0.003)
Calendar Time Effects	t=May-20 -0.010* (0.001)	t=Jun-20 -0.001 (0.002)	t=Jul-20 0.009* (0.002)	t=Aug-20 0.014* (0.002)	t=Sep-20 0.016* (0.002)	t=Oct-20 0.024* (0.002)	t=Nov-20 0.028* (0.002)	t=Dec-20 0.030* (0.002)	0.032* (0.002)
(b) Using Not-Yet-Treated Comparison Group									
	Partially Aggregated								Single Parameters
Simple Weighted Average									0.034* (0.002)
Group-Specific Effects	g=May-20 0.041* (0.003)	g=Jun-20 0.033* (0.005)	g=Jul-20 0.039* (0.005)	g=Aug-20 0.024* (0.004)	g=Sep-20 0.014* (0.004)	g=Oct-20 0.016* (0.005)	g=Nov-20 0.008 (0.008)	g=Dec-20 0.036* (0.013)	0.033* (0.003)
Event Study	e=8m 0.035* (0.003)	e=14m 0.041* (0.004)	e=20m 0.053* (0.004)	e=23m 0.057* (0.005)					0.035* (0.003)
Calendar Time Effects	t=May-20 -0.005* (0.001)	t=Jun-20 -0.002 (0.001)	t=Jul-20 0.009* (0.002)	t=Aug-20 0.012* (0.002)	t=Sep-20 0.013* (0.002)	t=Oct-20 0.021* (0.002)	t=Nov-20 0.028* (0.003)	t=Dec-20 0.030* (0.003)	0.032* (0.002)

* Confidence band does not cover 0. Doubly Robust approach used.

Difference-in-Differences Analysis

Table: Reactiva Peru Program Treatment Effect Estimates with 1 month Anticipation

(a) Using Never-Treated Comparison Group									
	Partially Aggregated								Single Parameters
Simple Weighted Average									0.021* (0.003)
Group-Specific Effects	g=May-20 0.018* (0.003)	g=Jun-20 0.021* (0.005)	g=Jul-20 0.042* (0.005)	g=Aug-20 0.027* (0.004)	g=Sep-20 0.016* (0.004)	g=Oct-20 0.019* (0.006)	g=Nov-20 0.010 (0.008)	g=Dec-20 0.035* (0.013)	0.021* (0.003)
Event Study	e=8m 0.023* (0.003)	e=14m 0.029* (0.003)	e=20m 0.038* (0.003)	e=24m 0.034* (0.005)					0.022* (0.003)
Calendar Time Effects	t=May-20 -0.033* (0.002)	t=Jun-20 -0.022* (0.002)	t=Jul-20 -0.009* (0.003)	t=Aug-20 -0.001 (0.002)	t=Sep-20 0.016 (0.003)	t=Oct-20 0.011* (0.003)	t=Nov-20 0.016* (0.003)	t=Dec-20 0.018* (0.003)	0.019* (0.003)
(b) Using Not-Yet-Treated Comparison Group									
	Partially Aggregated								Single Parameters
Simple Weighted Average									0.021* (0.003)
Group-Specific Effects	g=May-20 0.018* (0.003)	g=Jun-20 0.021* (0.005)	g=Jul-20 0.042* (0.005)	g=Aug-20 0.027* (0.004)	g=Sep-20 0.015* (0.004)	g=Oct-20 0.019* (0.006)	g=Nov-20 0.010 (0.008)	g=Dec-20 0.035* (0.012)	0.021* (0.003)
Event Study	e=8m 0.023* (0.003)	e=14m 0.029* (0.003)	e=20m 0.038* (0.003)	e=24m 0.034* (0.005)					0.022* (0.003)
Calendar Time Effects	t=May-20 -0.027* (0.002)	t=Jun-20 -0.019* (0.002)	t=Jul-20 -0.009* (0.003)	t=Aug-20 -0.004 (0.002)	t=Sep-20 0.002 (0.002)	t=Oct-20 0.011* (0.003)	t=Nov-20 0.016* (0.003)	t=Dec-20 0.018* (0.003)	0.019* (0.002)

*

Confidence band does not cover 0. Doubly Robust approach used.

Difference-in-Differences Analysis

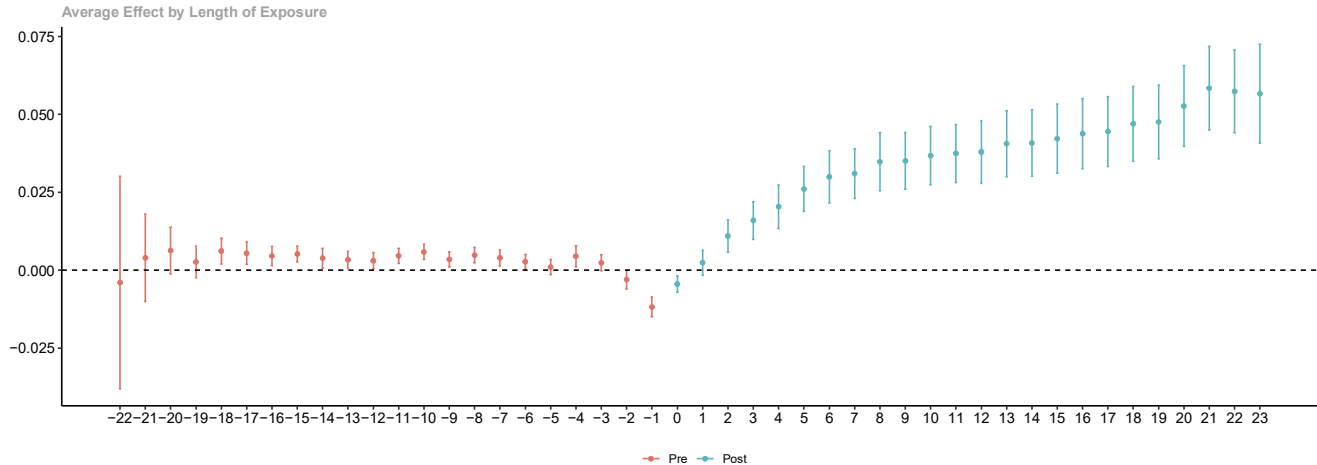


Figure: Reactiva Peru Program Time Average Treatment Effects: Non anticipation

Difference-in-Differences Analysis

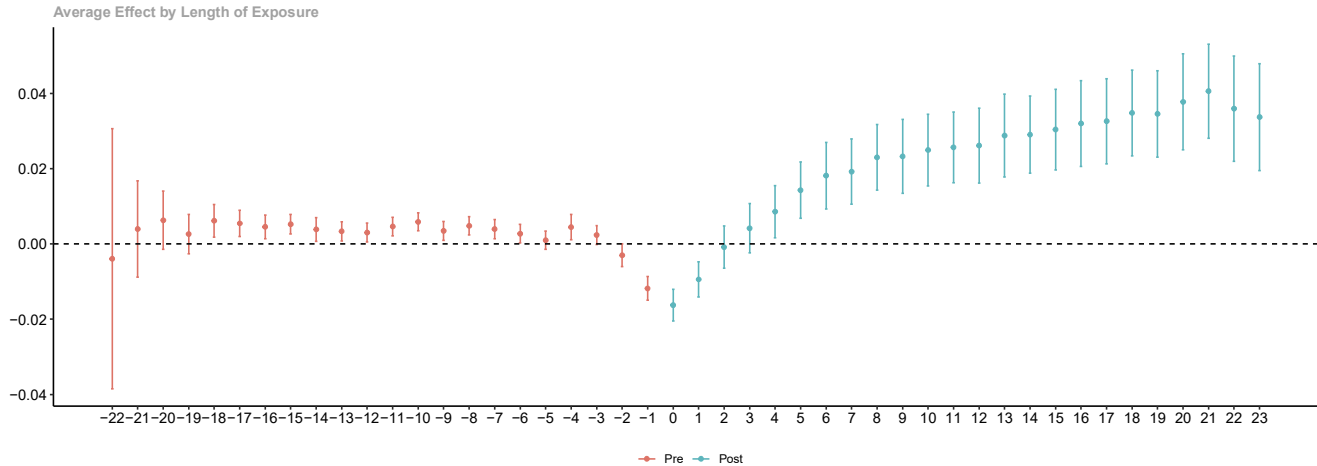


Figure: Reactiva Peru Program Time Average Treatment Effects: 1m anticipation

Endogeneity Issue and Spill Over Effects

- We propose a specification that aims to handle with the endogeneity issue and try to see if there is any spillover effect.
- We define spillover effect as the indirect benefit that companies that did not access to the program received.

$$EG_{it} = \beta_0 + \lambda_b + \mu_{st} + \eta_{rt} + \beta_1 REACTIVA_{b(i)t} + \beta_2 D_i REACTIVA_{b(i)t} + \varepsilon_{it}, \quad (5)$$

where EG_{it} refers to the monthly growth rate of the number of workers at the firm-time level. $REACTIVA_{b(i)t}$ is the percentage of Reactiva loans over the total portfolio of the main bank of firm i . D_i is our dummy variable and it takes one if the firm participated in REACTIVA program, and zero if the firm did not. We also include bank fixed effects, λ_b , and economic sector-time fixed effects, μ_{st} , and region- time fixed effects η_i .

Endogeneity Issue and Spill Over Effects

Table: Regression results

	(1) All	(2) Micro	(3) Small	(4) Median	(5) Big	(6) Corp
A. Sample: All firms						
REACTIVA _{b(i)t}	-0.00551	-0.0123	0.00588	-0.0113	-0.0131	0.0392***
D*REACTIVA _{b(i)t}	0.00528***	-0.00340*	-0.00859***	0.0136***	0.0311***	0.0452***
Observations	3,220,912	816,811	1,299,765	985,717	84,845	33,736
R-squared	0.007	0.004	0.009	0.011	0.029	0.035
B. Sample: Firms meet requirements to get REACTIVA						
REACTIVA _{b(i)t}	-0.00798*	0.0133	-0.00353	-0.0213**	-0.00740	0.0378**
D*REACTIVA _{b(i)t}	0.0145***	0.000131	0.00895***	0.0172***	0.0279***	0.0310***
Observations	1,901,032	120,850	843,437	835,450	75,148	26,109
R-squared	0.010	0.009	0.010	0.012	0.032	0.048
C. Sample: Firms that get REACTIVA and firms that do not meet the requirements						
REACTIVA _{b(i)t}	-0.00597	-0.0202**	0.0114	-0.0160	-0.0125	0.0272**
D*REACTIVA _{b(i)t}	0.00294***	-0.00384*	-0.0137***	0.0115***	0.0379***	0.0646***
Observations	2,890,931	734,383	1,155,637	904,501	71,021	25,332
R-squared	0.007	0.005	0.009	0.011	0.033	0.039

*** Statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%. We include bank fixed effects, region-time fixed effects, economic sector-time fixed effects. Clustered (at region level) standard errors.

Conclusions

- ① We find evidence of a positive impact of REACTIVA on employment on both the intensive and extensive margins.
- ② Similarly, we find a negative impact of it on total bank risk-taking, but a positive impact if we focus on the loan portfolio without REACTIVA loans.

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