

Measuring Financial Restrictions of Brazilian Private
Firms with Microdata: Did Credit Policies of Banco
Central do Brasil During the Covid-19 Pandemic
Affect Investment Demand?

Fernando N. Oliveira

(Banco Central do Brasil)

XXVI Meeting of the Central Bank

Researchers Network CEMLA

November 11th, 2021

Agenda

- Objectives
- Financial Restrictions of Firms
- Contributions
- Data
- Empirical Strategy
- Results
- Conclusion

Disclaimer

- The views expressed in this presentation work are those of the author and do not necessarily reflect those of the Banco Central do Brasil or its members

Objectives

- We have three objectives
 - Build measures of Financial Restrictions (hereafter FRs) of Brazilian private firms using microdata
 - FRs with good attributes
 - Use these measures to estimate investment cash-flow sensitivities
 - Estimate Investment Demand Functions
 - Verify if credit policies of Banco Central do Brasil in the covid-19 pandemic (2020) had a positive impact on FRs and investment of firms

Definition of FR

- FR is difficult to define
- A common definition, however, in the literature and one that we will use in this paper is:
 - Firm is FR if it has a positive Present Value Investment (project) ($PV > 0$), asks for banks loans to take on this investment (project) and the banks deny giving the credit

Measuring FR

- Previous definition
 - For one to observe FR in practice
 - One would have to ask the firm if it has a $PV > 0$
 - Then knock on the doors of the banks and ask if they have denied the credit to the firm for this specific purpose
 - Of course very difficult (impossible?!)
 - So this makes, in empirical terms, FR non-observable
 - Therefore, very hard to measure or estimate

Properties of a Good Measure of FR

- Silva and Carreira (2012)
 - Simple
 - Objective
 - Firm specific
 - Continuous
 - Time varying

Measuring FR

- Indirect, Direct Measures and Indexes
- Indirect Measures
 - Sensitivity of Investment in relation to Cash-Flow
 - FR present: sensitivity is higher
- Ex-ante classification of firms based on balance sheet characteristics
- Tobin's marginal q or Tobin's average Q
 - Measures growth opportunities (or investment) of firms

Pitfalls of Indirect Measures

- Problems associated with Q of Tobin measurements and therefore investment opportunities
 - Impossible to measure marginal q correctly, which Theory shows is the correct one
 - Average Q may be a bad proxy for marginal q
 - No average Q for private firms

Pitfalls of Indirect Measures

- Cash-Flow may contain information about investment opportunities
 - Firms highly uncertain about investment projects
- Clearly et al. (2007)
 - Relation between cash-flow and investment non- monotonic

Direct Measures of FR

- Reports of Public Firms
 - End of the year financial statements
 - Off-balance sheet information
- Surveys

FR Direct Measures

- Firm specific
- Eventually time varying
- One can use FR in this case as a dependent or independent variable in regressions

Direct Measures

- Company reports
 - Kaplan and Zingales (1997)
 - Keywords, expressions that are symptomatic of the presence of financial constraints
 - Use quantitative information as well

FR Survey Information

- Main advantage is the fact that firms are the best informed agents with respect with the quality of their projects or investments
- One should expect investment opportunities are already taken into account in firms responses
- One can measure FR for small and young firms which is an advantage over company reports

Pitfalls of Surveys

- Subjective nature of responses may lead to wrong understanding of the capacity firms have to obtain credit for investment
 - Researcher has to use quantitative information as well
- Information is expensive to collect, rather scarce and with insufficient level of detail
- Information coming from Financial Institutions to complement information of firms are not available

Measures of FR

➤ Indexes

- Combination of indirect and direct measures

 - Kaplan and Zingales (1997)

 - Whited and Wu (WW) (2006)

- They have the advantages and disadvantages of direct and indirect measures

Contributions of our Paper

- We use microdata to define FR, which is rare in the literature
 - We use loan contracts of Credit Information System of BCB (SCR)
 - We have the type of loan among many other information
 - We observe firms that are very likely not to be financially constrained
 - Obtained loans for investment or project financing
 - We observe others that are very much unlikely to obtain loans for investment
 - Are in restructuring or liquidation
- We look at private firms, which is also not common in the literature
 - Most papers look only at public firms
 - That by definition should be much less likely to be credit constrained than private firms

Contributions of our Paper

- Given our FRs measures, we may understand better investment cash flow elasticities in Brazil
 - Credit policies of BCB
 - Covid-19 pandemic (2020)
- We think that we can contribute not only to the empirical literature but also in terms of policy
 - More information on the difficulties of credit access for firms in Brazil

Credit Policies to SME of BCB due to the Pandemic

- **Working Capital Program to preserve business continuity (CGPE)**
- **Purchase of private securities by BCB in the secondary market**
- Deduction on reserve requirement on savings deposits conditional on credit provision to micro and small companies
- Real estate may be used as collateral in more than one credit operation
- **Emergency program provides payroll financing to SME in order to preserve employment in the segment**
- **Fostering credit for small and medium-sized enterprises**
- **Relaxed provisioning rules for refinancing loans of SME for six months**

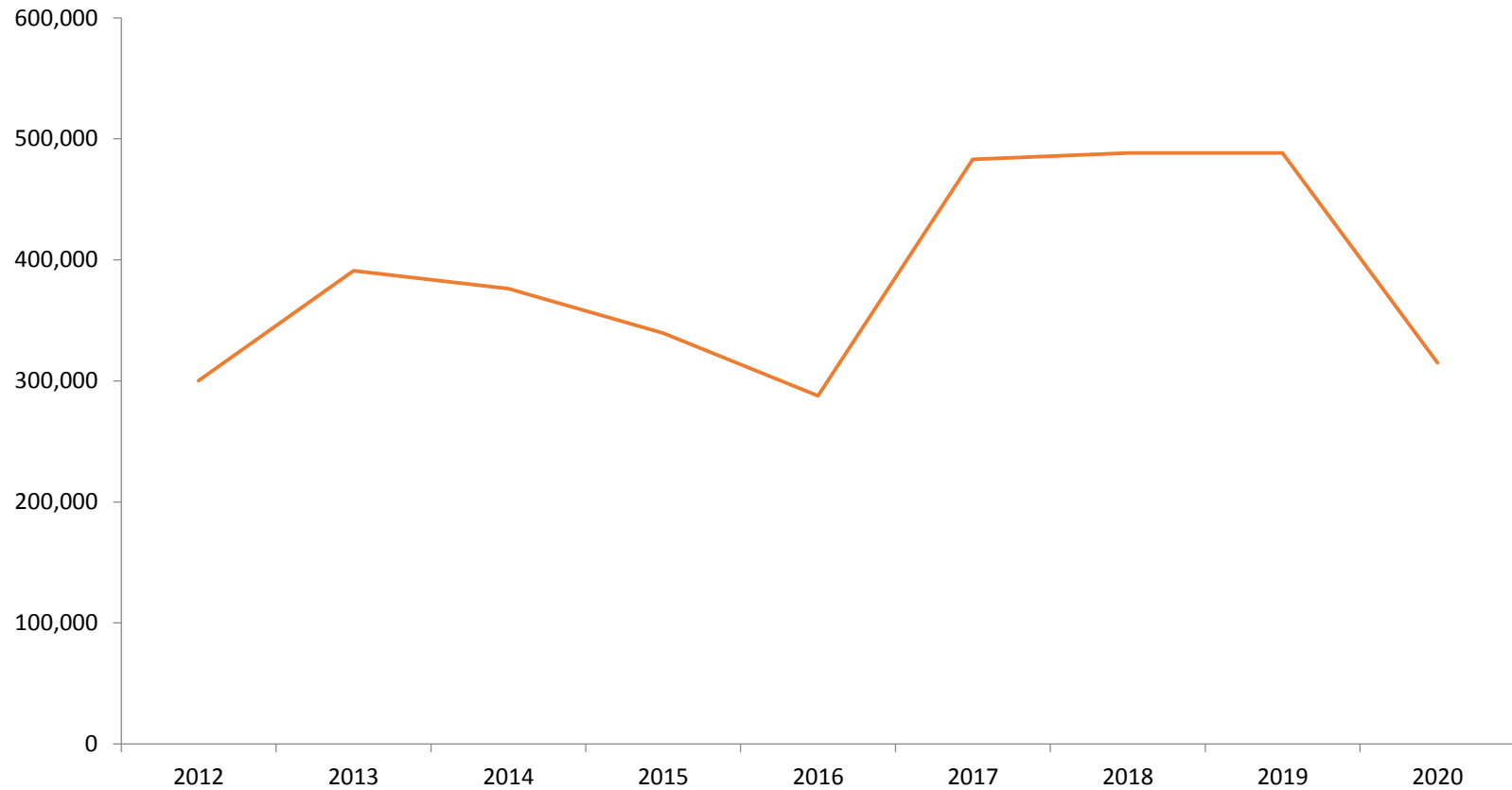
Sources of Data

- Loan Contracts
 - SCR
 - Around 3.5 million loan contracts
 - Firms
 - 8,071 private firms
 - Database of Valorpro: unbalanced panel
 - Balance Sheet Information
 - Mostly joint stock private firms
 - SME
- Sample Period 2012 to 2020

Sample of Firms

Sectors	Joint Stock	Limited Liability	Total
Agriculture	179	16	195
Commerce	573	217	790
Energy	778	218	996
Industry	1,358	621	1,979
Services	2,615	1,496	4,111
Total	5,503	2,568	8,071

Number of Loan Contracts



Empirical Strategy

- Definition of measures FR
- Use information of type of loan contracts and firm credit status
 - Investment
 - Financing
 - “Working Capital”
 - All sorts of loans that are not financing or investment
 - Firm is in a restructuring process or in liquidation

Empirical Strategy

- Classify firms in 5 categories
- 5=Very likely to be non financially restricted
- 4=likely to be non financially restricted
- 3=Not enough information to classify
- 2=likely to be financially restricted
- 1=Very likely to be financially restricted

Empirical Strategy

- We use Whited and Wu (WW) index (2006) and estimate ordered probit panel models with our ex-ante financial restrictions classifications as dependent variables
 - WW uses: Cash-Flow, long term debt/assets, $\log(\text{assets})$, sales growth
 - WW does not use Q of Tobin!

Empirical Strategy

- From these regressions, we find the threshold values of probabilities of each category
- We select our preferred index based on higher average probabilities of predicting categories 1,2, 4 and 5

Empirical Strategy

- Consider FR
 - Firms in categories 1 or 2
- Consider NFR
 - Firms in categories
 - 4 and 5
- Separate our sample in FR and non FR and estimate investment demand functions of firms
 - Controlling for the covid-19 pandemic
 - BCB credit policies

Definition Main FRs

FR1(2)[3]_

Categories

Contracts

1 Very Likely Financial Restricted

Information on Restructuring or Liquidation

5 Very Unlikely to be Financially Restricted

Investment or Project Financing

2 Likely to be Financially Restricted

Only "Working Capital" and Average Interest Rate > 70% (80%) [90%] percentil and average maturity lower than 30% (20%) [10%] percentil

4 Unlikely to be Financially Restricted

Financing and Average Interest Rate < 30% (20%) [10%] percentil and average maturity higher than 70% (80%) [90%] percentil

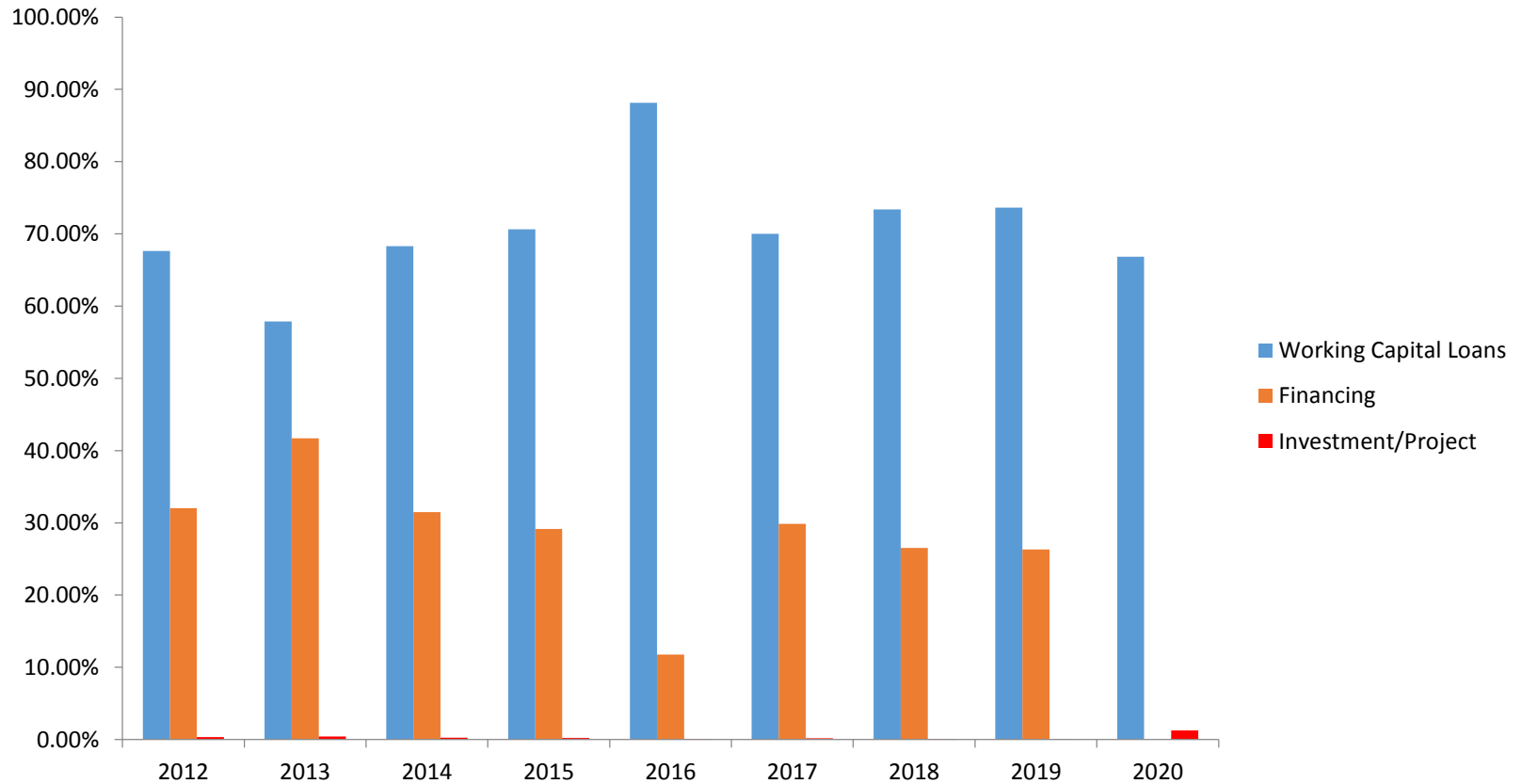
3 Not Clear

No sufficient information to classify

Other Definitions of FR

- We also construct other definitions to classify firms that we are not able to classify in FR or NFR with previous measures (category 3)
 - Information on the number of bank relationships
 - Information on 90 days delinquency of loans
 - Information on demand of financial derivatives
 - Information on the proportion of bad loans of portfolio of loans
 - Balance sheet information
 - Total assets, ebitda, fixed assets

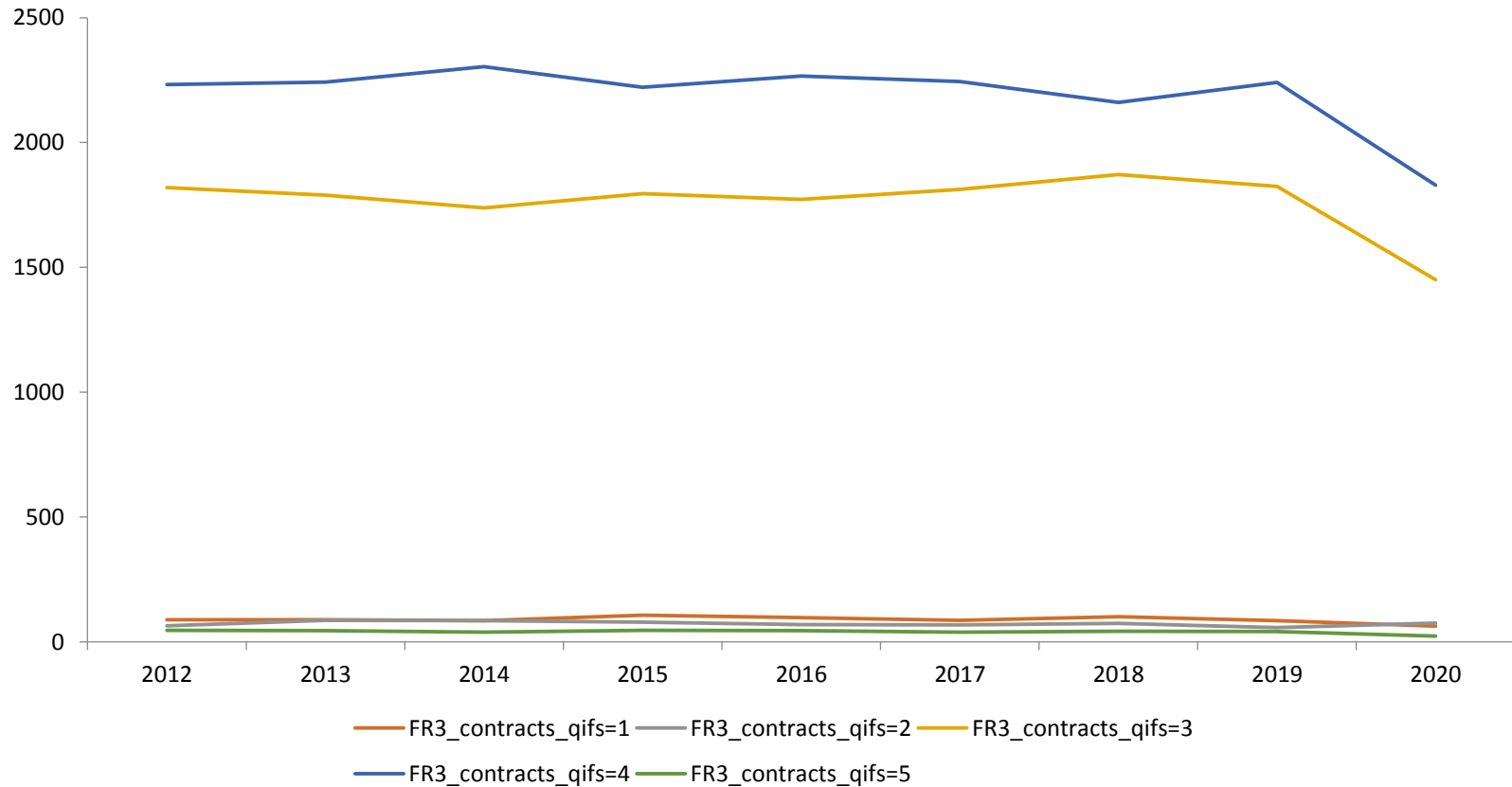
Types of Loan Contracts



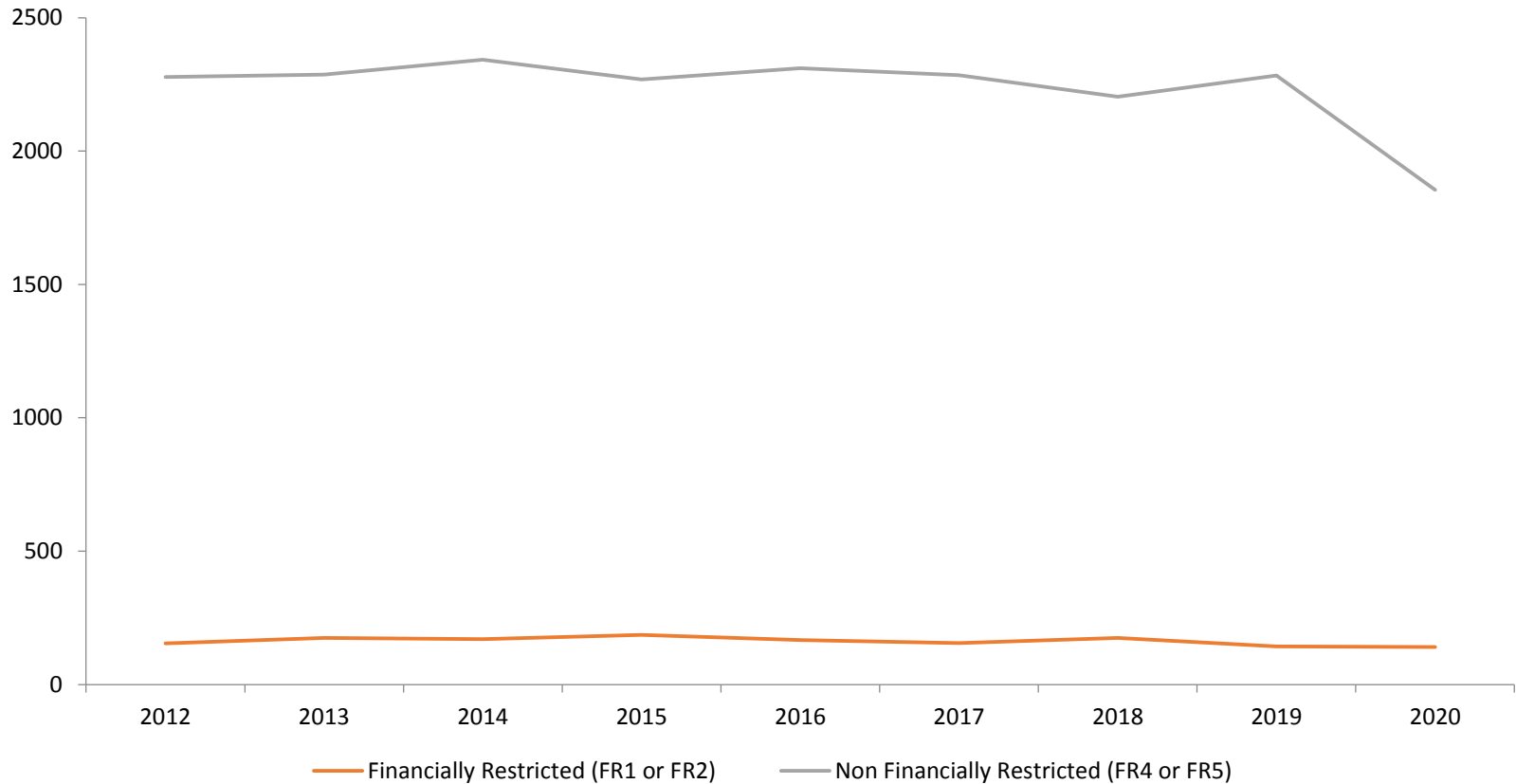
Chosen FRs based on WW

FR	Average Prob (FR=1 or 2 or 4 or 5)
Fr3_contracts_qifs	0.43
Fr2_contracts_qifs	0.39
Fr1_contracts_qifs	0.38

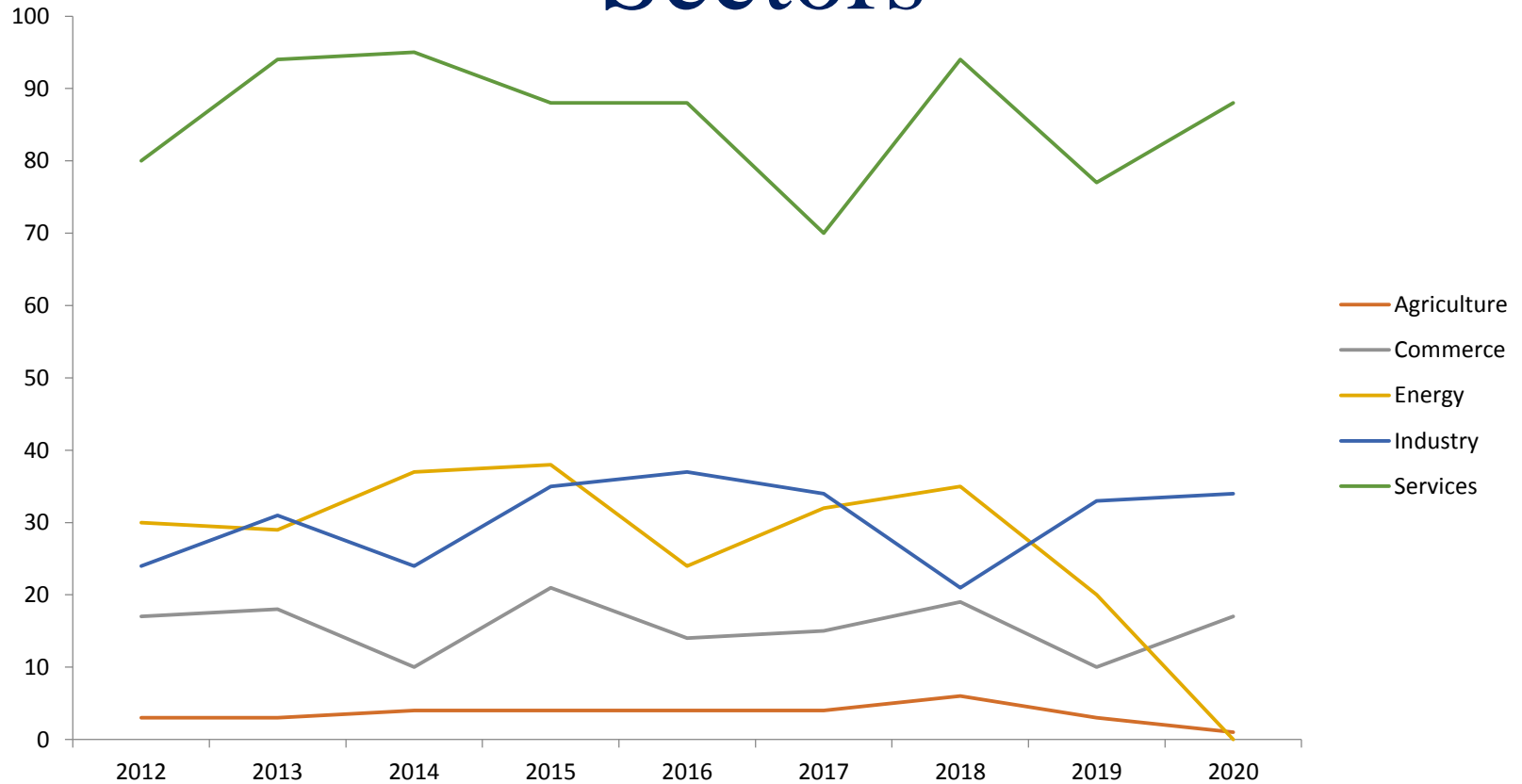
Number of Firms and FR/NFR Measures



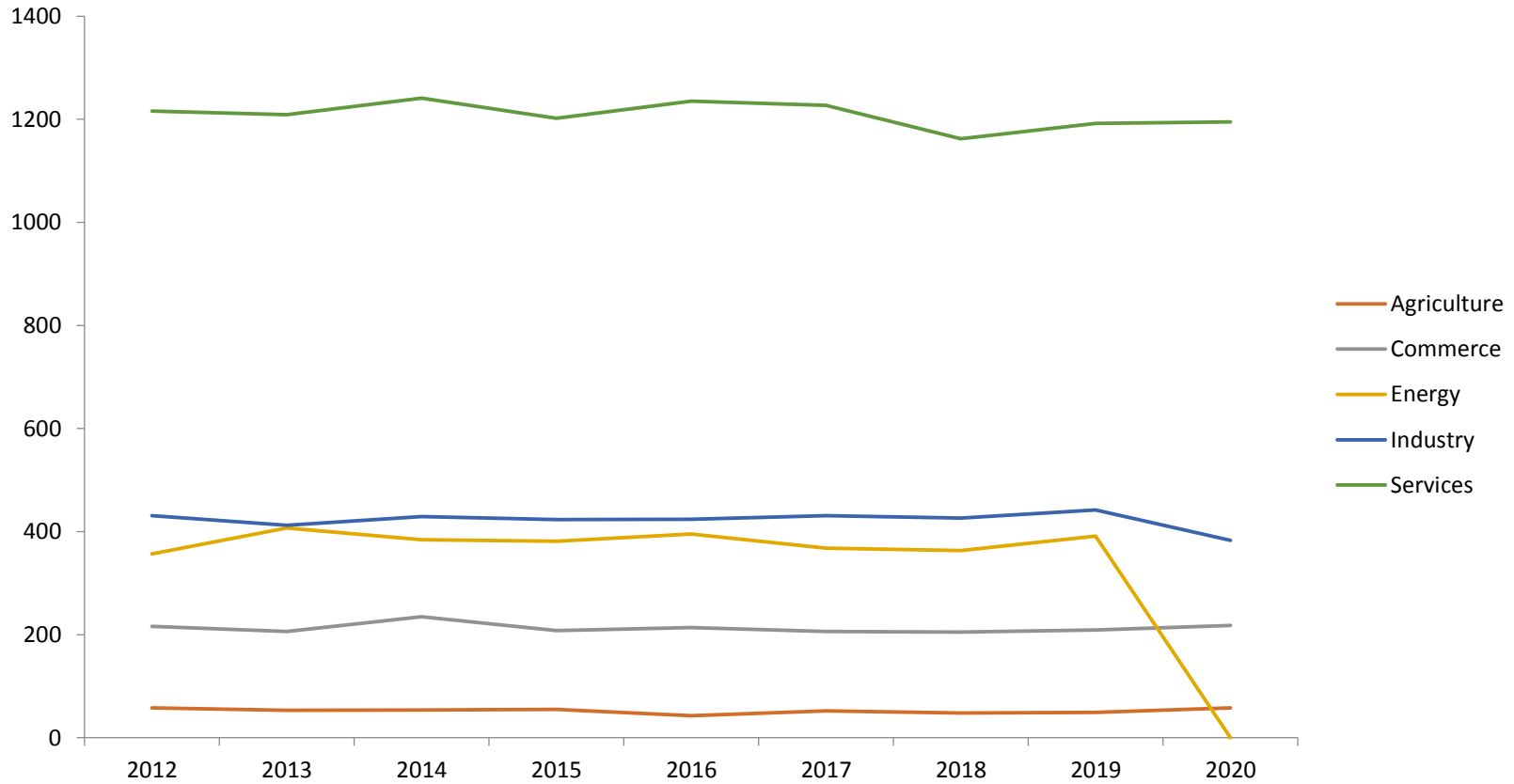
Number of Firms FRs and NFRs



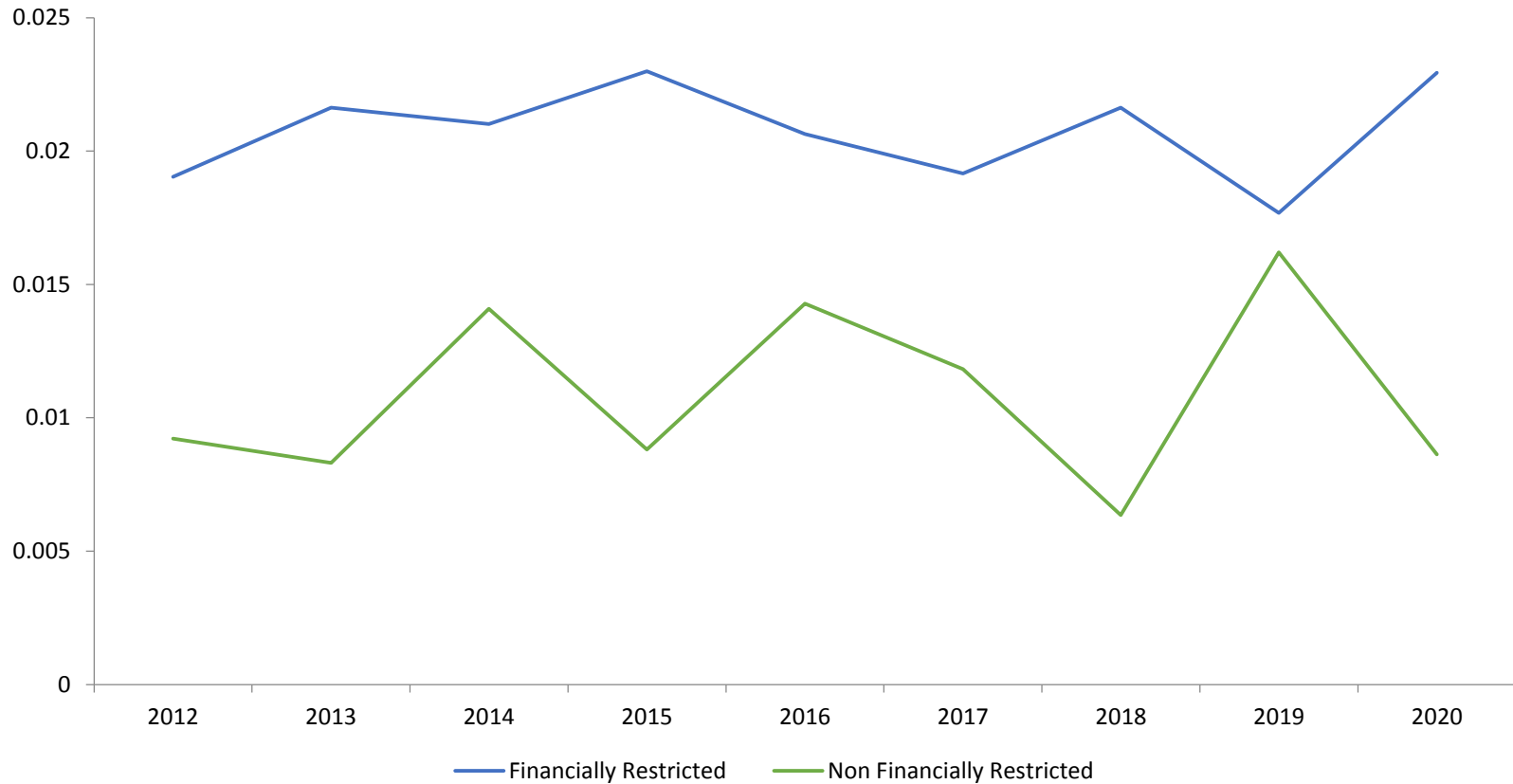
Number of Firms FRs and Sectors



Number of Firms NFRs



Average FR and NFR



Gala and Gomes (2016)

	(Capex/Assets)			
	FR	NFR	FR	NFR
var_oper_rev	0.0048*** (3.4994)	-0.211*** (-13.46)	0.0200*** (3.4662)	-0.0001 (-0.604)
pandemic*var_oper_rev			-0.000767 (-0.043)	-0.00027 (-0.230)
pandemic			-0.06603*** (-2.915)	-0.02869** (-2.366)
pandemic*var_oper_rev+var_oper_rev			0.0019 (1.1659)	-0.0009 (-1.48)
Robust Covariance	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Dif_Dif	no	no	yes	yes
Other Controls	yes	yes	yes	yes
N	213	1435	52	407

VEC Model Bond et al. (2003)

(Capex/Assets)

	FR	NFR	FR	NFR
var_oper_rev	0.0003** (2.2575)	-0.217*** (-15.01)	0.0162*** (3.5393)	-0.00001 (-0.334)
pandemic*var_rec			0.0240 (1.1936)	-0.0001 (-0.482)
pandemic			-0.057*** (-2.886)	-0.029** (-2.442)
pandemic*var_rec+var_rec			0.040 (0.018)	-0.029 (0.006)
Robust Covariance	yes	yes	yes	yes
Arellano-Bond	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Other Controls	yes	yes	yes	yes
N	213	1435	52	407

Lagged Investment Eberly (2012)

	capex_assets			
	FR	NFR	FR	NFR
var_oper_rev	0.0002**	0.2316	0.004	-6.294
	(1.9945)	(0.0916)	(0.0022)	(-0.461)
pandemic			0.0044	-0.0001
			(0.0027)	(-0.608)
pandemic*var_oper_rev			0.0053	-0.001
			(0.0144)	(-0.608)
pandemic*var_oper_rev+var_oper_rev			0.0453	-6.294
			(0.018)	(-0.006)
Robust Covariance	yes	yes	yes	yes
Arellano-Bond	yes	yes	no	no
Firm Fixed Effects	yes	yes	yes	yes
Other Controls Lagged Investment	yes	yes	yes	yes
N	1363	204	195	36

Average Treatment Effects (ATE)

	ATE Capex/Assets	
	FR=1-FR=0	(FR=1-FR=0)
Nearest Neighbour Matching	-0.13** (-2.03)	0.033 (1.02)
Propensity Matching Score	-0.0093** (-1.98)	0.012 (1.12)
Pandemic	No	Yes

Conclusion

- Our paper constructs original measures of financial restriction of Brazilian private firms
 - We use loan information of these private firms
- We use these measure to study investment demand of these firms from 2012 to 2020
 - In particular during the pandemic period in 2020, when Banco Central do Brasil implemented several credit policies

Conclusion

- We think our financial restrictions measures to a very good job in explaining the demand of credit for investment of our sample of firms in our sample period
 - FR firms=> dependent on cash-flow
 - NFR firms=> not dependent on cash-flow
 - In particular, our results indicate that credit policies of Banco Central do Brasil had no direct effect on the investment of these firms during the pandemic in 2020

Thank You!