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?

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CEMLA Joint Research Program 2021

July 28th, 2021

Agenda

- Objectives
- Financial Restrictions of Firms
- Expected Contributions
- Data
- Empirical Strategy
- Preliminary 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 atributes
  - Use these measures to estimate investment cash-flow sensitivities
    - Estimate Investment Demand Functions
  - Verify if credit policies of Banco Central do Brasil (BCB) 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 ask the banks 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
  - Continous
  - 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 Tobins´ average Q
  - Measures growth opportunities (or investment) of firms

FR Indirect Measures

- Fazari, Hubbard and Petersen (FHP) (1998)
  - Dividend as a way of classifying FR
- Kaplan and Zingales (1997)
  - Question FHP
  - Quantitative and qualitative information
  - Various categories of FR

Pitfalls of Indirect Measures

- Problems associated with Q of Tobin measurements and therefore investment oportunities
  - 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 oportunities
  - 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 Data

- Survey data
  - Savignac (2009), Beck et al. (2008), Survey on the access to finance of enterprises (SAFE) ECB , Eurostat “Acess to Finance”, among many others
  - Ask firms whether they are financially restricted or not
    - Single question or combination of different questions: cost of external funds, credit denials, avaiability of external funds, etc

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 oportunities are already taken into account in firms responses
- One can measure FR for small and young frms 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 avaiable

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

Expected 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 infomation
  - 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

Expected Contributions

- 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 more (less) 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

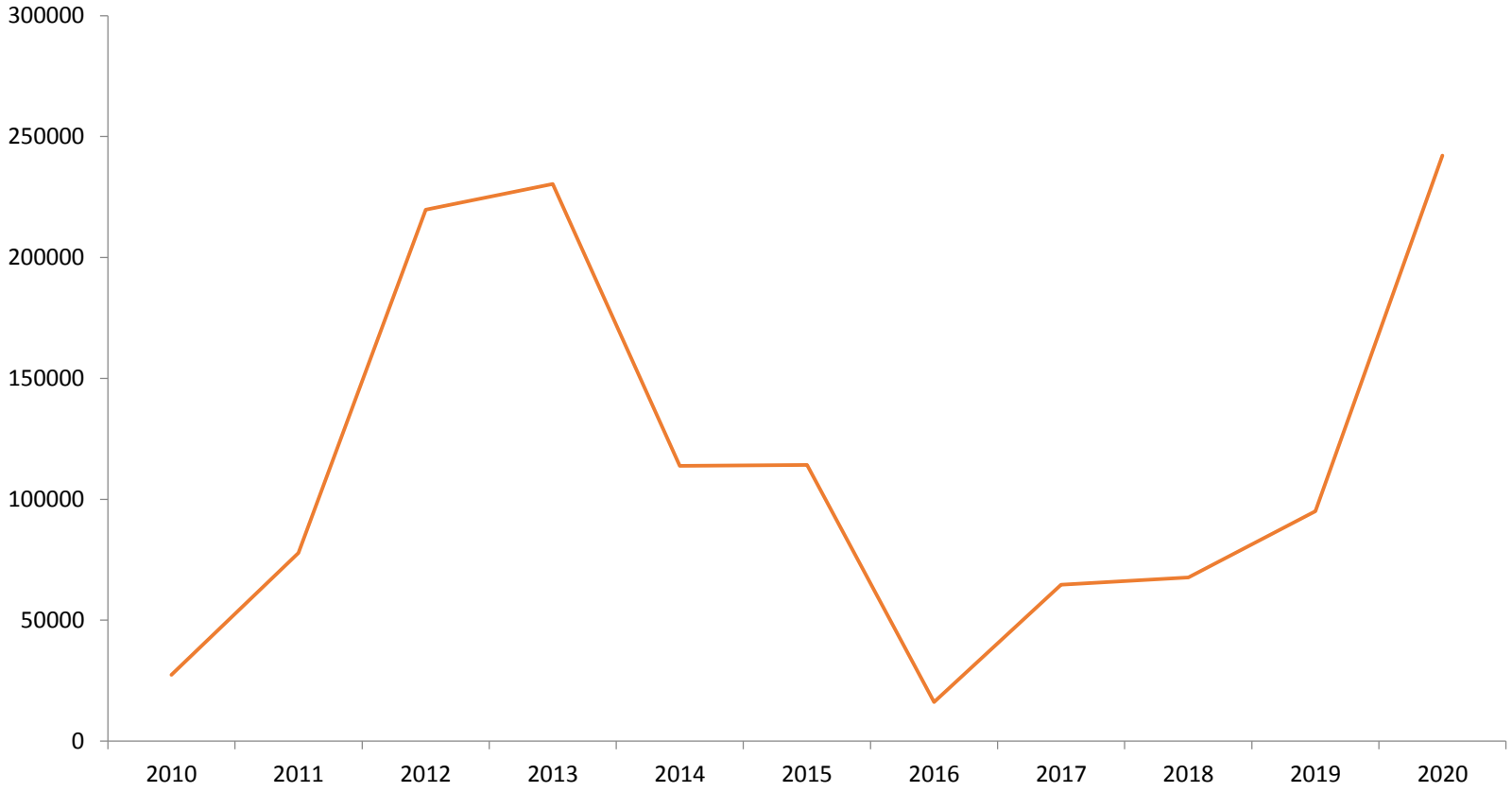
Sources of Data

- Loan Contracts
  - SCR
  - Around 1.3 million loan contracts
  - Firms
    - Database of Valorpro: unbalanced panel
    - Balance Sheet Information
    - Mostly joint stock private firms
      - SME
  - Sample Period 2010 to 2020

Sample of Firms

	Number of Firms
Agriculture	121
Commerce	500
Energy	851
Industry	1,084
Services	3,108
Total	5,664

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 reestructuring 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 restrited
- 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(assets), sales growth and sector growth
  - WW does not use Q of Tobin!

Empirical Strategy

- From these regressions, we find the treshhold values of probabilities of each category
- We select our prefered 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

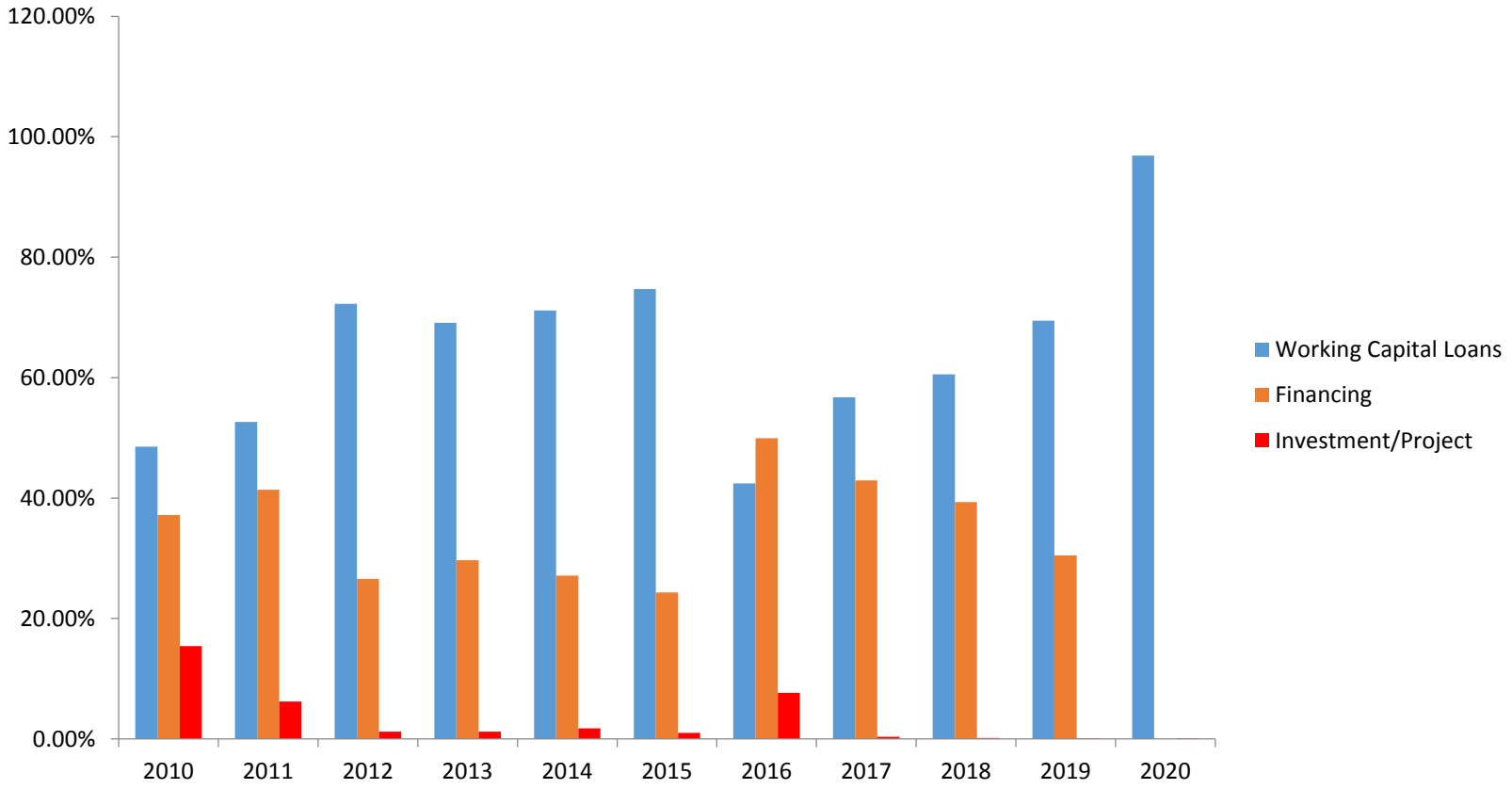
Definition Main FRs

FR1(2)[3]_	Categories	Contracts
1	Very Likely Financial Restricted	Information on Reestructuring 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 that include the following in the previous definitions
  - Information on 90 days delinquency of loans
  - Information on demand financial derivatives
  - Information on the proportion of bad loans of portfolio of loans
  - Balance sheet information
    - Total assets, coverage ratio, fixed assets

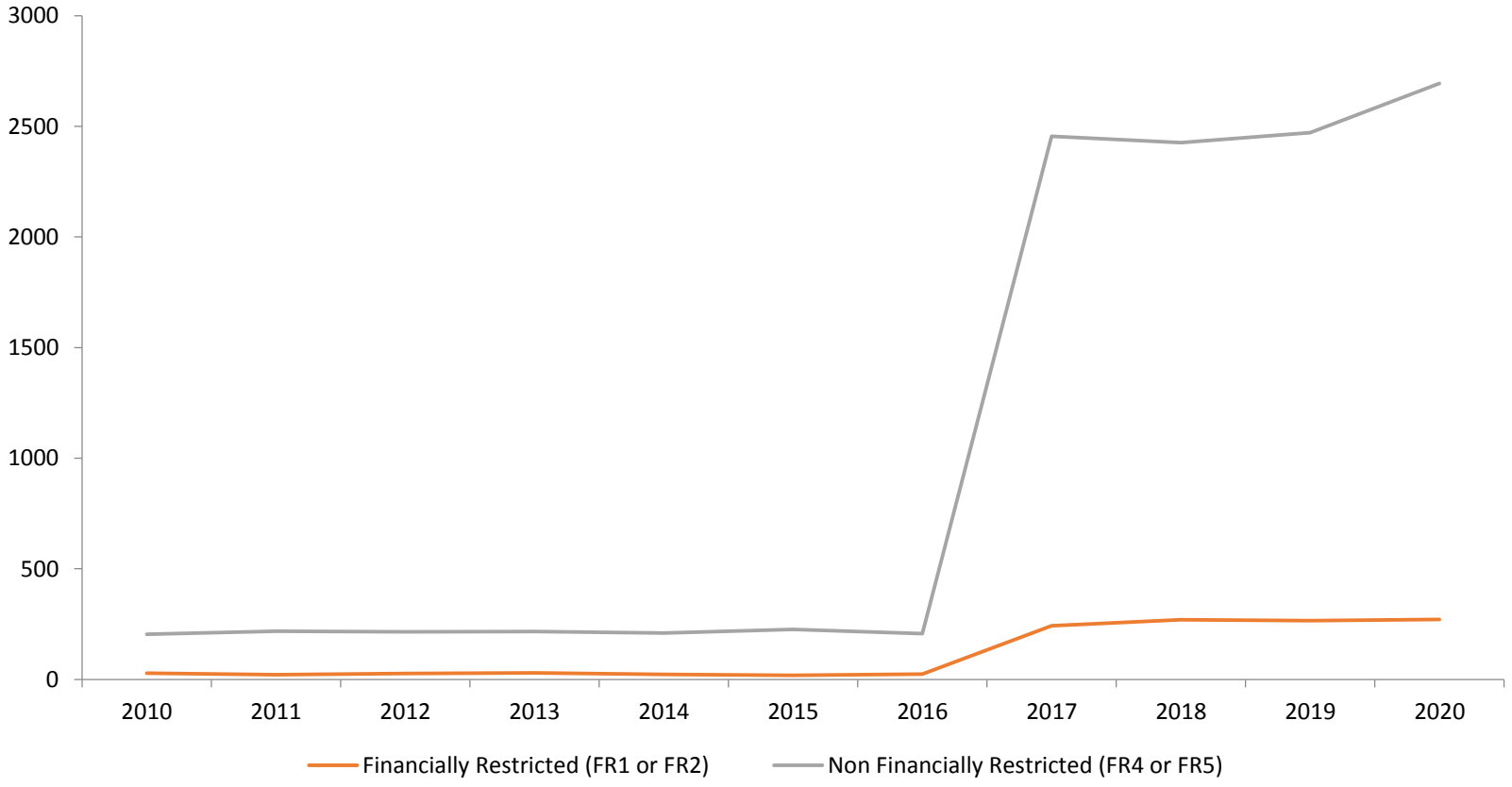
Types of Loan Contracts



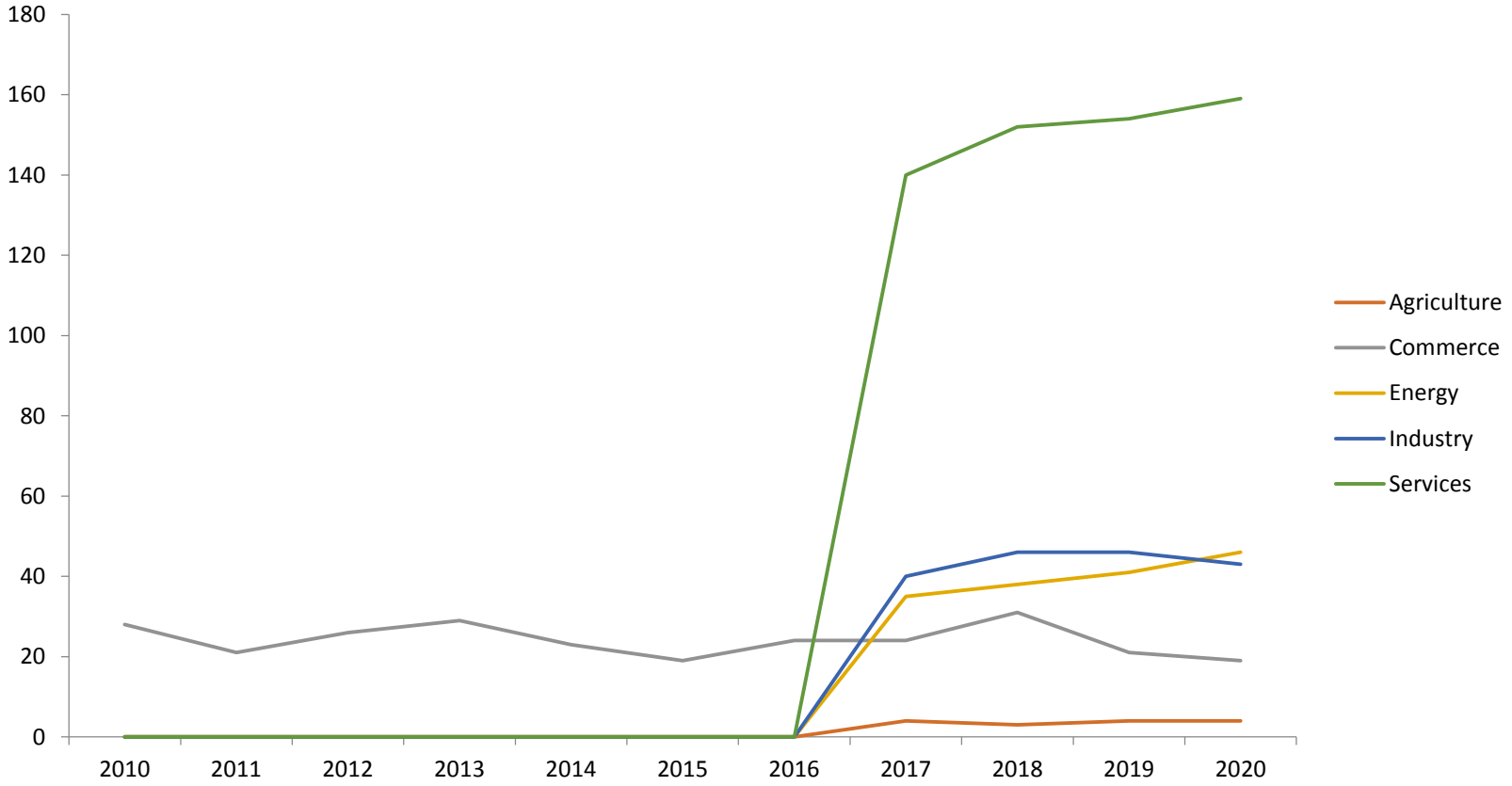
Chosen FRs based on WW

FR	Average Prob (FR=1 or 2 or 4 or 5)
Fr1_contracts	0.61
Fr1_contracts_balance	0.52
Fr1_contracts_derivatives	0.53

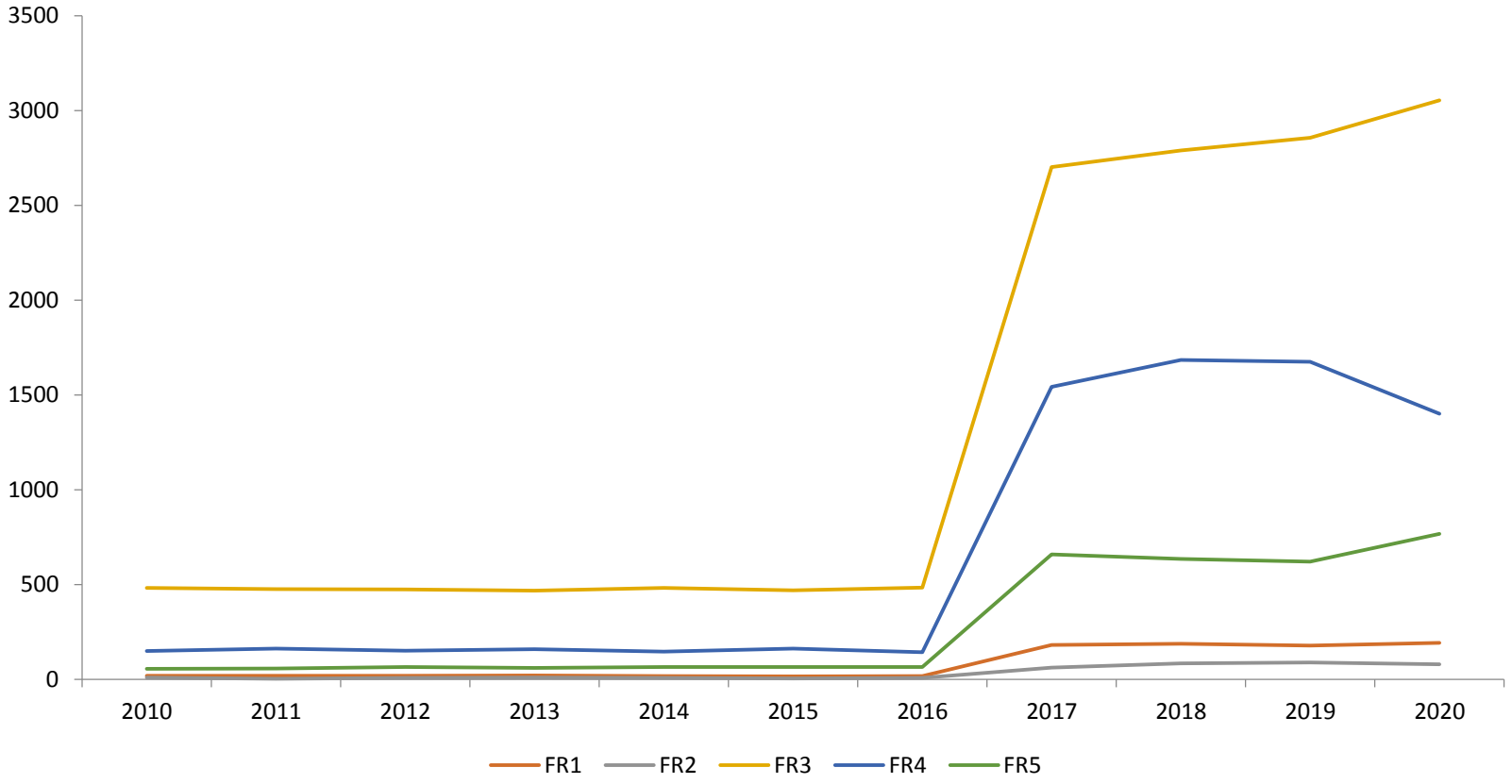
Number of Firms FRs and NFRs



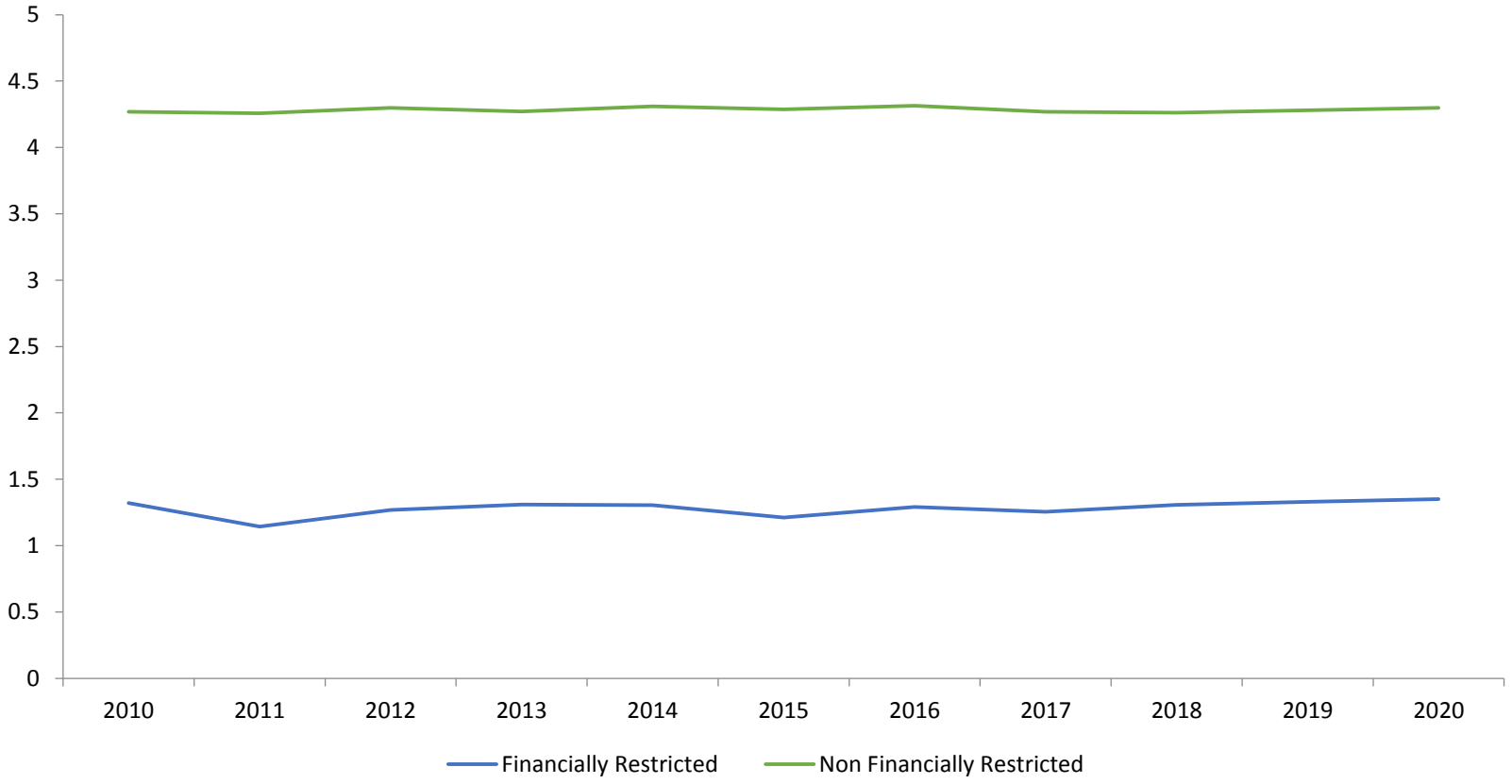
Number of FRs and Sectors



Levels of Financial Restrictions



Average FR and NFR



Regressions: Adapting Fazarri et al. (1988)

$capex_{it}$
$= \beta_0 + \beta_1 var\_oper\_rev_{i(t+1)} + \beta_2 CF_{it} +$

$\beta_3 CF_{it}$*Pandemic+$a_i + v_t + \gamma sectors_{it} + u_{it}$
, t=2010 to 2020, i=1 to 5,664

Q of Tobin substituded by first difference of operational revenue next period

Adapting Fazarri et al. (1988)

	capex_assets	
	FR	NFR
var_rec_oper	0.075***	2.52***
	(0.00)	(0.00)
Ebitdat/Assets	26.08	11.02
	(0.41)	(0.58)
(Ebitdat/Assets)*pandemic	1.41*E-9**	-5.17E-8***
	(0.03)	(0.00)
Robust Covariance (cluster sectors)	yes	yes
Sectors	yes	yes
Random Effects	yes	yes
Obs	509	63

Regressions: VEC Model

$$capex_{it} = \beta_0 + \beta_1 capex_{i(t-1)} + \beta_2 CF_{it} +$$

$$\beta_3 CF_{it} * \text{Pandemic} + \beta_4 \Delta sales_{i(t-1)} +$$

$$+\beta_5 (sales_{i(t-2)} - K_{i(t-2)}) + a_i + v_t +$$

$$\gamma sectors_{it} + u_{it}$$

t=2010 to 2020, i=1 to 5,604

Vector Error Correction Specification

Bond et al. (2003), Bond and Lombardi (2006), Bloom et al. (2007)

VEC Model

	capex_assets	
	FR	NFR
var_sales	42.08***	46.91***
	(0.00)	(0.00)
Ebitdat/Assetst-1	3019.1	-3623.15
	(0.21)	(0.89)
(Ebitdat/Assetst-1)*pandemic	1.44*10-7	2.31*10-10
	(0.97)	(0.89)
Robust Covariance (cluster sectors)	yes	yes
Sectors	yes	yes
Random Effects	yes	yes
Obs	299	1469

Conclusion

- Work in progress
  - There is still a lot of work ahead
- Defining FR on montly basis
- At the moment, collecting more data on balance sheet and loan contracts of other private firms
  - Around 3000 more firms than the sample we show in this presentation

Conclusion

- Estimation of ordered probit models with measurement erros in dependent variable
- Instead of working with ordered regressions
  - Work with binary regressions
- Other measures of FR
  - Number of financial institutions that transact with firms (sometimes used in the literature)
- Estimate other demand functions controlling for Covid-19

Thank You!