

# Labor Supply and Demand Shocks in Brazil During Covid-19 Period

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# Outline

1. Overview of the impact of the pandemic on the labor market in Brazil
2. Present the model we used to estimate and historically decompose the shocks
3. Show the results using Bayesian Structural Vector Autoregression - BSVAR
4. Conclusion and final remarks

# Introduction

## The impact of the pandemic on the labor market in Brazil

- ▶ It has been pretty similar around the world
- ▶ **Main points related to the Brazilian economy:**
- ▶ Abrupt changes occurred in the second quarter of 2020, but they actually started in March
- ▶ Affected the labor by altering real effective earnings (wage) and hours effectively worked (labor)
- ▶ Pandemic had affected sectors differently
- ▶ Service sector has suffered more than other sectors
- ▶ Estimation of labor supply and demand shocks by activities

# Introduction

## Questions of the paper

- ▶ Following this approach we have tried to answer two questions:
  - (i) How much can the change in labor be empirically explained by changes in labor supply and labor demand?
  - (ii) Are these changes similar across economic activities?
- ▶ We estimated a simple labor supply and demand model using the Bayesian approach by Baumeister & Hamilton (2015)
- ▶ Brinca et al. (2021) used this approach to study the US labor market

# Introduction

A not exhaustive list of factors that may have resulted in labor shocks

- ▶ Labor demand shocks:
  - ✓ restrictions on the normal functioning of various economic activities
  - ✓ reductions in consumption of various types of goods and services
  - ✓ macroeconomic uncertainties
  
- ▶ Labor supply shocks:
  - ✓ people moving away from their occupations (reducing their hours worked or even leaving the workforce)
  - ✓ incentives generated by the emergency aid grant

# Before We Go into Further Details...

## Activities that we are observing

1. "Public administration"
2. "Agriculture"
3. "Lodging and food services"
4. "Trade; repair of motor vehicles and motorcycles"
5. "Construction"
6. "Education, human health and social services"
7. "Industry"
8. "Information, communication and financial services"
9. "Other services"
10. "Domestic services"
11. "Transportation"

# The Impact of the Pandemic

Real earnings (wage) and hours Worked (labor), seasonally adjusted - 2020

Activity	Variable	Q2	Q3	Mean	SD	MAX	MIN
Public administration	hours worked	-7.7	9.3	-0.3	2.5	9.3	-8.1
	earnings	0.0	1.3	0.6	1.2	3.4	-1.3
Agriculture	hours worked	-4.7	8.5	-0.5	3.0	8.5	-8.2
	earnings	-4.9	-0.9	0.4	3.0	6.1	-4.9
Lodging and food services	hours worked	-45.5	26.6	0.1	9.3	26.6	-45.5
	earnings	-18.6	1.5	-0.6	3.7	4.0	-18.6
Trade	hours worked	-25.9	18.4	-0.1	5.7	18.4	-25.9
	earnings	-9.9	6.5	-0.2	2.3	6.5	-9.9
Construction	hours worked	-25.8	19.1	-0.4	6.4	19.1	-25.8
	earnings	-2.6	-2.3	-0.3	1.2	2.4	-2.6
Education & health	hours worked	-23.0	21.3	1.1	6.0	21.3	-23.0
	earnings	0.4	2.9	0.5	2.1	5.3	-4.6
Overall industry	hours worked	-23.3	16.1	-0.3	5.6	16.1	-23.3
	earnings	0.7	2.2	0.1	2.4	4.2	-8.6
Inform., commun.and fin.	hours worked	-17.6	11.2	0.4	4.6	11.2	-17.6
	earnings	-3.1	0.7	0.1	1.2	1.8	-3.1
Other services	hours worked	-45.7	39.7	0.7	10.4	39.7	-45.7
	earnings	-15.4	2.4	-0.3	3.2	4.4	-15.4
Domestic services	hours worked	-36.2	18.5	-0.5	7.6	18.5	-36.2
	earnings	-7.6	1.0	0.1	1.8	3.8	-7.6
Transportation	hours worked	-27.1	14.8	0.2	5.7	14.8	-27.1
	earnings	-6.5	-1.9	-0.5	2.0	3.2	-6.5
Aggregate	hours worked	-22.4	16.4	-0.1	5.0	16.4	-22.4
	earnings	-0.8	0.5	0.2	0.6	1.3	-1.4

# Percentage Change in Wage and Labor

Fluctuations in terms of activities grouped in sectors, seasonally adjusted





# The model for decomposing total variation in labor

## Shocks to supply and demand for labor

- ▶ Baumeister & Hamilton (2015)
- ▶ Inspiration: became quite popular in macroeconomics to try to draw conclusions from SVAR using minimal assumptions
- ▶ Implicit prior of the standard approach is informative
- ▶ Suggestion
  - ▶ Admit we have a prior distribution that influence the results
  - ▶ Make sure the prior has some grounding in terms of something in what we actually know
- ▶ We can't get something from nothing: additional information is necessary
- ▶ If we aren't confident in this information, we couldn't be totally confident in the final outcome
- ▶ If we have some uncertainty about the model itself, we want to reflect that uncertainty in the final results
- ▶ That comes out from Bayesian approach

# Structural Model

Wage and labor determined by some kind of dynamic demand and supply equations

$$\mathbf{B}_0 \mathbf{y}_t = \mathbf{B}_1 \mathbf{y}_{t-1} + \cdots + \mathbf{B}_p \mathbf{y}_{t-p} + \boldsymbol{\omega}_t \quad (1)$$

$$\mathbf{B}_0 = \begin{pmatrix} -\beta & 1 \\ -\alpha & 1 \end{pmatrix} \quad (2)$$

$\mathbf{B}_0$  = matrix contemporaneous coefficients;  $\beta$  = short-run price elasticity demand;  $\alpha$  = short-run elasticity of supply;  $\boldsymbol{\omega}_t$  = vector of shocks (to demand and supply)

- ▶ If we knew the values of the coefficients of matrix  $\mathbf{B}$  zero:
  - ✓ How much of the wage movement in some data  $t$  came from demand shock as opposite to supply shock
  - ✓ If there is a disturbance to supply, here is the implication for wage and labor
- ▶ We'd like to know the values of these coefficients!!!

# Reduced Form of the Structural Model

Forecasting equation: relation between wage and labor and the lag values

$$\mathbf{y}_t = \mathbf{A}_1 \mathbf{y}_{t-1} + \cdots + \mathbf{A}_p \mathbf{y}_{t-p} + \mathbf{u}_t \quad (3)$$

$\mathbf{u}_t$  = error in forecasting wage and labor one period ahead

- ▶ It is possible to estimate those forecasting parameters and variance and covariance with simple regressions
- ▶ Imposing some identify restrictions we can recovery the structural shocks. From a truncated  $t$  we have a combination of:
  - ▶ sign restrictions: supply curve slops up and demand curve slops down

$$\begin{pmatrix} u_t^w \\ u_t^h \end{pmatrix} = \begin{pmatrix} + & - \\ + & + \end{pmatrix} \begin{pmatrix} \omega_t^d \\ \omega_t^s \end{pmatrix} \quad (4)$$

- ▶ informative prior for the elasticities from empirical work.
- ▶ From our prior distribution:  $(-/+)$  values for demand and supply elasticity, respectively, and some values are more likely than others

# Labor Market Elasticities from Empirical Literature

## Priors

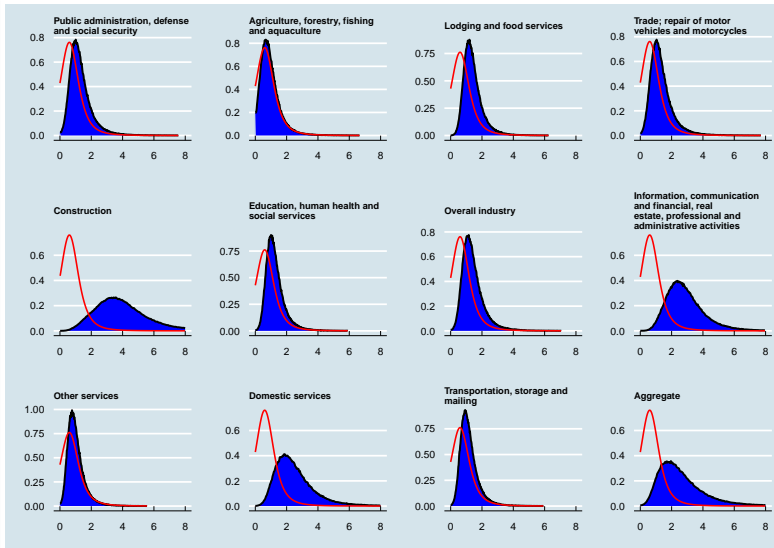
- ▶ There is not much data for Brazil
- ▶ Barros et al. (2015) (demand for labor in Brasil): short term:  $[-0.4 ; -0.2]$
- ▶ Vick (2017) (labor supply):  $[1.6 ; 2.2]$  for men;  $[1.2 ; 1.5]$  for women
- ▶ A truncated  $t$  distribution for the elasticities with location of  $-0.6$  - demand,  $0.6$  - supply; scale  $0.6$ ; and 3 degrees of freedom (gives the prior a finite variance)
- ▶ 90% probability that the elasticity is in the range  $[0.1; 2.2]$  in absolute value
- ▶ It would be a surprise see a labor demand and supply greater than  $|2.2|$

# Some Details about the Data

- ▶ Microdata from Continuous PNAD - The National Household Sample Survey (an official statistic for Brazil calculated by The Brazilian Institute of Geography and Statistics - IBGE)
- ▶ Data from 2012 to the first quarter of 2021
- ▶ Our sample for estimating the model coefficients: 2012Q1 - 2020Q1
- ▶ We used this model to historically decompose the shocks from 2020Q2 to 2021Q1
- ▶ Proxies: (i) average effective earnings, CPI deflated; (ii) hours effectively worked in all jobs in the week of reference

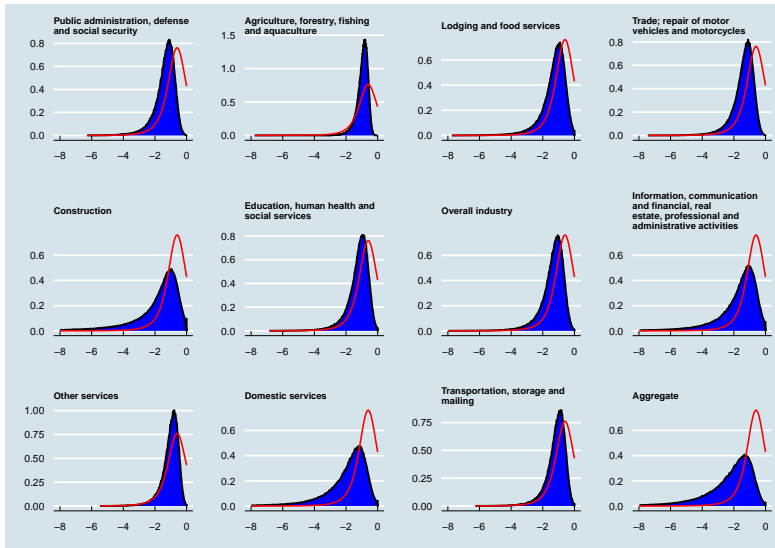
# Prior and Posterior Distributions for Supply

## Activities and Aggregate



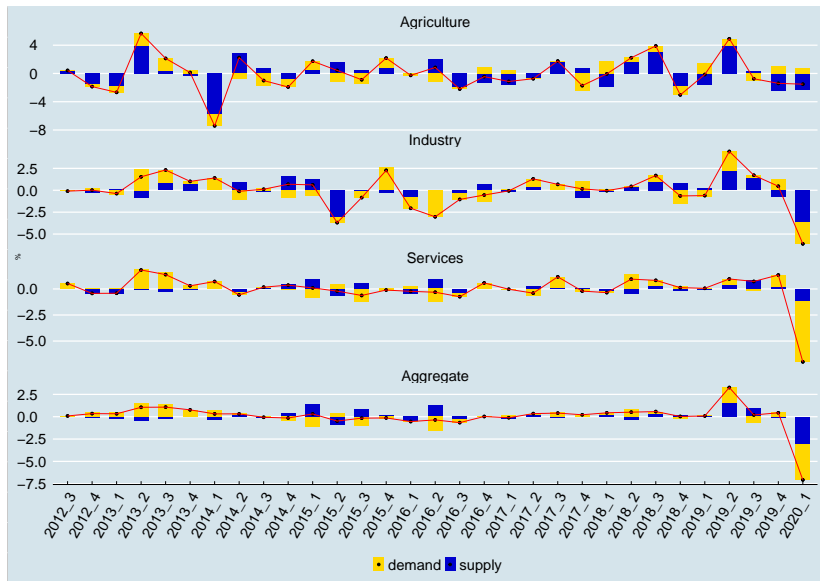
# Prior and Posterior Distributions for Demand

## Activities and Aggregate



# Historical Decomposition pre-Covid-19

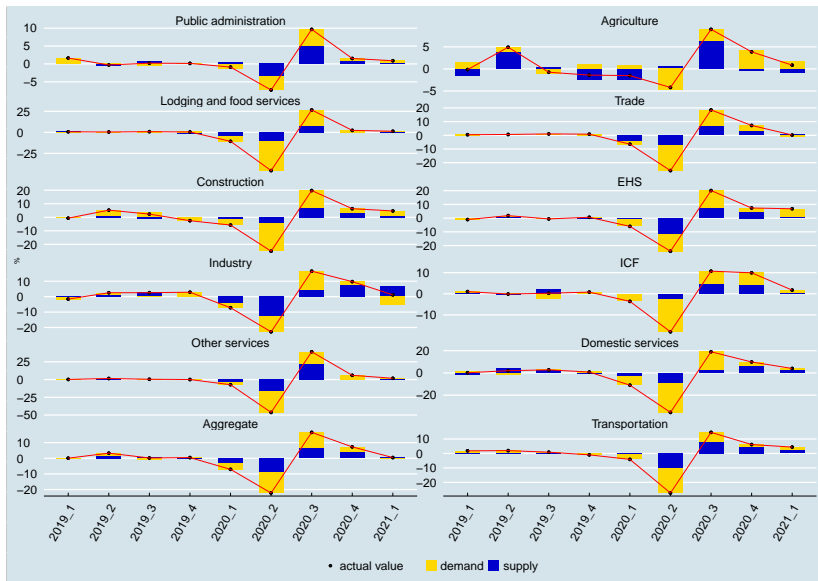
Hours worked by sectors





# HD of the Growth Rate of Labor

By activity, from 2020Q2 to 2021Q1



# Summary of One Important Point

The weight of a shock to labor demand decreased from Q2 to Q3

**Table:** Historical decomposition

Activity	2020Q2		2020Q3	
	shock	demand	shock	demand
<b>Agriculture</b>	-4	114	9	28
<b>Industry</b>				
Construction	-25	82	20	64
Overall industry	-23	45	17	71
<b>Services</b>				
Domestic services	-36	75	19	87
Education, health and social services	-24	52	20	62
Information, communication and financial	-18	85	11	54
Lodging and food services	-46	76	27	68
Other services	-46	66	39	42
Public administration	-7	54	10	49
Trade; repair	-26	73	19	61
Transportation, storage and mailing	-27	63	15	43
<b>Aggregate</b>	-22	59	17	59

# Main Points from HD

## First Wave Impacts: 2nd & 3rd quarter 2020

- ▶ Labor declined 22% in 2020Q2, 60% due to demand shock
- ▶ Service sector: almost 70% due to demand shocks
- ▶ Slight increase in the importance of supply shocks in relation to labor demand shocks for some activities

## Return of Shocks to Historical Pattern: 2020Q4 and 2021Q1

- ▶ Positive demand and supply shocks - 60% due to supply in 2020Q4 against 41% in 2020Q3
  - ✓ continuity of the processes of easing restrictions
  - ✓ recovery of economic activity
  - ✓ reduction of emergency aid

# Additional Analysis

- ▶ How much do the results change if we change?
  - ▶ Proxy for labor and wage used in SBVAR
    - ✓ employed population
  - ▶ Truncation point of the data
    - ✓ data until the last quarter of 2019
  - ▶ Seasonality
    - ✓ quarter over quarter of last year
  - ▶ Number of variables
    - ✓ GDP
- ▶ What did we find?
  - ✓ Similar results

# Conclusion and Final Considerations

- ▶ Covid-19 had a strong impact on the Brazilian economy and its labor market
- ▶ The largest negative effect on labor occurred in the second quarter of 2020
- ▶ Greater than registered in previous periods, with exceptions:
  - ✓ public administration
  - ✓ agriculture (counter cyclical and depreciation of the real exchange rate)
- ▶ On aggregate, shocks in labor demand could explain almost 60% of the drop in the growth rate of hours effectively worked in 2020Q2.
- ▶ Activities related to the service sector were the most affected - almost 70% due to demand shocks

# Conclusion and Final Considerations

- ▶ The positive variation in labor in the following quarters largely offsets the decline in 2020Q2
  - ✓ 10% lower than the pre-crisis situation in 2020Q4
- ▶ A slight increase in the importance of supply shocks in relation to labor demand shocks was observed
- ▶ Shocks closer to their historical records in 2020Q4
- ▶ Limitations and extensions:
  - (i) proxies for labor and wage
  - (ii) end point of the data for estimating the model
  - (iii) variables entering in the model

**THANK YOU FOR YOUR ATTENTION!!!**