Exports and Regional Dynamics: Evidence from Brazil

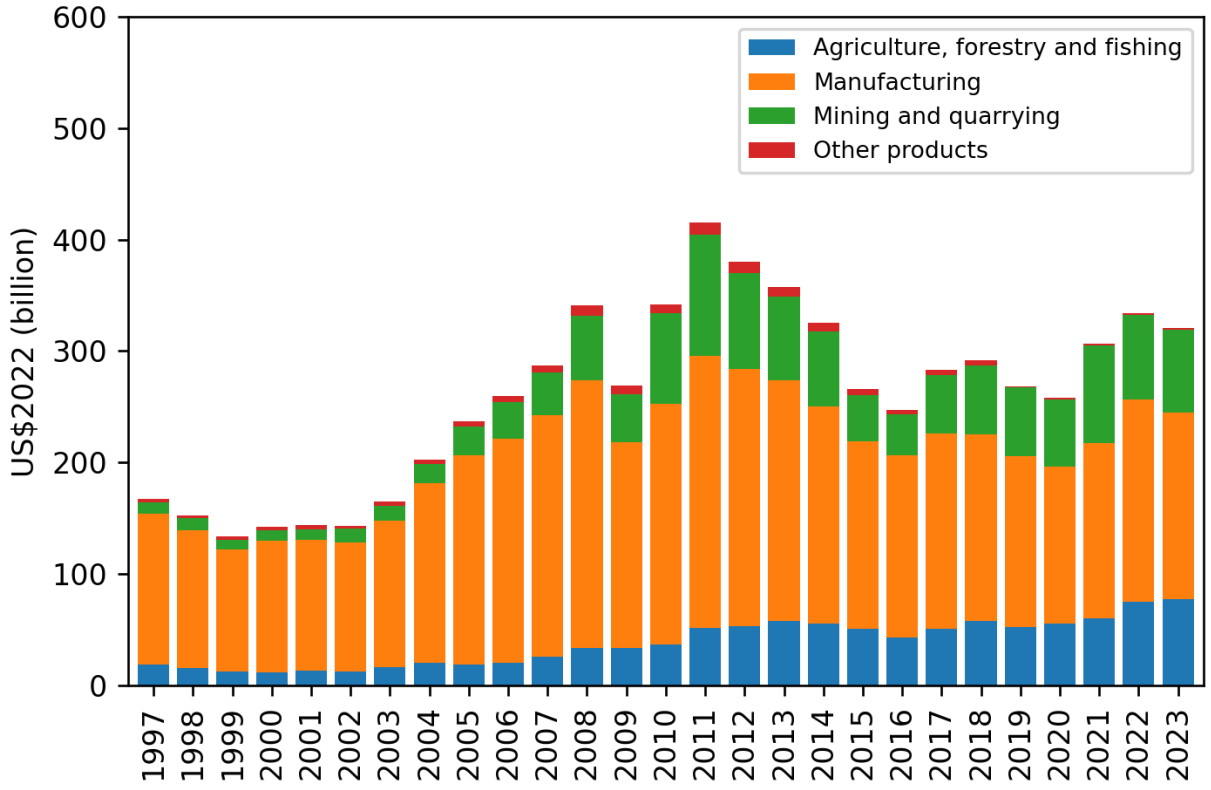
Carlos Góes, Otávio Conceição, Gabriel Lara, and Gladys Lopez-Acevedo

Summary of results

- Over last 25y, exports increased about 3x in Brazil
- At the local level, export expansion leads to important labor market implications
- Municipalities more exposed to exports see higher growth in formal emp. and wages
- Effects are largely transitory, tapering out over the long-run
- Adjustment is sluggish, w/ differences being significant even 10y after shock
- Impact over formalization rates and high-skilled employment more persistent
- Takeaways:
  - Export-oriented demand-side policies unlikely to increase employment over LR...
  - ...but adjustment is slow and they may alter the formalization rate.

The cycle of exports in Brazil

- In aggregate terms, real exports are about 3x from larger than 25 years ago but about 25% down from the 2010 peak.
- At a macro-level (1-digit industry) the cycle is a combination of a continuous expansion of agro; a large cycle of oil; and a volatile manufacturing sector

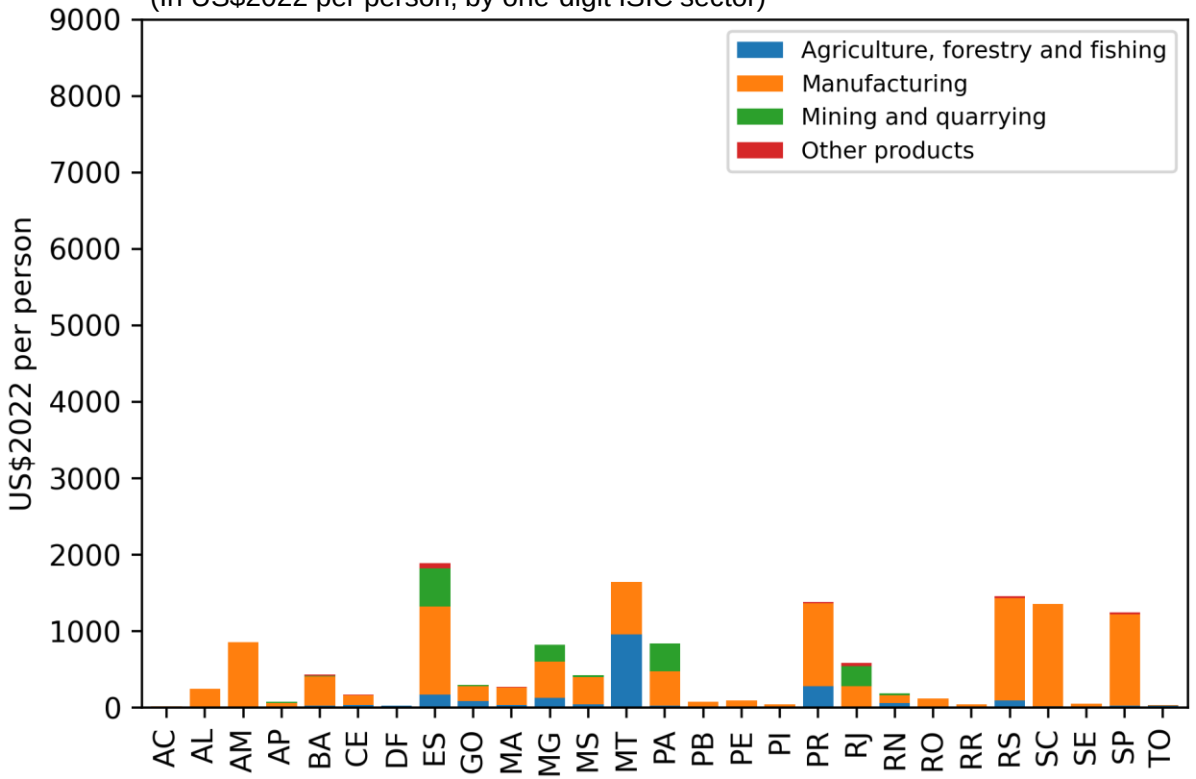


Sources: Own calculations with MDIC, IBGE and Fred data.

How does this look across states?

Average levels of exports increased for most states...

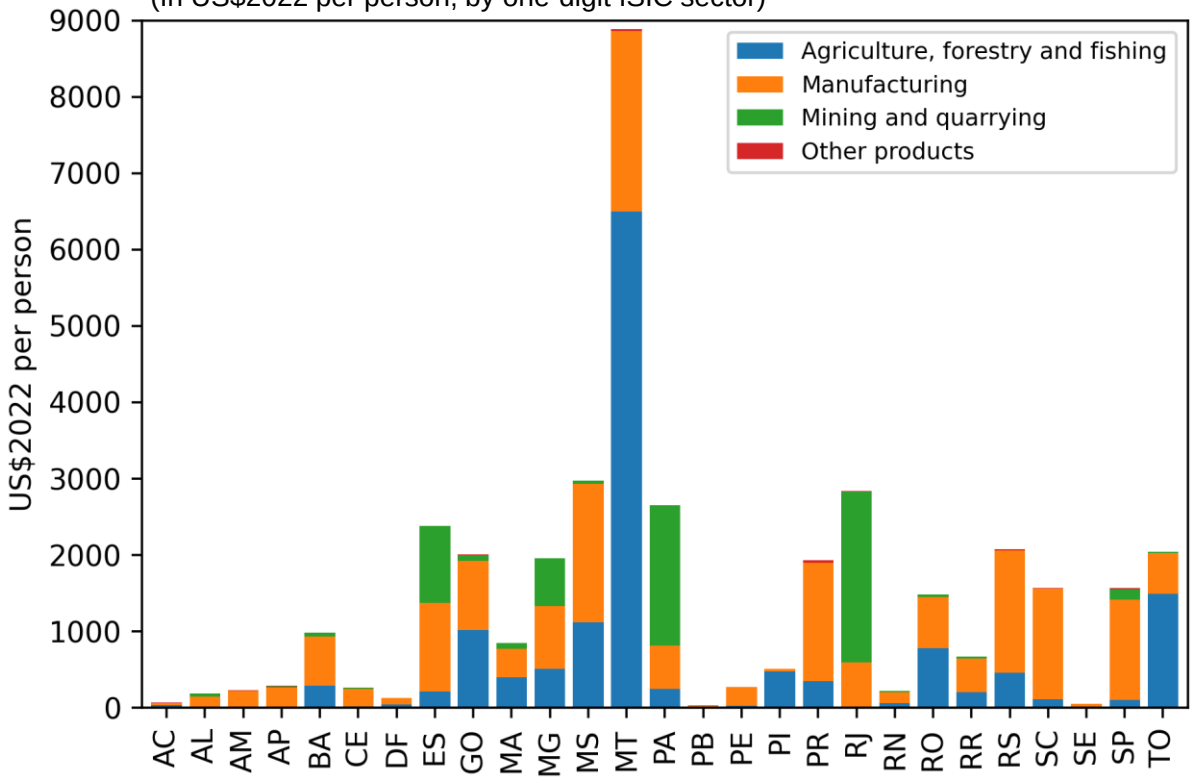
Brazilian States: Exports per Person, 2002
(In US$2022 per person; by one-digit ISIC sector)



Sources: Own calculations with MDIC, IBGE and Fred data.

...and while the common story about agriculture does matter, there are some complementarieties between agriculture and manufacturing at play...

Brazilian States: Exports per Person, 2022
(In US$2022 per person; by one-digit ISIC sector)

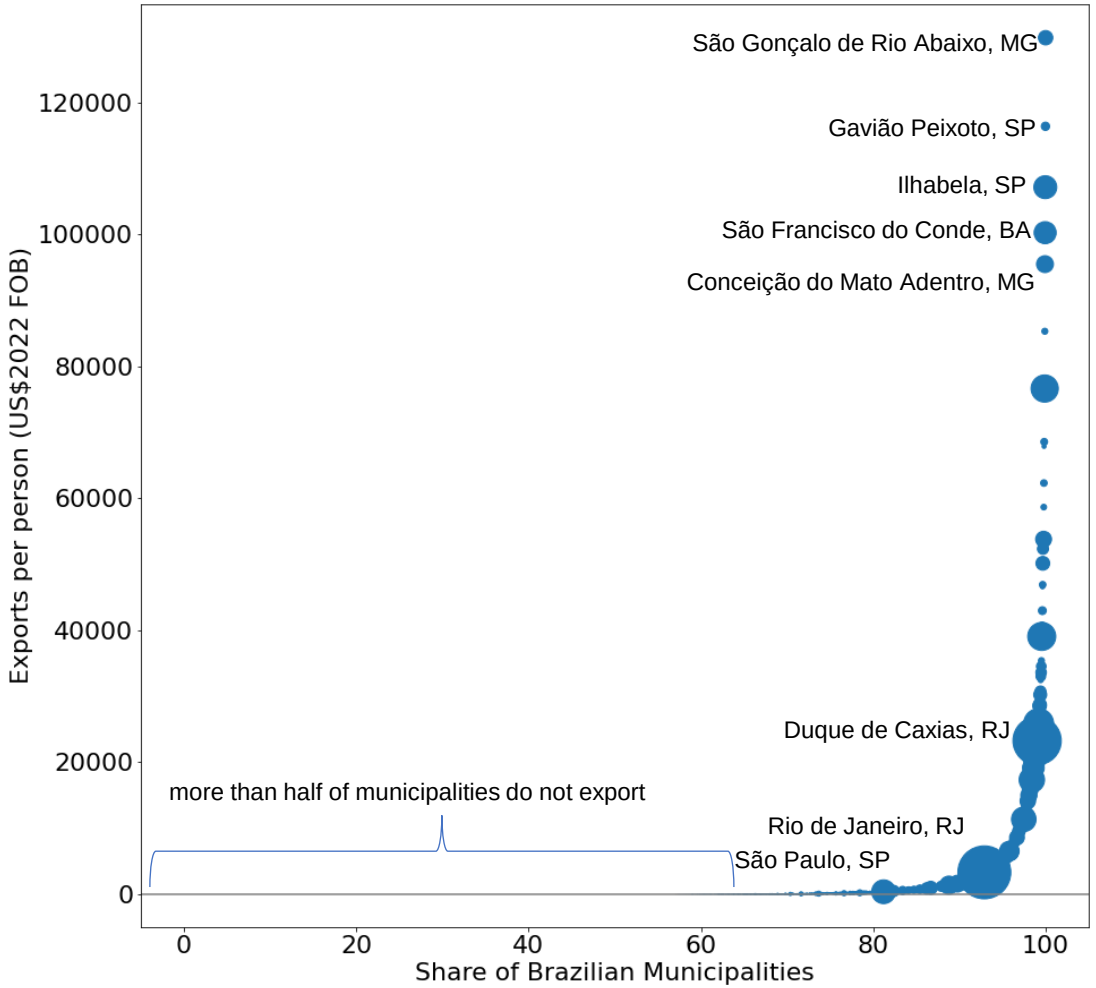


Sources: Own calculations with MDIC, IBGE and Fred data.

Local exposure to exports

- More than half of Brazilian municipalities did not export in 2022
- Among the top 20 largest cities in Brazil, only Rio de Janeiro-RJ ($3,303), Curitiba-PR ($1,367), Guarulhos-SP ($1,591), and São Luís-MA ($1,838) have per capita exports larger than $1,000.
- However, some smaller municipalities have very high exposure to exports.

Brazilian Municipalities: Exports per Person, 2022
(In US$2022 per person; bubbles are proportional to total municipal exports)



Sources: Own calculations with MDIC, IBGE and Fred data.

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

Local exposure to exports

São Gonçalo de Rio Abaixo, MG

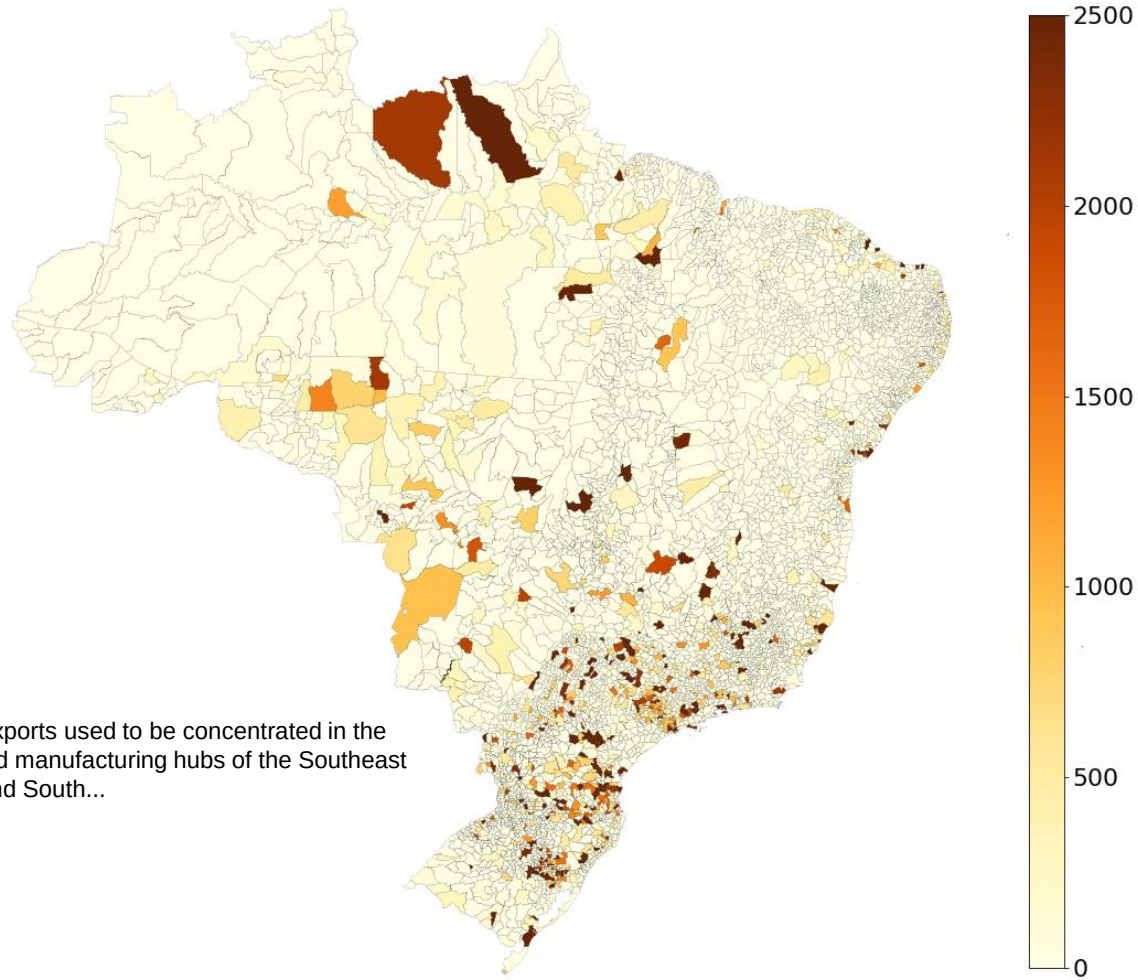
- (Vale *Brucutu* Mining Site)

Gavião Peixoto, SP

- (Embraer Production Plant)

Looking at the distribution over space, one can see the takeoff of the countryside

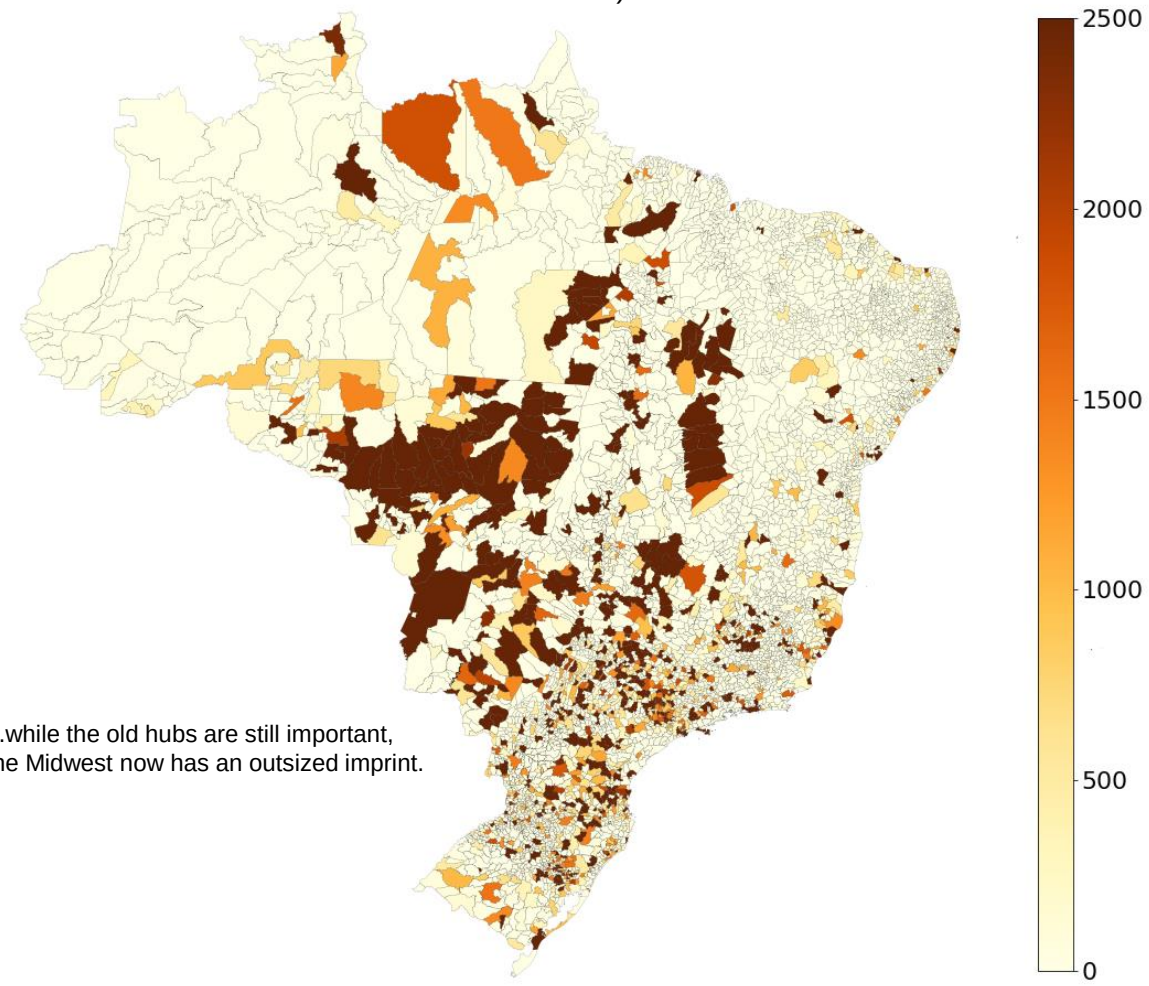
Brazilian Municipalities: Exports per Person, 2002
(In US$2022 per person; bubbles are proportional to total municipal exports; distribution truncated at US$2022 2500+)



Exports used to be concentrated in the old manufacturing hubs of the Southeast and South...

Sources: Own calculations with MDIC, IBGE and Fred data.

Brazilian Municipalities: Exports per Person, 2022
(In US$2022 per person; bubbles are proportional to total municipal exports; distribution truncated at US$2022 2500+)



...while the old hubs are still important, the Midwest now has an outsized imprint.

Sources: Own calculations with MDIC, IBGE and Fred data.

Data

- Administrative customs data (SISCOMEX-MDIC)
  - Total aggregate exports at the municipality level.
  - State-level exports at HS-6-digit product level.
- Administrative formal labor market data (RAIS)
  - Employer reported formal employment, gender, education level, wages for the universe (35-45 million) of formal workers.
- Two waves of Decennial Census (2000, 2010)
  - Captures universe of workers, both formal and informal.
- Final datasets:
  - Panel of 3,371 exporting municipalities from 1995-2020 (N*T = ~34k).
  - Robustness: panel of all 558 microregions from 1995-2020.

Methodology

- Observe growth in exports by region: $\Delta X_{r,s,t} = \ln X_{r,s,t} - \ln X_{r,s,t-1}$
- Local Projections (Jordà, 2005)

$$\underbrace{O_{r,s,t+h} - O_{r,s,t-1}}_{\text{cumulative change in outcome since t-1}} = \alpha_h + \beta_h \underbrace{\Delta X_{r,s,t}}_{\text{exports}} + \underbrace{\boldsymbol{Z}'_{r,s,t-1}}_{\text{controls}} \boldsymbol{\Phi}_h + \varepsilon_{r,s,h}, \qquad \text{for } h \in \{-5, \dots, 0, \dots, 6\}$$

- the coefficients are estimated for each h: they will form impulse response functions

Since exports potentially endogenous, need IV

- Instrument: labor force weighted average of growth in global exports by ISIC 3-digit industry:

$$\Delta\overline{X}_{r,s,t} \equiv \sum_{i \in \mathcal{I}} \frac{L_{r,s,i,t-1}}{L_{r,s,t-1}} \Delta X^{f}_{i,t}$$

- $\Delta X^{f}_{i,t}$: change in the log of global exports (excluding Brazil) in industry *i*
- Also re-estimate with alternative instrument based on GDP growth of trade partners, results qualitatively unchanged

Two stage least squares local projections

- First-stage

$$\Delta X_{r,s,t} = \alpha + \beta \Delta \bar{X}_{r,s,t} + \boldsymbol{Z}'_{r,s,t-1}\boldsymbol{\Phi} + \bar{\varepsilon}_{r,s,t}$$

- Second Stage

$$O_{r,s,t+h} - O_{r,s,t-1} = \alpha_h + \beta_h \Delta \hat{X}_{r,s,t} + \boldsymbol{Z}'_{r,s,t-1}\boldsymbol{\Phi}_h + \varepsilon_{r,s,h},$$

$$\text{for} \quad h \in \{-5, \ldots, 0, \ldots, 6\}$$

Instrument is relevant: First Stage F-stat > 280

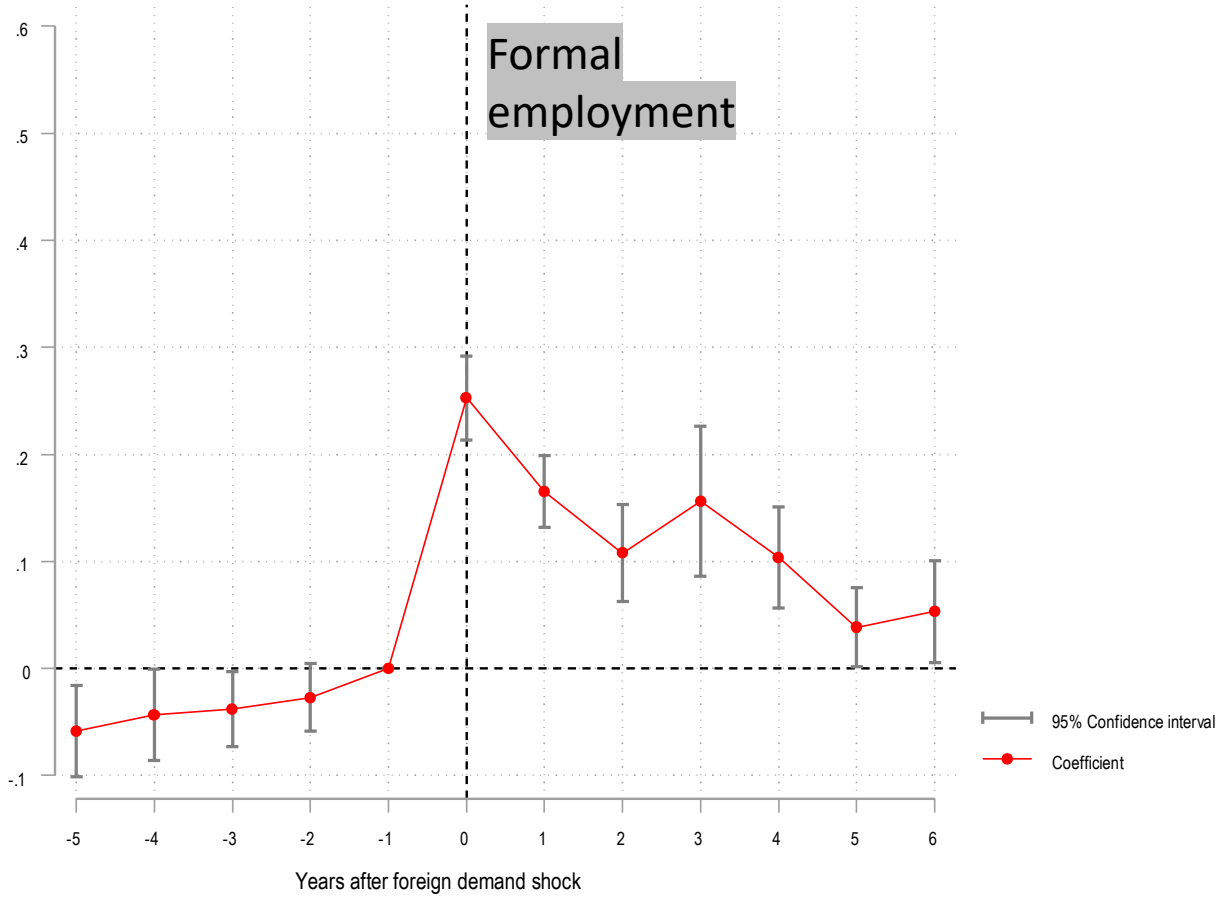
Note: this is a binscatter that reproduces the slope of regressing the observed growth in exports on the instrument. The underlying regression has N=34,670, β=2.25 and t-stat = 16.76

Is the instrument valid?

- We are leveraging:
  - differential growth in global exports (minus Brazil) in each market
  - differential exposure of each local labor market to different industries
- Critical assumption: every municipality in Brazil is small relative to global demand of a given industry
- Exclusion restriction: changes in foreign demand are uncorrelated with the distribution of unobserved factors that drive changes across 3k+ local labor markets

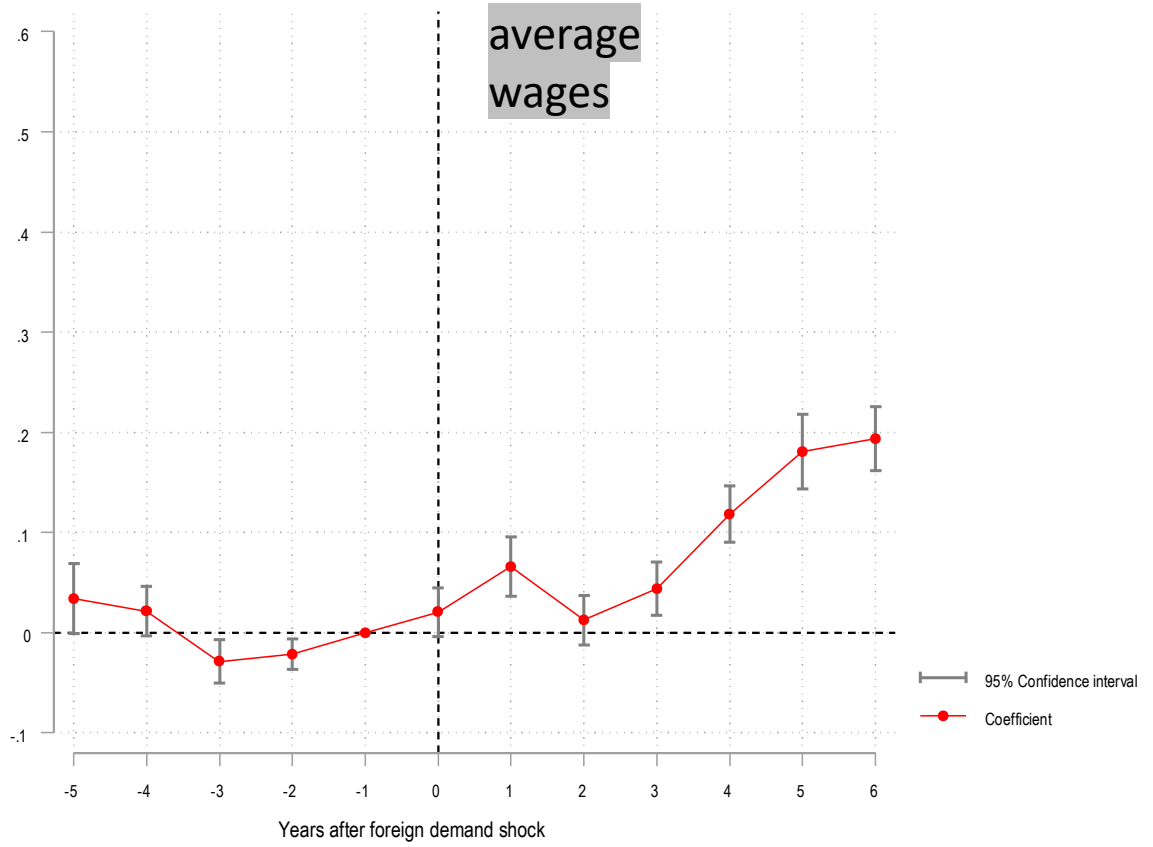
Preliminary results: horizon-specific elasticity of formal employment to foreign demand shocks

- Little evidence of pre-trends
- Clear break in trend when the shock hits
- 1% exogenous increase in exports:
  - +0.25% increase in formal employment in SR
  - +0.05% increase in formal employment in MR
- Effects largely transitory



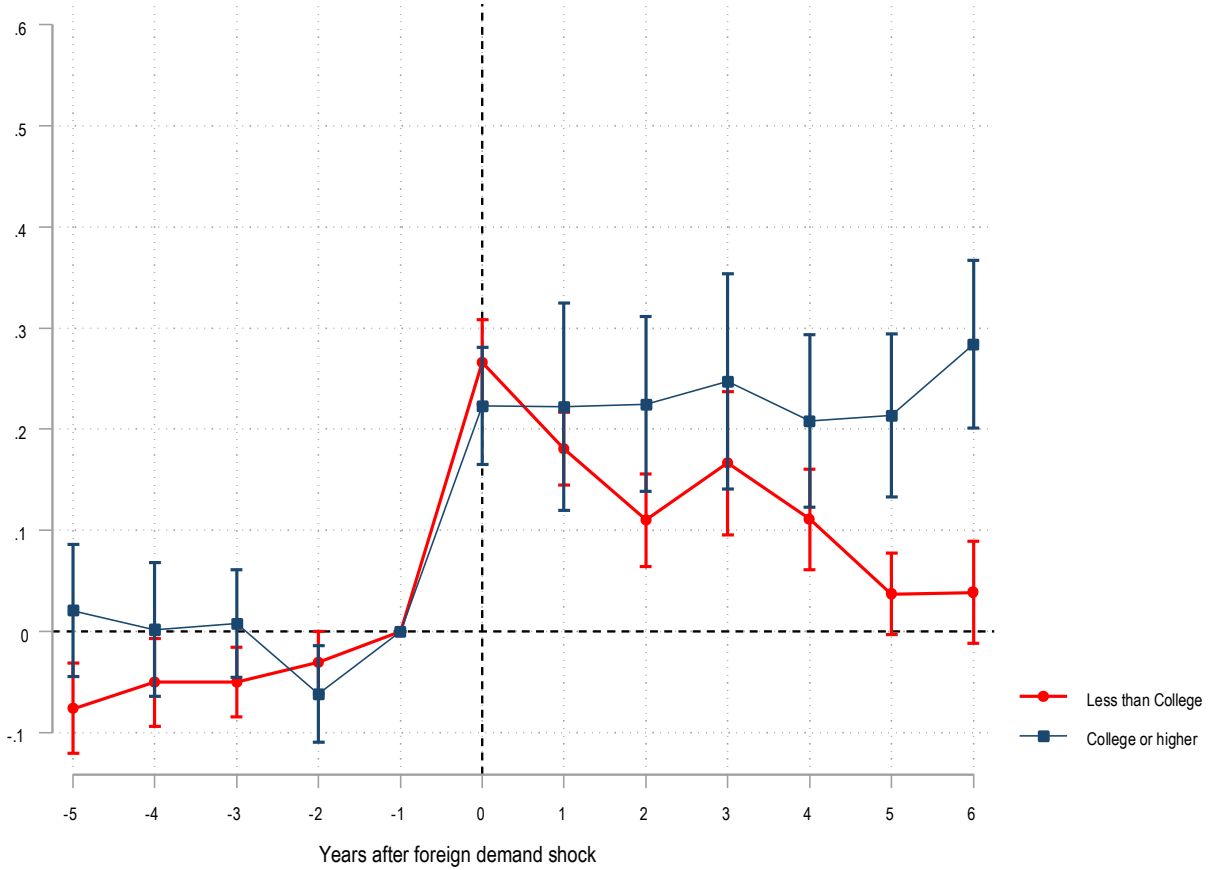
Preliminary results: horizon-specific elasticity of average wages to foreign demand shocks

- Effect builds up with a lag
  - sticky wages?
  - are the gains for incumbents or entrants?
- LR estimation (later) show differences taper down eventually
- 1% exogenous increase in exports:
  - <0.1% increase in wages in SR
  - ~0.2% increase in wages in MR



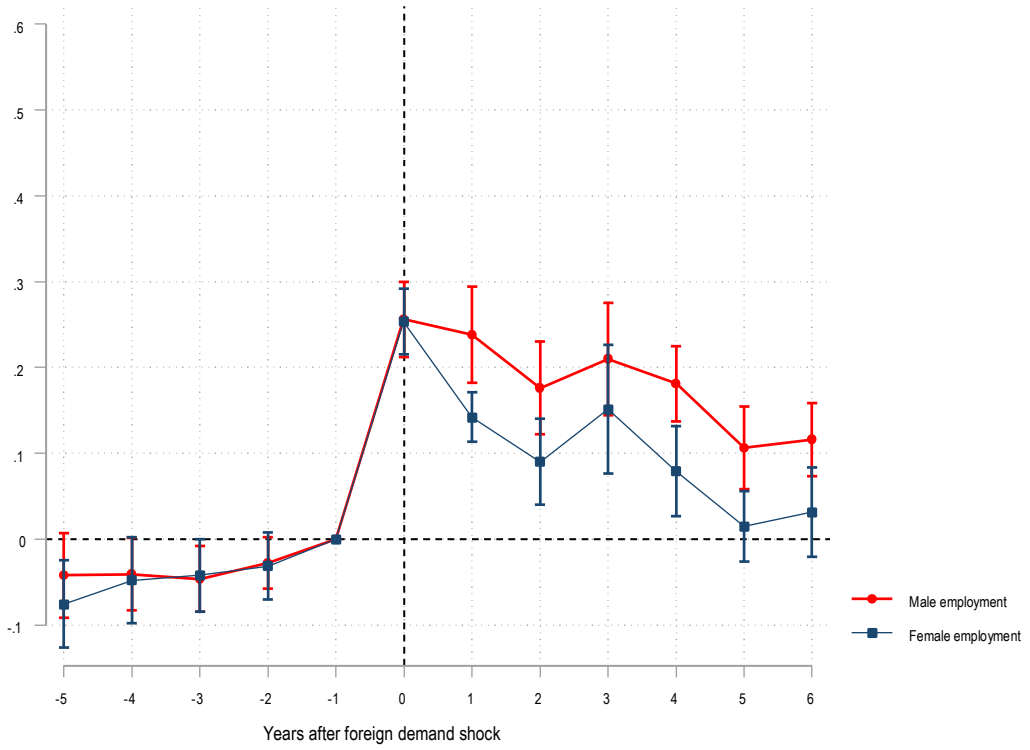
Heterogeneity by education

- Effects similar over SR, w/ elasticities:
  - ~0.25-0.3 over short run
- Effects on high skilled employment more persistent over mid-horizon
  - 0.05 for below college education
  - ~0.3 for college or higher

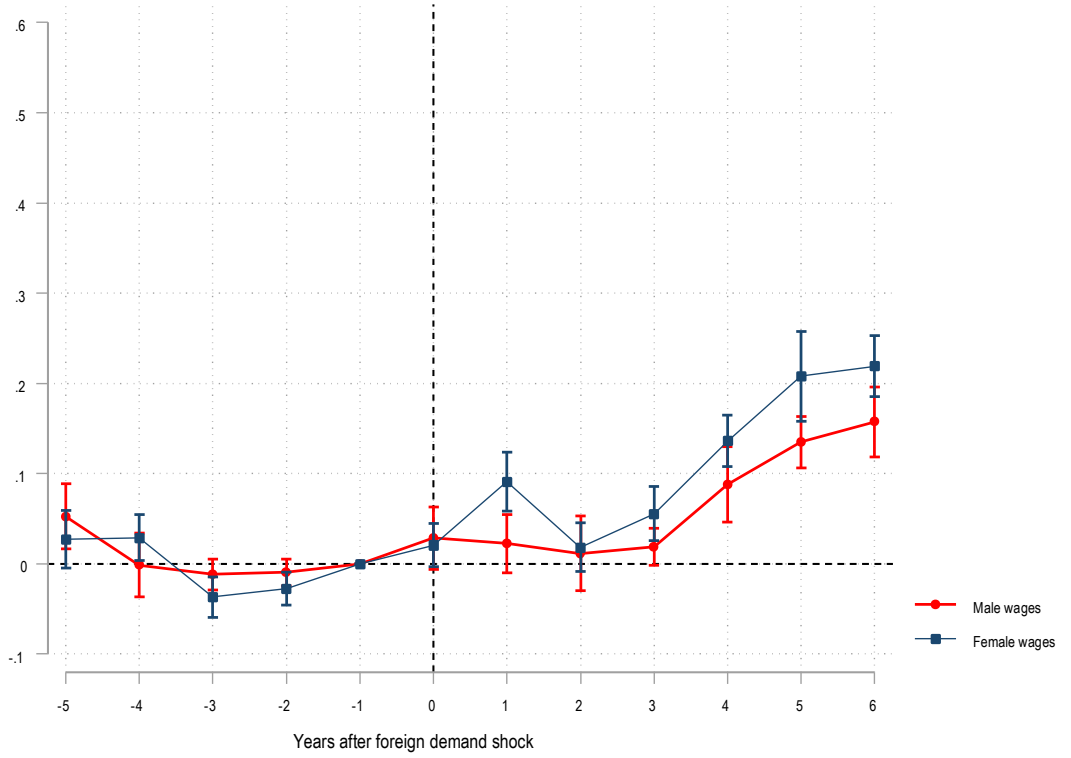


Preliminary results: heterogeneity by gender

Small differences in employment response…



… as well as on wage response.



The long-run

- Re-estimate results with two waves of Census data (2000-2010)
- Waves coincide with increase in exports
- Effects on fomal employment are positive but small over LR
- Regions with higher exposure to export shocks are less likely to see increase in informal employment
- Differential effects on wages taper down relative to MR, small but significant for both formal and informal sectors
- Baseline instruments has F-stat > 30
- Baseline results in column (1)

Elasticities with respect to exports

	(1)	(2)
Instrument:	Global Exports	
Dependent variables:		
Formal employment	0.052	0.044
	(0.02)	(0.024)
First stage f-stat	32.03	24.00
N	1278	1279
Informal employment	-0.120	-0.139
	(0.027)	(0.033)
First stage f-stat	34.25	27.39
N	1278	1279
Formal wages	0.025	0.001
	(0.012)	(0.013)
First stage f-stat	32.30	25.82
N	1278	1279
Informal wages	0.049	0.001
	(0.019)	(0.019)
First stage f-stat	33.40	30.04
N	1278	1279
State Fixed Effects	Y	N