Trade Effects on Mortality: Evidence from China Shocks in Brazil

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Introduction and Motivation

- International trade can affect health and mortality in many ways — expanded access to foreign goods and knowledge, labor market effects, household income (Blouin et al., 2009)

- Causal identification is a challenge

- Many cross-country studies, or studies focusing on specific causes of deaths (e.g. pollution, despair) or infant mortality

- Evidence for overall mortality is lacking, especially in developing countries

This paper

- We use the China Shock for causal identification — harmful for manufacturing industries (Autor et al., 2013)

- In Brazil, there were positive effects from demand shocks and productivity gains (Costa et al., 2016; Alfaro et al., 2022)

- Using a shift-share instrumental variable approach, we investigate whether the effects on mortality were also different

China Shock and Mortality

- In the US: increase in despair deaths (Pierce and Schott, 2020) and work related injuries (Adda and Fawaz, 2020)
- In Mexico: increase in crime (Dell et al., 2019), and obesity / diabetes mortality (Fernández Guerrico, 2021)
- What about Brazil? (spoiler: **decreases** in mortality, **both** from imports and exports)

Literature contributions

- Trade and mortality (Pierce and Schott, 2020; Autor et al., 2019; Fernández Guerrico, 2021; Charris et al., 2023)
- Economic shocks and mortality (Browning and Heinesen, 2012; Classen and Dunn, 2012; Ruhm, 2000; Hone et al., 2019)
- Trade and crime (Dell et al., 2019; Dix-Carneiro et al., 2018)
- China Shock (Autor et al., 2013; Autor, 2018; Costa et al., 2016; Connolly, 2022)

Data

- Demographic Censuses (2000 and 2010)
- Trade data: UN Comtrade and CEPII BACI
- Mortality: SIM DATASUS (age adjusted mortality rates)

Empirical strategy

We build shift-share instruments (analogous for import supply IS_m and export demand XD_m) following Autor et al. (2013):

$$IS_m = \sum_j s_{jm} x_{j,IS}$$

$$\text{where } s_{jm} = \frac{L_{mj,2000}}{L_{m,2000}} \quad \text{and } x_{j,IS} = \frac{\Delta I_j}{L_{Bj,2000}}$$

and the instruments

$$ivIS_m = \sum_j s_{jm} g_{j,IS} = \sum_j \frac{L_{mj,2000}}{L_{m,2000}} \frac{\Delta X_{China,j}}{L_{Bj,2000}}$$

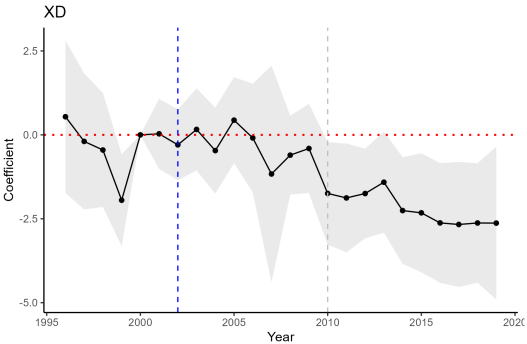
Empirical strategy: estimation

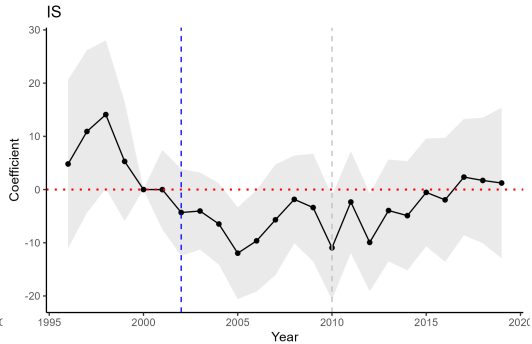
Then we run the following regression:

$$\underbrace{\Delta \ln Y_m}_{\text{Outcome}} = \underbrace{\beta IS_m}_{\text{Import Shocks}} + \underbrace{\theta XD_m}_{\text{Export Shocks}} + \underbrace{\lambda X'_m}_{\text{Controls for Economic Structure}} + \underbrace{\alpha_s}_{\text{State Fixed-Effects}} + \varepsilon_m$$

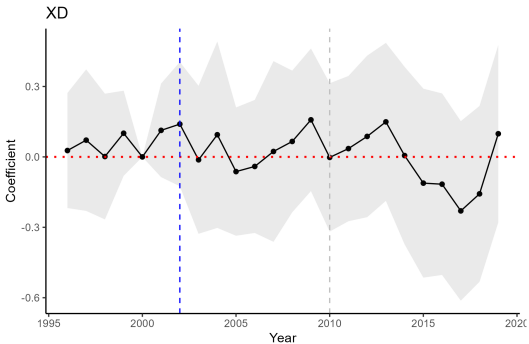
- Regressions are weighted by relative workforce size, and errors are clustered by microrregion
- We conduct tests for the identification assumptions discussed by the recent econometric literature (Borusyak et al., 2022; de Chaisemartin and Lei, 2023) Here

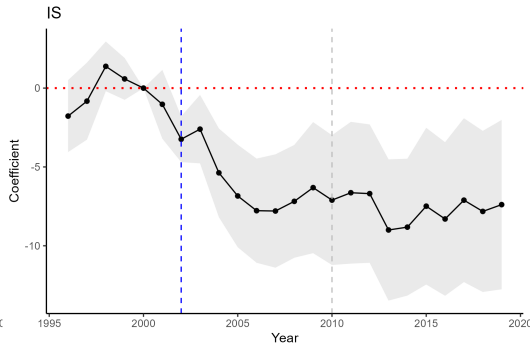
Dynamic effects on mortality





Dynamic effects on homicides





Results: Mortality by cause

	Cancer	Cardiovascular	Blood and Endocrine	Nutritional	Infectious	Respiratory
XD_m	−0.151	−0.158	−0.154	−0.036	−0.080	−0.225*
	(0.202)	(0.402)	(0.122)	(0.051)	(0.163)	(0.116)
IS_m	−0.146	−0.111	−1.325	0.174	−0.218	0.260
	(1.329)	(2.874)	(1.102)	(0.272)	(1.978)	(0.937)
	Transport accidents	Violence	Drug overdose	Self-harm	Other	Indeterminate
XD_m	−0.156	−0.027	−0.103	−0.0001	−0.142	−0.428
	(0.099)	(0.151)	(0.075)	(0.057)	(0.182)	(0.404)
IS_m	−0.649	−6.983***	0.059	−0.123	−0.487	−9.690*
	(0.912)	(1.917)	(0.383)	(0.273)	(1.963)	(5.716)
N	4,267	4,267	4,267	4,267	4,267	4,267

Note: *p<0.1; **p<0.05; **p<0.01

Robustness

- Alternative estimator based on Costa et al. (2016) Here
- Sector-level equivalent regressions (Borusyak et al., 2022) Here
- Alternative standard errors (Adão et al., 2019) Here
- Socioeconomic controls Here
- Inclusion of instrumented pre-trends Here

What do these numbers mean?

- For each USD 1,000 increase in exports from Brazil to China, the age adjusted mortality rate was reduced by 1.7 deaths per 100k (5.3 deaths for 1 std). Mean mortality rates: 563 in 2000 and 491 in 2010

- For imports: reduction of 2.2 homicides per 100k people for an increase of one standard deviation in imports

Mechanisms: Labor market outcomes

	Poverty 2SLS	Log income 2SLS	Unemployment 2SLS	Informality 2SLS	Employment 2SLS	Log wages 2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
XD_m	-0.013^{**}	0.006^{***}	0.0002	-0.001^{***}	-0.00002	0.003
	(0.007)	(0.002)	(0.0002)	(0.001)	(0.0003)	(0.002)
IS_m	-0.138^{***}	-0.001	-0.012^{***}	-0.010^{**}	0.003	0.020^{*}
	(0.044)	(0.008)	(0.002)	(0.005)	(0.002)	(0.011)
N	4,267	4,267	4,267	4,267	4,267	4,267

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N	4,267	4,267	4,267	4,267	4,267	4,267

Note: *p<0.1; **p<0.05; **p<0.01

Results: Sectors

	Manuacturing	Primary	Non-Traded
Panel A: Sector shares			
XD_m	-0.0001	0.001^{**}	-0.001^{***}
	(0.0004)	(0.0005)	(0.0004)
IS_m	-0.009	0.007^{**}	-0.006
	(0.006)	(0.003)	(0.007)
Panel B: Log wages			
XD_m	0.001	-0.007^{*}	0.003^{*}
	(0.003)	(0.004)	(0.002)
IS_m	-0.023	0.038	0.028^{***}
	(0.017)	(0.051)	(0.010)
N	4,267	4,267	4,267

Note: *p<0.1; **p<0.05; **p<0.01

Workforce distribution by education (in 2000)

	Sector		
Group	Manufacturing	Non-traded	Primary
No School	0.17	0.17	0.47
Elementary	0.45	0.38	0.45
High-school	0.30	0.30	0.06
College	0.08	0.15	0.01

Workforce distribution by education (in 2000)

Group	Sector		
	Manufacturing	Non-traded	Primary
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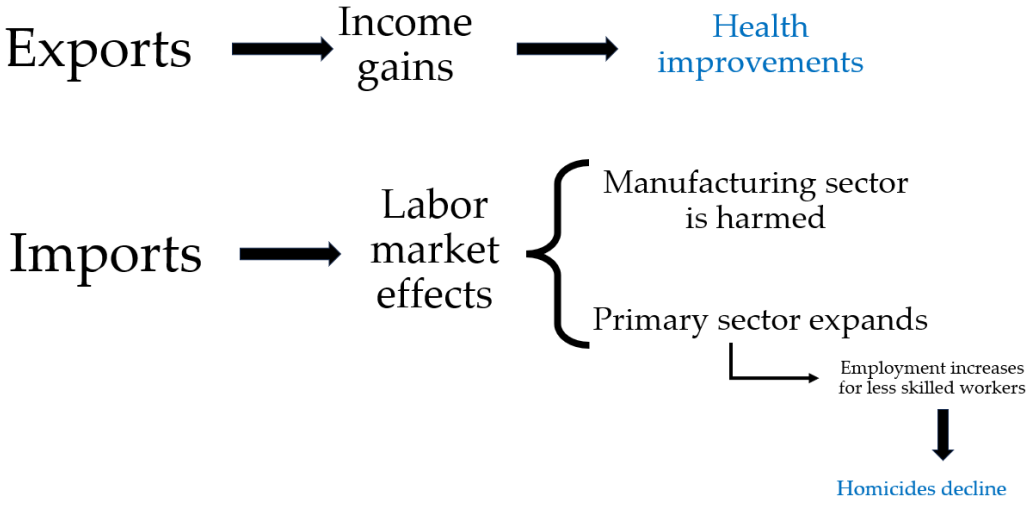
College	0.08	0.15	0.01

Mechanisms: Labor market outcomes by education

	No School	Elementary	High-school	College
Panel A: Log income				
XD_m	0.010^{***}	0.006^{***}	0.004^{**}	0.005
	(0.003)	(0.002)	(0.002)	(0.003)
IS_m	0.048^{***}	-0.018^{*}	0.006	0.008
	(0.016)	(0.010)	(0.009)	(0.016)
N	4,267	4,267	4,267	4,149
Panel B: Employment				
XD_m	0.001	-0.001	-0.001^{**}	0.001
	(0.001)	(0.0004)	(0.0003)	(0.001)
IS_m	0.033^{***}	0.005	-0.006^{*}	-0.014^{***}
	(0.004)	(0.003)	(0.003)	(0.004)
N	4,267	4,267	4,267	4,244

Note: *p<0.1; **p<0.05; **p<0.01

In sum: mechanisms work through different channels



Conclusion

- Both import competition and export demand shocks **decreased mortality** in Brazil, but **mechanisms were different**

- While exports affected income, increasing overall health, imports affected employment, increasing the opportunity cost of crime and reducing homicides

- Next: more insights on mechanisms; focus on infant mortality

Thank you

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Identification

- The exogenous shocks framework supports identification in our setting (Borusyak et al., 2022)

$$\mathbb{E}\left[\sum_m e_m ivXD_m \varepsilon_m\right] = \mathbb{E}\left[\sum_m e_m \sum_j s_{jm} g_{j,XD} \varepsilon_m\right] = \mathbb{E}\left[\sum_j s_j g_{j,XD} \bar{\varepsilon}_j\right] = 0$$

- But there are concerns: sectoral composition between regions leads to correlation of residuals (Adão et al., 2019)

- We also need many random and independent shocks, but this assumption can be (suggestively) tested (de Chaisemartin and Lei, 2023) Here

Back

Random Shocks Test

	Imports ($g_{j,IS}$)			Exports ($g_{j,XD}$)		
	(1)	(2)	(3)	(4)	(5)	(6)
Sector share	−104.272	−46.097	−45.365	−252.553	25.615	20.642
	(77.069)	(51.891)	(51.124)	(153.366)	(128.762)	(128.297)
College (%)		37.348	35.820		−53.471	−49.442
		(66.671)	(66.441)		(67.958)	(68.797)
Black (%)		7.585	10.092		87.728	88.546
		(8.100)	(8.589)		(78.243)	(78.921)
Log wage		2.784	3.747		33.688	33.988
		(5.901)	(5.775)		(24.781)	(25.042)
Male (%)		−26.582*	−25.882		24.512	21.644
		(15.924)	(15.986)		(18.987)	(19.124)
Control for other instrument	No	No	Yes	No	No	Yes
N	82	82	82	82	82	82
F-stat P-value	0.18	0.28	0.39	0.11	0.37	0.49

Back

Results: All-cause mortality

	OLS	2SLS
	(1)	(2)
XD_m	−1.428	−1.661
	(0.628)**	(0.672)**
		[0.352]***
IS_m	−15.989	−19.239
	(5.127)***	(5.816)***
		[5.454]***
Kleibergen-Paap F-Stat.		90.087***
N (Regions)	4,267	4,267
N (Sectors)	82	82

Note: *p<0.1; **p<0.05; **p<0.01

Back

Robsutness: Alternative Instrument

	Main	Costa et al (2016)	Costa et al (2016) - Municipality
	(1)	(2)	(3)
XD_m	-1.661^{**}	-5.764^{*}	-6.749^{***}
	(0.672)	(3.272)	(1.807)
IS_m	-19.239^{***}	-16.344^{**}	-14.733^{**}
	(5.816)	(6.855)	(6.364)
N	4,267	554	4,267

Back

Robustness: Alternative SE

	$\hat{\beta}_{2SLS}$	Microregion	Mesoregion	Shock-level HC	Shock-level clustered	AKM C.I.
	(1)	(2)	(3)	(4)	(5)	(6)
XD_m	−2.186	(0.721)	(0.618)	(0.823)	(0.829)	[-3.480, -0.892]
IS_m	−19.684	(5.780)	(6.470)	(4.046)	(4.600)	[-26.022, -13.347]
N (Regions)		4,267	4,267	4,267	4,267	4,267
N (Sectors)		82	82	82	82	82
N (Clusters)		554	137	—	48	48

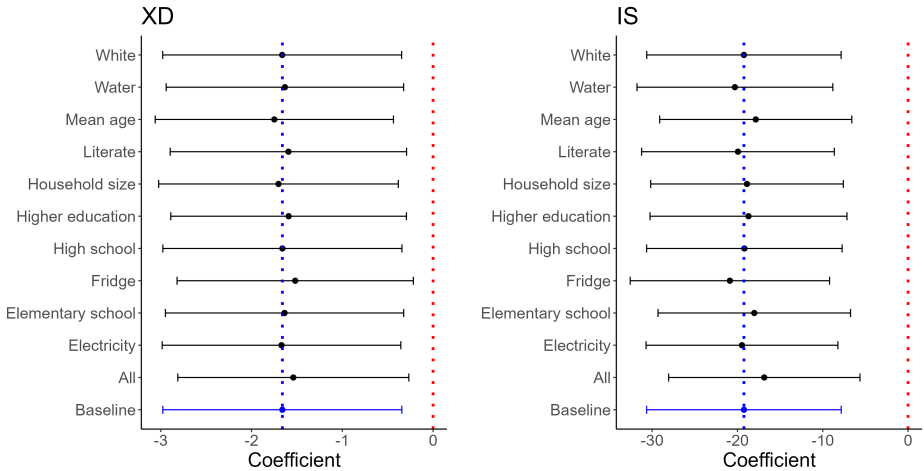
Back

Robustness: Alternative specifications

	Main	Pre-trend	Controls	Log	Alternative instrument
	(1)	(2)	(3)	(4)	(5)
XD_m	−1.661	−1.984	−1.540	−0.005	−1.432
	(0.672)**	(0.770)***	(0.649)**	(0.002)***	(0.644)**
	[0.352]***	[0.608]***	[0.327]***	[0.001]***	[0.119]***
IS_m	−19.239	−22.864	−16.854	−0.034	−21.182
	(5.816)***	(6.795)***	(5.720)***	(0.012)***	(7.757)***
	[5.454]***	[5.833]***	[5.921]***	[0.016]**	[7.710]***
N (Regions)	4,267	4,267	4,267	4,267	4,267
N (Sectors)	82	82	82	82	82

Back

Robustness: Socioeconomic controls



Back