

Chinese imports and US labour market adjustment: Insights from value-added trade flows

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Overview

- We study the impact of the increased volume of trade with China on the size of the US manufacturing sector in local labour markets
- We distinguish between some drivers of these local effects using bilateral trade flows which are decomposed by the origin of value added

Introduction

- To what extent are negative local labour market effects explained by:
 - A) **China** - due to domestic policy changes, productivity increase, continuing development, etc.
 - B) **Third Countries** - e.g. Japan, Korea, due to increasing GVC integration of China
- Have local labour markets adjusted by now?

Context

- Autor, Dorn, and Hanson (2013) – Chinese import competition caused manufacturing sector to shed jobs in trade exposed local labour markets, this explains 25% of all US manufacturing job losses in 1990-2007.
- Amiti et al. (2017) estimate China's WTO entry caused consumer price of manufacturing goods to fall 7.6% in between 2000-2006.

Introduction

- Thanks to value added decomposition techniques a la Koopman, Wang, and Wei (*AER* 2014)
 - (i) our data identify the source country and industry of VA
 - (ii) we can clean it of double counting as this has no labour market implications
 - (iii) we can take out endogenous US VA
 - (iv) we can improve the precision of ADH import-exposure measure
 - (v) Also, our data allows us to extend the analysis to 2015

Introduction

- Why Value-Added Decomposition of Trade Flows?

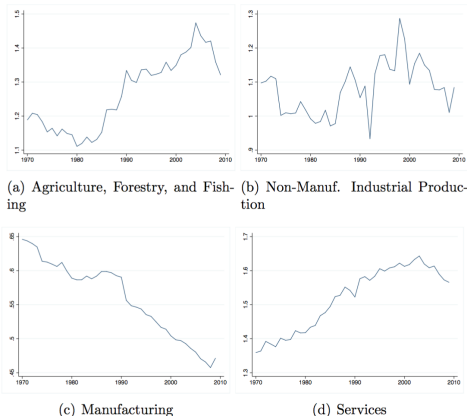
“Focusing on gross values of exports and imports, traditional trade statistics give us a distorted picture of trade imbalances between countries.” – Pascal Lamy

“With the rise of cross-border supply chains, conventional (gross) trade data is an increasingly misleading guide to how value added is traded in the global economy.” – Johnson & Nogueira (RE&S, 2017)

Stylised facts

- Johnson & Nogueira (2017) show ratio of value-added to gross exports in manufacturing decreasing (proliferation of GVCs).

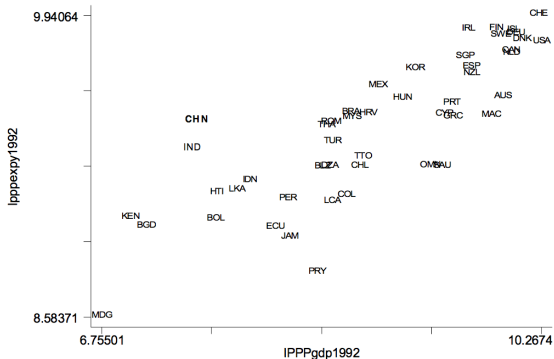
Figure 2: Ratio of Value-Added to Gross Exports for the World, by Sector



Stylised facts

- According to Rodrik (2006) PRC exports content resembles that of a more developed, higher-income, and higher-skill economy.

Figure 2: Productivity level indicator vs GDP (PPP) in 1992



An (Extreme) Example

- In a case study of the 2006 30GB iPod, Linden, Kraemer, and Dedrick (2009) estimate a Chinese export value of about \$150, out of which the value added attributable to producers in China is only \$4.
- Xing and Detert (2010) perform a similar exercise for the iPhone 4:

Country	Components	Manufacturers	Costs
Chinese Taipei	Touch screen, camera	Largan Precision, Wintek	\$ 20.75
Germany	Baseband, power management, transceiver	Dialog, Infineon	\$ 16.08
Korea	Applications processor, display, DRAM memory	LG, Samsung	\$ 80.05
United States	Audio codec, connectivity, GPS, memory, touchscreen controller	Broadcom, Cirrus Logic, Intel, Skyworks, Texas Instruments, TriQuint	\$ 22.88
Other	Other	Misc.	\$ 47.75
		Total	\$ 187.51

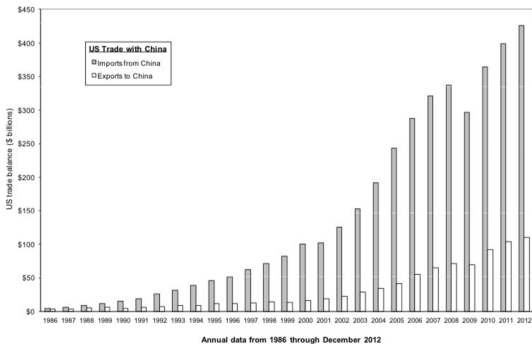
- This does not tell the full story...

Literature - Local Labour Market Identification Strategy

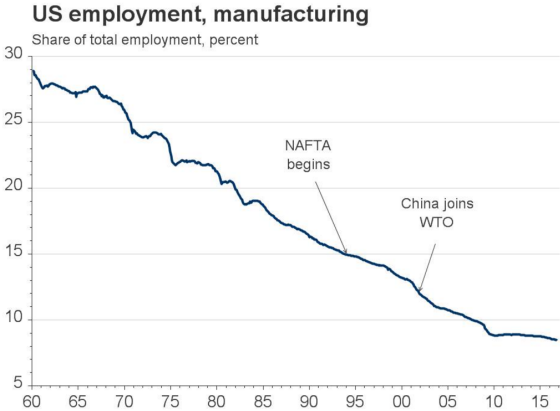
- Topalova 2007
- Autor, Dorn, Hanson 2013
- Acemoglu, Autor, Dorn, Hanson, Price, 2016
- Colantone and Stanig, 2016; Autor et al., 2017
- Dauth, Findeisen, Suedekum, 2014
- Donoso et al., 2015; Balsvik et al., 2015; Malgouyres, 2016

China shock?

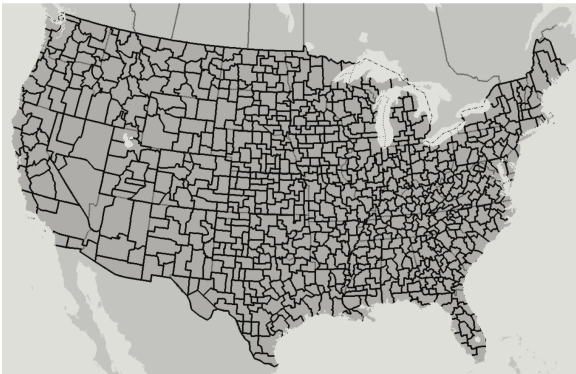
China shock



US manufacturing employment



Commuting zones

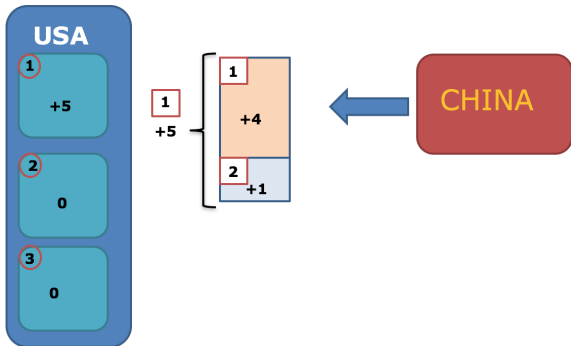


Local exposure methodology

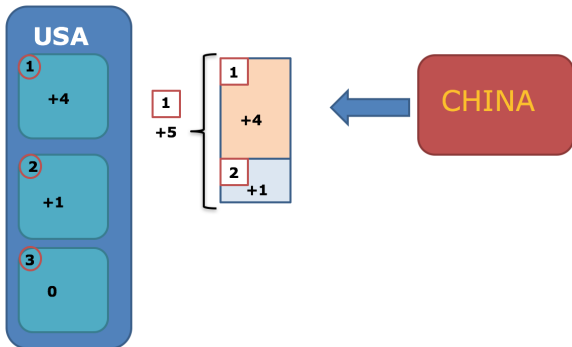
- Exposure:

$$\Delta EXP_{it} = \frac{1}{L_{it}} \sum_s \frac{L_{ist}}{L_{st}} \Delta IMP_{st}$$

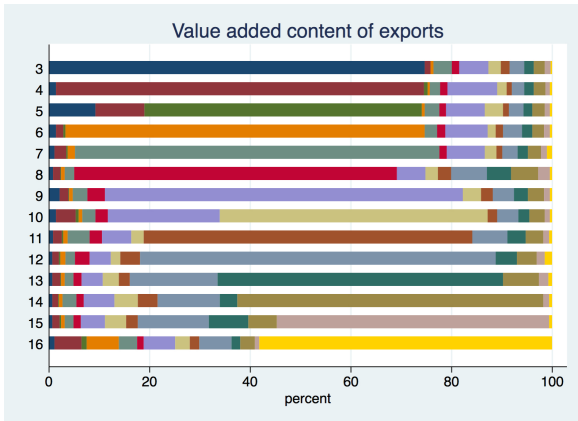
Better exposure measure



Better exposure measure



Better exposure measure



Better Controls for Endogeneity

- Instrument in ADH 2013
 - Imports by US replaced by imports by a group of other developed countries: Austria, Finland, Japan, Denmark, Germany, Spain
 - Unobserved demand shocks, positive bias in OLS
 - Strong 1st stage, exclusion restriction debatable
- Exclusion restriction more plausible if we replace countries that feature prominently in FVA, e.g. Japan, Germany
- We remove US VA from imports as this is directly related to the dependent variable

Data

- VA trade flows for 2000, 2008, 2015: decomposition using Asian Development Bank multi-regional input-output tables (ADB-MRIO), provided by Zhi Wang
- Employment data 1990, 2000, 2007, 2008, and 2014: County Business Patterns (CBP) series of the United States Census Bureau
- Working age population: Population Estimates Program (PEP) of the United States Census Bureau
- Industry concordances: United Nations Statistics Division
- Control variables: David Dorn

Validation Exercise

$$\Delta MANUF_{it} = b_1 + b_2 \Delta EXP_{it} + \mathbf{X}'_{it} b_3 + e_{it}$$

Validation Exercise

Table 1 — Comparison with Autor et al. (2013) using 2000-2008 trade flows
Dependent Variable: 10-year equivalent change in manufacturing employment / working-age population in % pts

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local exposure to Chinese exports / worker	-2.142*** (0.225)	-1.683*** (0.380)	-1.436*** (0.363)	-1.145*** (0.296)	-1.017*** (0.295)	-0.958*** (0.285)	-0.469*** (0.123)
% manufacturing employment t-1		-0.0481 (0.0380)	-0.0680** (0.0347)	-0.132*** (0.0392)	-0.126*** (0.0331)	-0.138*** (0.0358)	-0.083*** (0.025)
% college educated population t-1				-0.0319 (0.0246)		-0.00726 (0.0204)	-0.000 (0.021)
% foreign born t-1				-0.0470*** (0.0112)		-0.000 (0.0214)	0.057*** (0.013)
% employment among women t-1				-0.0268 (0.0396)		0.0349 (0.0414)	-0.064 (0.039)
% employment in routine occupations t-1					-0.229*** (0.0742)	-0.220*** (0.0739)	-0.142*** (0.093)
avg offshorability of occupations t-1					-0.511 (0.351)	-0.628 (0.519)	-0.670* (0.344)
Constant	0.0651 (0.334)	0.204 (0.364)	-0.364 (0.516)	4.608** (2.066)	7.334*** (2.385)	5.152 (3.798)	-1.182 (3.270)
Observations	722	722	722	722	722	722	722
R-squared	0.437	0.453	0.532	0.589	0.638	0.642	0.532
Census division dummies	NO	NO	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Extending in time

$$\Delta MANUF_{it} = b_1 + b_2 \Delta EXP_{it} + b_3 \Delta EXP_{it} \times D_t + \mathbf{X}'_{it} b_4 + e_{it}$$

Extending in time

Table 2 — Results using trade data from 2000-2015

Dependent Variable: 8-year equivalent change in manufacturing employment / working-age population in % pts

	(1)	(2)
Local exposure to Chinese exports / worker	-1.219*** (0.363)	-1.905*** (0.321)
Time Dummy * Local exposure to Chinese exports / worker		1.425*** (0.305)
t		-0.568** (0.281)
Coefficient + Time Interaction for Chinese Export Exposure		-0.480 (0.378)
% manufacturing employment t-1	-0.111*** (0.0286)	-0.0629*** (0.0224)
% employment in routine occupations t-1	-0.176*** (0.0591)	-0.121*** (0.0300)
avg offshorability of occupations t-1	-0.502 (0.416)	-0.487** (0.230)
Constant	4.121 (3.038)	2.067 (1.663)
Observations	722	1,444
R-squared	0.642	0.574
Census division dummies, other controls	YES	YES

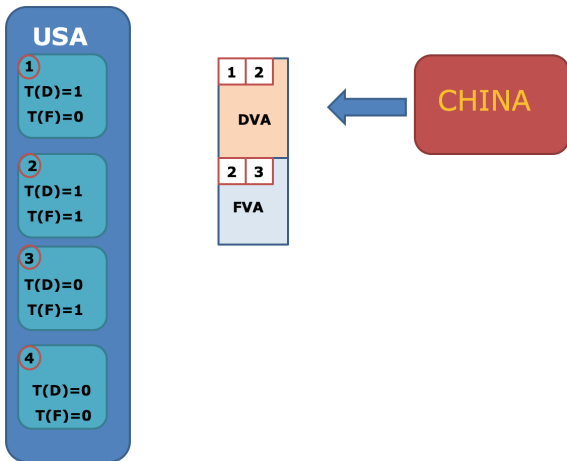
Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Trade flow decomposition

$$\begin{aligned}\Delta MANUF_{it} = & b_1 + b_2 \Delta DVAEXP_{it} + b_3 \Delta DVAEXP_{it} \times D_t \\ & + b_4 \Delta FVAEXP_{it} + b_5 \Delta FVAEXP_{it} \times D_t + \mathbf{X}'_{it} b_6 + e_{it}\end{aligned}$$

Identification



Trade flow decomposition

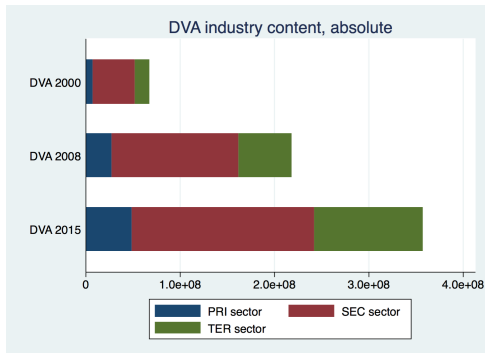
Table 3 — Local labour market exposure by origin of value added for periods 2000-2008 and 2008-2015
Dependent Variable: 8-year equivalent change in manufacturing employment / working-age population in % pts

	(1)	(2)
Local exposure to the Chinese value added content of Chinese exports / worker	-4.298*** (1.314)	-4.801*** (0.856)
Local exposure to the Foreign value added content of Chinese exports / worker	7.609** (3.591)	8.356*** (2.741)
Time Dummy * Local exposure to the Chinese value added content of Chinese export		3.189*** (0.618)
Time Dummy * Local exposure to the Foreign value added content of Chinese export		-5.334 (5.035)
Coefficient + Time Interaction for Chinese value added content		-1.613*** (0.626)
Coefficient + Time Interaction for Foreign value added content		3.022 (3.782)
t		-0.558* (0.290)
Constant	3.622 (3.247)	1.837 (1.711)
Observations	722	1,444
R-squared	0.645	0.583
Census division dummies, controls	YES	YES

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Increasing trade exposure



- Bloom, Draca, Reenen (2016) - firms accelerate technological and organisational innovation to inoculate themselves against import competition
- Magyari (2017) - firms reorganise their production activities towards less exposed industries

Interpretation

- FVA robustly not negative, contradicts GVC story where other developed countries compete indirectly
- Previously direct imports from FVA countries re-routed through China
- Comparative advantage of developed countries (FVA-Countries and USA) similar
- US Firms also outsourcing.

Comparative Advantage Sectors

$$\begin{aligned} \Delta MANUF_{it} = & b_1 + b_2 \Delta DV A1 EXP_{it} + b_3 \Delta DV A1 EXP_{it} \times D_t \\ & + b_4 \Delta DV A2 EXP_{it} + b_5 \Delta DV A2 EXP_{it} \times D_t \\ & + b_6 \Delta DV A3 EXP_{it} + b_7 \Delta DV A3 EXP_{it} \times D_t \\ & + b_8 \Delta FVA EXP_{it} + b_9 \Delta FVA EXP_{it} \times D_t + \mathbf{X}'_{it} b_{10} + e_{it} \end{aligned}$$

- CA not set in stone: e.g. Hanson, Lind, Muendler (2015)
- Define groups:
 - OLD: RCA in 1995 – e.g. food, textile, shoes, rubber, metal
 - NEW: New RCA in 2008 – e.g. wood, chemical, machinery, electrical equipment
 - NEVER: RCD 1995-2008 – paper, transport equipment

Comparative Advantage Sectors

Table 4 — Local labour market exposure by origin of value added for periods 2000-2008 and 2008-2015
Dependent Variable: 8-year equivalent change changes in manufacturing employment / working-age population in % pts

	(1)	(2)
Local exposure to the Chinese OLD value added content of Chinese exports	-3.189** (1.351)	-4.020*** (1.068)
Local exposure to the Chinese NEW value added content of Chinese exports	-4.882*** (1.364)	-5.718*** (0.998)
Local exposure to the Chinese NEVER value added content of Chinese exports	1.275 (5.022)	-1.510 (4.498)
Local exposure to the Foreign value added content of Chinese exports / worker	9.075** (3.535)	10.50*** (3.058)
Time Dummy * Local exposure to the Chinese OLD		2.861*** (0.609)
Time Dummy * Local exposure to the Chinese NEW		4.313*** (1.204)
Time Dummy * Local exposure to the Chinese NEVER		3.086 (6.046)
Time Dummy * Local exposure to the Foreign value added content of Chinese export		-8.132* (4.685)
Coefficient + Time Interaction for Chinese OLD value added content		-1.159 (0.866)
Coefficient + Time Interaction for Chinese NEW value added content		-1.405* (0.796)
Coefficient + Time Interaction for Chinese NEVER value added content		1.577 (4.813)
Coefficient + Time Interaction for Foreign value added content		2.369 (3.721)
Observations	722	1,444
R-squared	0.656	0.592
Census division dummies, controls, constant, t	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Interpretation

- OLD & NEW significant in first period
- NEW significant in second period, indicates "rolling adjustment"
- NEVER is never significant

Conclusions

- Contribute new and accurate value added exposure measure
- Adjustment seems to have largely concluded
- Effects likely due to China-specific factors hypothesised in ADH 2016 rather than increased GVC integration
- Prolonged adjustment period due to dynamics of China's comparative advantage

Policy

- Positive macroeconomic effects: Caliendo and Parro (2015), Handley and Limao (AER, forthcoming); Amiti, Dai, Feenstra, Romalis (CERP, 2017), Arkolakis, Esposito, Adao (2017)
- All trade shocks followed by adjustment – China shock exceptionally large, unique event in history
- All technology shocks followed by adjustment – more disruptive technologies on the horizon
- Labour market policies key to fast and successful adjustment

*While trade and globalization have
yielded net economic benefits
for the U.S. economy, they have also
created severe local hardships
that the U.S. and other advanced economies have
struggled to address.*

– Bob Kaplan, Dallas Fed President