

The Impact of Chinese Trade on U.S. Employment: The Good, The Bad, and The Debatable

Nicholas Bloom^a Kyle Handley^b André Kurmann^c Philip Luck^d

^aStanford University

^bUniversity of Michigan

^cDrexel University

^dUniversity of Colorado Denver

NBER SI Labor Studies

July 24, 2019

*Disclaimer: Any opinions and conclusions expressed herein are those of the author(s)
and do not necessarily represent the views of the U.S. Census Bureau. All results
have been reviewed to ensure that no confidential information is disclosed.*

The Impact of Chinese Trade on U.S. Employment: The Good, The Bad, and The Debatable (new title under debate)

Nicholas Bloom^a Kyle Handley^b André Kurmann^c Philip Luck^d

^aStanford University

^bUniversity of Michigan

^cDrexel University

^dUniversity of Colorado Denver

NBER SI Labor Studies

July 24, 2019

*Disclaimer: Any opinions and conclusions expressed herein are those of the author(s)
and do not necessarily represent the views of the U.S. Census Bureau. All results
have been reviewed to ensure that no confidential information is disclosed.*

Two facts and a question

- Spectacular rise in import competition from China – the “China Shock” – is estimated to have exerted large negative effect on U.S. manufacturing employment.
 - ▶ Autor, Dorn and Hanson (2013); Pierce and Schott (2016); Acemoglu et al. (2016)

Two facts and a question

- Spectacular rise in import competition from China – the “China Shock” – is estimated to have exerted large negative effect on U.S. manufacturing employment.
 - ▶ Autor, Dorn and Hanson (2013); Pierce and Schott (2016); Acemoglu et al. (2016)
- U.S. has experienced large reorganization of production and employment towards non-manufacturing.
 - ▶ Autor and Dorn (2013); Bernard et al. (2017); Fort et al. (2018)

Two facts and a question

- Spectacular rise in import competition from China – the “China Shock” – is estimated to have exerted large negative effect on U.S. manufacturing employment.
 - ▶ Autor, Dorn and Hanson (2013); Pierce and Schott (2016); Acemoglu et al. (2016)
- U.S. has experienced large reorganization of production and employment towards non-manufacturing.
 - ▶ Autor and Dorn (2013); Bernard et al. (2017); Fort et al. (2018)
- Is some of this reorganization a consequence of rise in low-cost Chinese manufacturing?
 - ▶ *“The phrase on the back of iPhones—“Designed by Apple in California. Assembled in China”— highlights a key reason for the company’s remarkable success ...” – WSJ 07/24/18*

Paper reassesses the effects of the China Shock

- Based on similar estimation strategy to identify China Shock as existing literature (exposure by commuting zone and/or industry).
- Plus two advantages
 - (1) **Census micro-data:** use LBD, CMF, LFTTD & LEHD to (i) measure restructuring of U.S. employment within and across plants, firms, sectors, and geography and (ii) improve data precision
 - (2) **Time:** estimate up to 2014 and assess differential impact across time periods

Three key results

- (1) Manufacturing job losses coincide with service sector job gains, but gains not evenly distributed and overall effect unclear.

Three key results

- (1) Manufacturing job losses coincide with service sector job gains, but gains not evenly distributed and overall effect unclear.
- (2) Within-firm reorganization—in particular industry switching—accounts for bulk of manufacturing job losses.
 - ▶ driven by large, importing firms that expand in non-manufacturing

Three key results

- (1) Manufacturing job losses coincide with service sector job gains, but gains not evenly distributed and overall effect unclear.
- (2) Within-firm reorganization—in particular industry switching—accounts for bulk of manufacturing job losses.
 - ▶ driven by large, importing firms that expand in non-manufacturing
- (3) A tale of high vs. low human capital areas
 - ▶ high HC areas (e.g. Coasts) experience mfg job losses offset by non-mfg job gains and no earnings losses
 - ▶ low HC areas (e.g. Midwest, South) experience large mfg job losses without non-mfg gain and large earnings losses

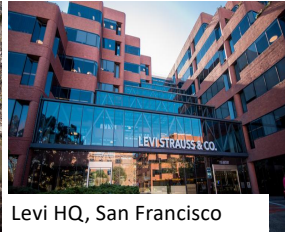
Consistent with a “Coastal” story



Apple HQ, San Jose



Nike HQ, Portland



Levi HQ, San Francisco



Hasbro HQ, Providence



Raytheon HQ, Waltham

We build on large prior literature – some examples

- **Employment:** Bernard et al. (2006); Autor et al. (2013, 2016); Pierce and Schott (2016); Acemoglu et al. (2016); Asquith et al. (2017)
- **Innovation and reorganization:** Bloom et al. (2015); Magyari (2016); Bernard et al. (2017); Autor et al. (2019)
- **Global production sharing:** Bernard and Fort (2015); Breinlich et al. (2018); Fort et al. (2018); Hummels et al. (2014); Kamal (2018); Nayar et al. (2016); Arkolakis et al. (2018)
- **Other benefits:** new varieties and lower import prices (Handley & Limão, 2017); net positive welfare effects (Amiti et al., 2018; Galle et al., 2018; Caliendo et al. 2019); new US export opportunities (Feenstra & Sasahara, 2017); and positive downstream effects (Wang et al., 2018).

Roadmap of presentation

(1) Data and empirical strategy

(2) Three key results

Census micro-data

- Employment and payroll from Longitudinal Business Database (LBD)
- Industry affiliation encoded at establishment level using time-consistent NAICS codes developed by Fort and Klimek (2016)
- Firm-level trade flows from Longitudinal Firm Trade Transaction Database (LFTTD)
- Establishment details from Census of Manufacturers (CMF)
- Job turnover and churn rates from Quarterly Workforce Indicators (Firm-side LEHD)

Measuring the China Shock as in Acemoglu et al. (2016)

- Change in Chinese import exposure of Commuting Zone (CZ) c over period τ

$$\Delta IP_{c\tau} = \sum_j \frac{L_{jct}}{L_{ct}} \Delta IP_{j\tau}$$

where Chinese import penetration in industry j

$$\Delta IP_{j\tau} = \frac{\Delta M_{j\tau}^{UC}}{Y_{j,91} + M_{j,91} - EX_{j,91}}$$

Measuring the China Shock as in Acemoglu et al. (2016)

- Change in Chinese import exposure of Commuting Zone (CZ) c over period τ

$$\Delta IP_{c\tau} = \sum_j \frac{L_{jct}}{L_{ct}} \Delta IP_{j\tau}$$

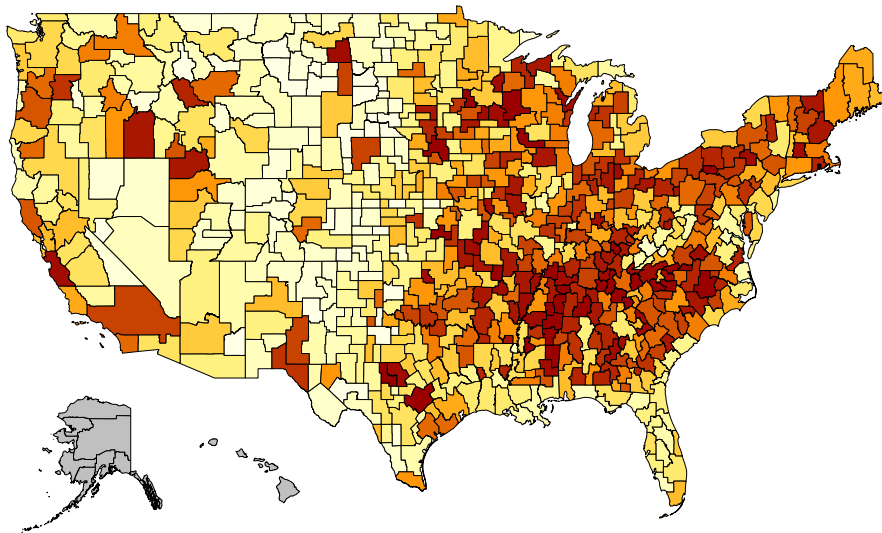
where Chinese import penetration in industry j

$$\Delta IP_{j\tau} = \frac{\Delta M_{j\tau}^{UC}}{Y_{j,91} + M_{j,91} - EX_{j,91}}$$

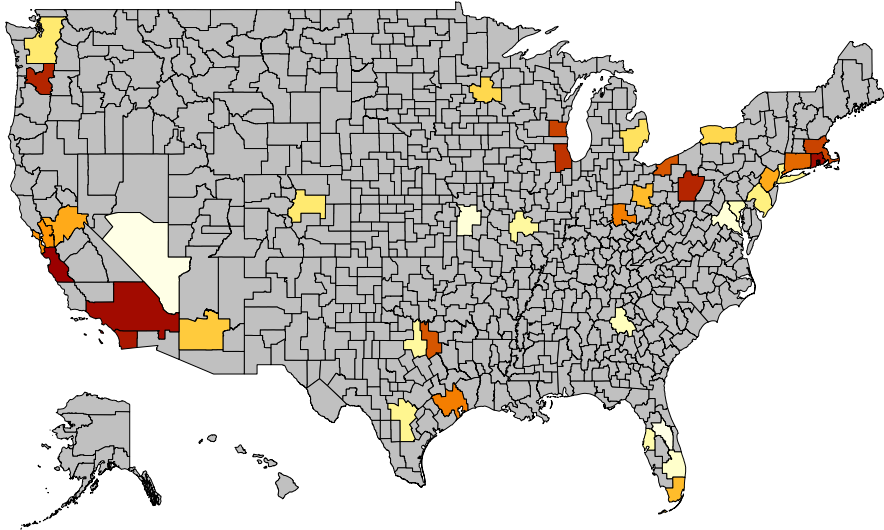
- To identify supply-side effect of Chinese imports, instrument with import penetration to other developed countries

$$\Delta IP_{c\tau}^{IV} = \sum_j \frac{L_{jct-10}}{L_{ct-10}} \Delta IPO_{j\tau} \text{ with } \Delta IPO_{j\tau} = \frac{\Delta M_{j\tau}^{OC}}{Y_{j,89} + M_{j,89} - EX_{j,89}}$$

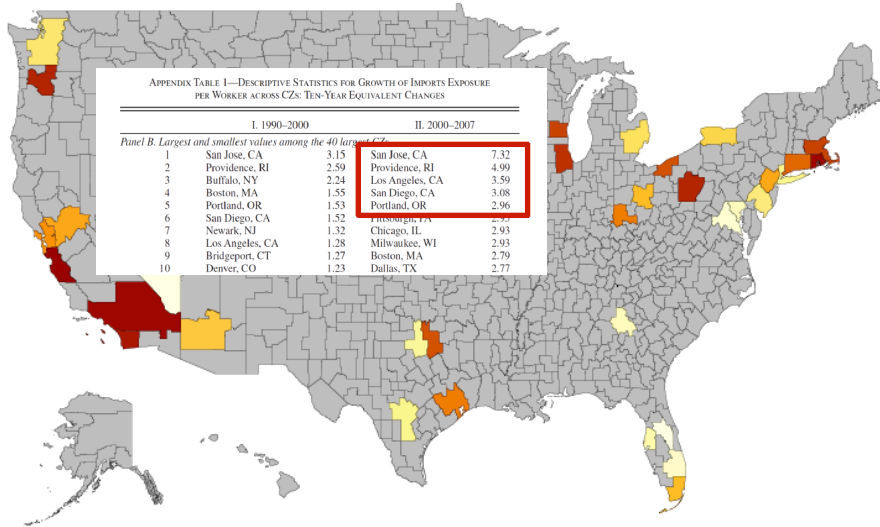
Import penetration heavy in the Mid-west and South



However, 38 largest CZs contain 50% total population many of which on the coasts



However, 38 largest CZs contain 50% total population many of which on the coasts



Empirical strategy

- Follow empirical strategy of Autor, Dorn and Hanson (2013, ADH)

$$\Delta y_{ic\tau} = \alpha_{i\tau} + \beta_i \Delta IP_{c\tau} + \mathbf{X}'_{c\tau} \gamma_i + \varepsilon_{ic\tau}$$

- ▶ $\Delta y_{ic\tau}$ = change in labor market variable y for sector i and CZ c over time interval τ
- ▶ $\Delta IP_{c\tau}$ = change in Chinese import penetration for CZ c over time interval τ
- ▶ $\mathbf{X}_{c\tau}$ = vector of beginning of interval τ controls for CZ c (as in ADH, from NBER-CES, ACS, and Decennial Census)

Empirical strategy

- Follow empirical strategy of Autor, Dorn and Hanson (2013, ADH)

$$\Delta y_{ic\tau} = \alpha_{i\tau} + \beta_i \Delta IP_{c\tau} + \mathbf{X}'_{c\tau} \gamma_i + \varepsilon_{ic\tau}$$

- ▶ $\Delta y_{ic\tau}$ = change in labor market variable y for sector i and CZ c over time interval τ
 - ▶ $\Delta IP_{c\tau}$ = change in Chinese import penetration for CZ c over time interval τ
 - ▶ $\mathbf{X}_{c\tau}$ = vector of beginning of interval τ controls for CZ c (as in ADH, from NBER-CES, ACS, and Decennial Census)
- Baseline τ = Economic Census (EC) 5-year intervals (92-97, 97-02, 02-07, 07-12)
 - ▶ industry coding more accurate in EC years. Approx $5\times$ as many estabs switch from mfg to non-mfg in EC years

Empirical strategy

- Follow empirical strategy of Autor, Dorn and Hanson (2013, ADH)

$$\Delta y_{ic\tau} = \alpha_{i\tau} + \beta_i \Delta IP_{c\tau} + \mathbf{X}'_{ct} \gamma_i + \varepsilon_{ic\tau}$$

- ▶ $\Delta y_{ic\tau}$ = change in labor market variable y for sector i and CZ c over time interval τ
 - ▶ $\Delta IP_{c\tau}$ = change in Chinese import penetration for CZ c over time interval τ
 - ▶ $\mathbf{X}_{c\tau}$ = vector of beginning of interval τ controls for CZ c (as in ADH, from NBER-CES, ACS, and Decennial Census)
- Baseline τ = Economic Census (EC) 5-year intervals (92-97, 97-02, 02-07, 07-12)
 - ▶ industry coding more accurate in EC years. Approx $5\times$ as many estabs switch from mfg to non-mfg in EC years
 - Note Bartik issues: Goldsmith-Pinkham, Sorkin and Swift (2018); Borusyak, Hull and Jaravel (2019); Adão, Kolesar and Morales (2018); Jaeger, Ruist and Stuhler (2018)

Three key results

- (1) Manufacturing job losses and non-manufacturing job gains**
- (2) Within-firm reorganization – in particular industry switching
- (3) A tale of high vs. low human capital areas

Manufacturing job losses and non-manufacturing job gains

IMPORT PENETRATION FROM CHINA AND CHANGE IN SECTORAL EMPLOYMENT
2SLS ESTIMATES AT CZ LEVEL FOR STACKED CENSUS 5-YEAR LONG DIFFERENCES 1992-2012

Dependent variable: annualized CZ sectoral growth rate

	Manufacturing Employment		Non-Manufacturing Employment		Total CZ Employment	
Annual Δ in China IP	-3.558** (1.674)	-4.292*** (1.344)	1.460* (0.823)	1.356* (0.818)	0.598 (0.813)	0.318 (0.800)
Annual Δ in China IP x Post 2007		12.750 (14.910)		1.811 (6.213)		4.874 (6.012)
Observations (rounded)	2900	2900	2900	2900	2900	2900

Notes: Each long difference contains (rounded) 700 CZs. All regressions include the original ADH controls and Census division dummies as well as 1980-90 employment growth pretrends. Coefficients estimates are weighted by 1991 CZ population. Robust standard errors in parenthesis are clustered at the CZ level.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

All 5yr stacks

bilateral trade

bodies vs. jobs

Manufacturing job losses and non-manufacturing job gains

IMPORT PENETRATION FROM CHINA AND CHANGE IN SECTORAL EMPLOYMENT
2SLS ESTIMATES AT CZ LEVEL FOR STACKED CENSUS 5-YEAR LONG DIFFERENCES 1992-2012

Dependent variable: annualized CZ sectoral growth rate

	Manufacturing Employment		Non-Manufacturing Employment		Total CZ Employment	
Annual Δ in China IP	-3.558** (1.674)	-4.292*** (1.344)	1.460* (0.823)	1.356* (0.818)	0.598 (0.813)	0.318 (0.800)
Annual Δ in China IP x Post 2007		12.750 (14.910)		1.811 (6.213)		4.874 (6.012)
Observations (rounded)	2900	2900	2900	2900	2900	2900

Notes: Each long difference contains (rounded) 700 CZs. All regressions include the original ADH controls and Census division dummies as well as 1980-90 employment growth pretrends. Coefficients estimates are weighted by 1991 CZ population. Robust standard errors in parenthesis are clustered at the CZ level.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

All 5yr stacks

bilateral trade

bodies vs. jobs

Manufacturing job losses and non-manufacturing job gains

IMPORT PENETRATION FROM CHINA AND CHANGE IN SECTORAL EMPLOYMENT
2SLS ESTIMATES AT CZ LEVEL FOR STACKED CENSUS 5-YEAR LONG DIFFERENCES 1992-2012

Dependent variable: annualized CZ sectoral growth rate

	Manufacturing Employment		Non-Manufacturing Employment		Total CZ Employment	
Annual Δ in China IP	-3.558** (1.674)	-4.292*** (1.344)	1.460* (0.823)	1.356* (0.818)	0.598 (0.813)	0.318 (0.800)
Annual Δ in China IP x Post 2007		12.750 (14.910)		1.811 (6.213)		4.874 (6.012)
Observations (rounded)	2900	2900	2900	2900	2900	2900

Notes: Each long difference contains (rounded) 700 CZs. All regressions include the original ADH controls and Census division dummies as well as 1980-90 employment growth pretrends. Coefficients estimates are weighted by 1991 CZ population. Robust standard errors in parenthesis are clustered at the CZ level.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

All 5yr stacks

bilateral trade

bodies vs. jobs

Comparison to Autor, Dorn and Hanson (2013)

	Autor, Dorn and Hanson (2013)	ADH Replication with LBD data	NAICS industries & ΔIP as in Acemoglu et al.	Census 5-year diffs 1992-2007	Census 5-year diffs 1992-2012	Baseline: Census 5-year diffs 1992-2012 and pretrends
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Manufacturing sector						
Annual Δ in China IP	-4.231*** (1.047)	-5.584*** (1.384)	-6.694*** (1.845)	-4.256*** (1.406)	-3.687*** (1.690)	-3.558** (1.674)
Panel B: Non-manufacturing sector						
Annual Δ in China IP	-0.274 (0.651)	-0.230 (0.878)	0.977 (1.074)	2.201** (0.383)	2.304** (0.955)	1.460* (0.823)
Stacked long differences	90-00 00-07	90-00 00-07	91-00 00-07	92-97, 97-02 02-07	92-97, 97-02 02-07, 07-12	92-97, 97-02 02-07, 07-12
Pre-trend Controls	No	No	No	No	No	Yes
Observations (rounded)	1400	1400	1400	2200	2900	2900

Pretrends

All 5yr stacks

bodies vs. jobs

Three key results

- (1) Manufacturing job losses and non-manufacturing job gains
- (2) **Within-firm reorganization – in particular industry switching**
- (3) A tale of high vs. low human capital areas

Employment growth decomposition

- Investigate effect of China Shock on different margins of employment growth, using Davis, Haltiwanger and Schuh (DHS) growth rates

$$g_{ict,t-k} \equiv \frac{E_{ict} - E_{ict-k}}{0.5(E_{ict} + E_{ict-k})} = \frac{(JC_{ict}^{cont}) - (JD_{ict}^{cont}) + (E_{ict}^{entry}) - (E_{ict-k}^{exit}) + (S_{ict}^{in}) - (S_{ict-k}^{out})}{0.5(E_{ict} + E_{ict-k})}$$

- Job Creation and Job Destruction** from continuing establishments
- Entry and Exit** of establishments
- Switching In and Out** of establishments from / to other sector
 - S_{ict}^{in} year t employment of estabs that switched into sector i b/w $t-k$ and t
 - S_{ict-k}^{out} year $t-k$ employment of estabs that switched out of sector i b/w $t-k$ and t

Plant shrinkage, plant closure and industry switching drive manufacturing job losses

	Net Employment Growth	Job Creation by Continuing Establishments	Job Destruction by Continuing Establishments	Entry of Establishments & Firm Birth	Exit of Establishments & Firm Death	Switch In from Other Sector	Switch Out to Other Sector
Panel A: Effect on CZ employment growth component in Manufacturing sector							
Annual Δ in China IP	-3.558** (1.674)	0.414 (0.686)	-0.842 (0.818)	0.569 (0.767)	-2.588* (1.344)	0.606*** (0.191)	-1.717*** (0.595)

- Plant closings by continuing firms account for 60% contribution from exits. [Details](#) [Robust](#)
- Less plant shrinking, closures and switching in drive service job gains – not entry [Details](#)

Industry switching of manufacturing plants mainly to offshoring-related services (R&D, management, wholesale)

	Non-manufacturing switch-in NAICS industries			
	All Non-manufacturing	54 (Prof services) & 55 (Management)	42 (Wholesale)	Other
Manufacturing switch-out	1.717*** (0.595)	1.086* (0.577)	0.490** (0.197)	0.140 (0.169)

- Primarily driven by plants within NAICS 33 (Metal, Machinery, Computer & Electronics, Electrical, Transportation equm, Furniture) [Full mfg switch matrix](#)
- Plants switching out of manufacturing shrink by approximately 10% and workforce turnover doubles. [Details](#)

Large, importing firms that expand in non-manufacturing drive manufacturing job losses

	Manufacturing Employment Growth	Contribution by Firms Expanding in Non-Mfg	Contribution by Importing Firms	Contribution by Firms with 1000+ Employees	Contribution by Estabs with Low Earnings per Worker
Annual Δ in China IP	-3.558** (1.674)	-2.600** (1.014)	-3.896*** (1.365)	-2.791** (1.398)	-2.306** (0.911)

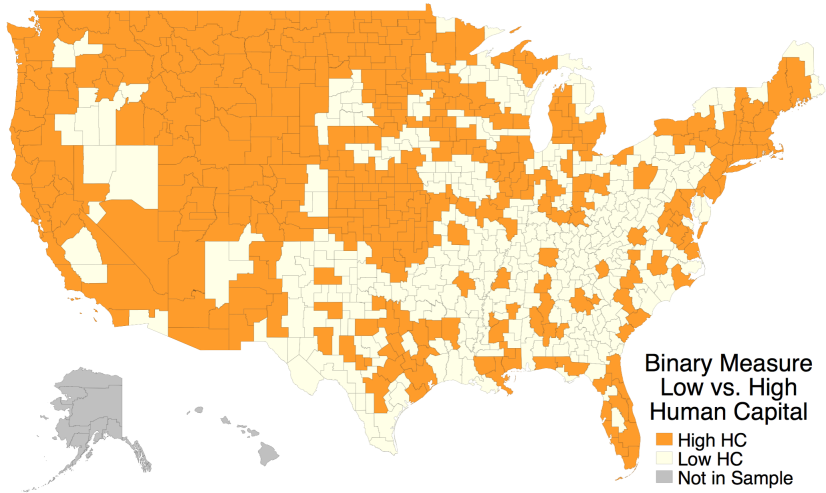
- 80% of employment loss due to switching out of manufacturing occurs within large importing firms [Details](#) [Compustat](#)

Three key results

- (1) Manufacturing job losses and non-manufacturing job gains
- (2) Within-firm reorganization – in particular industry switching
- (3) **A tale of high vs. low human capital areas**

High versus low human capital across Commuting Zones

- CZs with above vs below median share of population with a college degree in 1990



High HC areas experience smaller manufacturing job losses (with 50% from industry switching)

	Net Employment Growth (A)	Net Switching to Non-Mfg (B)	Conventional Emp. Growth (A) - (B)	Job Creation by Continuing Establishments	Job Destruction by Continuing Establishments	Net Entry and Exit of Establishments
Annual Δ in China IP \times 1(HHC)	-3.108 (2.056)	-1.640** (0.803)	-1.468 (1.949)	0.932 (0.923)	-0.668 (1.040)	-0.345 (0.840)
Annual Δ in China IP \times 1(LHC)	-4.527** (1.835)	-0.528 (0.528)	-3.999** (1.665)	-0.100 (0.564)	-1.770** (0.853)	-2.129*** (0.860)

- Similar results when negative CZ mfg effect decomposed by high vs. low average earnings plants [Details](#)

Low HC areas do not experience offsetting non-mfg job gains and see large nominal earnings declines

	CZ Employment Growth	Nominal Average Earnings Growth		
		CZ	Manufacturing	Non-Mfg
Annual Δ in China IP x 1(HHC)	0.913 (1.085)	0.635 (1.245)	3.887* (2.227)	0.466 (1.301)
Annual Δ in China IP x 1(LHC)	-1.684 (1.134)	-5.172*** (1.243)	-2.332 (1.517)	-6.695*** (1.647)

- larger negative effects on participation and employment rates in LHC CZs Labor market states

Three key results

- (1) Manufacturing job losses and non-manufacturing job gains
- (2) Within-firm reorganization – in particular industry switching
- (3) A tale of high vs. low human capital areas

Important point: What's happening overall? Depends on what you count

	Total CZ Emp/Pop Share (LAUS = workers)	Total CZ Emp/Pop Share (LBD = jobs)	Difference in Emp/Pop Share (LBD vs. LAUS)
Annual Δ in China IP	-0.779** (0.369)	0.425 (0.425)	1.203** (0.488)
Stacked long differences	92-97, 97-02 02-07, 07-12	92-97, 97-02 02-07, 07-12	92-97, 97-02 02-07, 07-12
Pre-trend Controls	Yes	Yes	Yes
Observations (rounded)	2900	2900	2900

- Important difference in employment outcomes for jobs (LBD) versus residents (LAUS) – due either to increase in part-time (unlikely) or changing commuting patterns.
- Difference concentrated largely in HHC areas [Details](#) [Back to Benchmark](#)

Summary and implications

- Manufacturing job losses coincide with service sector job gains
 - ▶ net effect less clear, due to difference between "jobs" and "bodies" as well as GE effects

Summary and implications

- Manufacturing job losses coincide with service sector job gains
 - ▶ net effect less clear, due to difference between "jobs" and "bodies" as well as GE effects
- Firm reorganization—especially plant switching out of manufacturing into offshore-related activities—important for understand manufacturing employment losses
 - ▶ occurs predominantly in HHC areas, accounting for 50% of manufacturing employment effect

Summary and implications

- Manufacturing job losses coincide with service sector job gains
 - ▶ net effect less clear, due to difference between "jobs" and "bodies" as well as GE effects
- Firm reorganization—especially plant switching out of manufacturing into offshore-related activities—important for understand manufacturing employment losses
 - ▶ occurs predominantly in HHC areas, accounting for 50% of manufacturing employment effect
- Reallocation from mfg towards non-mfg employment—within large firms but not necessarily in same location
 - ▶ some CZs (high-human capital) and some firms (multinationals) are more agile and able to cope with trade shocks

Thank You

Appendix

Largest U.S. manufacturing *firms* did not seem to have suffered much

Dependent variables: Change in measure of firm performance

	Employment	Sales	Profits	Investment	Market Value
Panel A: Manufacturing Firms w/ Trade Exposure					
D in Firm-Level China IP	-0.209 (0.172)	-0.345* (0.186)	-3.014** (1.514)	-0.110 (0.130)	-0.134 (0.182)
Panel B: Manufacturing Firms w/ Trade Exposure, Employment Weighted					
D in Firm-Level China IP	0.334 (0.423)	0.312 (0.275)	0.263 (0.533)	0.120 (0.078)	-0.472 (0.353)
Observations	10429	10439	10451	10493	9604

Notes: Import penetration measure in all regressions is the five year change in Chinese imports / absorption attributed to firms based on their average sales over the period 1987 to 1992. Estimation is performed on a rolling window of stacked five-year long differences spanning 1992-2007. All regressions include industry and year fixed effects. In panel C coefficients estimates are weighted by initial firm employment. Robust standard errors reported in parenthesis are clustered at firm and industry level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

- Note: Compustat publicly listed firms global operations. Replication file

<http://web.stanford.edu/~nbloom/>

Robustness to different pretrend controls

	No pretrends	1980-90 sectoral employment growth pretrends	1980-90 sectoral employment share pretrends
Panel A: Manufacturing employment			
Annual Δ in China IP	-3.697*** (1.675)	-3.558** (1.674)	-4.091*** (1.701)
Panel B: Non-manufacturing employment			
Annual Δ in China IP	2.922*** (0.945)	1.460* (0.823)	1.689** (0.807)
Panel C: Total CZ employment			
Annual Δ in China IP	1.238 (0.924)	0.598 (0.813)	0.651 (0.801)
Observations (rounded)	2900	2900	2900

Establishment entry & exit by firm survival

	Entry of Establishments	=	Openings by Continuing Firms	+	Openings from Firm Birth		Exit of Establishments	=	Closings by Continuing Firms	+	Closings from Firm Death
Panel A: Manufacturing sector											
Annual Δ in China IP	0.569		-0.285		0.854		-2.588*		-1.593*		-0.995
	(0.767)		(0.532)		(0.598)		(1.344)		(0.832)		(0.882)
Panel B: Non-manufacturing sector											
Annual Δ in China IP	-0.096		-0.033		-0.063		0.748*		0.611**		0.137
	(0.498)		(0.318)		(0.419)		(0.430)		(0.287)		(0.329)

Industry switching of manufacturing plants occurs mainly from NAICS 33 to offshoring-related services (R&D, management, wholesale)

Dependent variables: growth contribution of component relative to average CZ manufacturing employment

		Non-manufacturing switch-in NAICS industries			
		All Non-manufacturing	54 (Professional Services) & 55 (Management)	42 (Wholesale)	Other Non-manufacturing
Manufacturing switch-out NAICS industries	All Manufacturing	1.717*** (0.595)	1.086* (0.577)	0.490** (0.197)	0.140 (0.169)
	31 (Food&Bev, Textile mills, Apparel, Leather)	0.140 (0.164)	0.040 (0.050)	0.140 (0.095)	-0.040 (0.113)
	32 (Wood, Paper, Petro&Coal, Chemicals, Plastics&Rubber, Nonmetallic)	-0.028 (0.141)	-0.127 (0.094)	0.036 (0.035)	0.062 (0.081)
	33 (Metal, Machinery, Computer&Electronics, Electrical, Transportation equm, Furniture)	1.605*** (0.622)	1.172** (0.594)	0.314** (0.148)	0.118 (0.087)

Data: Industry Classification Report

2017 Economic Census Industry Classification Report

CFN:

TYPE OF OPERATION TYPE OF OPERATION

Which ONE of the following best describes this establishment's principal type of operation? – Select only ONE

- ☐ Merchant Wholesaler/Jobber – An establishment primarily engaged in buying and selling on its own account merchandise produced by other companies.
- ☐ Broker, Representing Buyers and/or Sellers – Buying and/or selling merchandise on a brokerage basis for others, not receiving goods on consignment, and not taking title to the goods being sold
- ☐ Manufacturers' Representative or Agent – Selling merchandise on a commission or fee basis for a limited number of manufacturers on a continuing agency basis, and not taking title to the goods being sold
- ☐ Electronic Marketer – Business-to-business marketplace that facilitates the sale of goods for other buyers and sellers via the internet or other electronic means, operates on a commission or fee basis, not taking title to the goods being sold
- ☐ Other type of operation – Specify:

CLASS OF CUSTOMER HOUSEHOLD CONSUMERS

As a general business practice, did this establishment sell to household consumers and individual users in the past 12 months?

- ☐ Yes
☐ No

CLASS OF CUSTOMER HOUSEHOLD CONSUMER SALES

Were 10 percent or more of your sales to household consumers and individual users in the past 12 months?

- ☐ Yes
☐ No

2017 Economic Census Industry Classification Report

CFN:

CLASS OF CUSTOMER SALES TO RETAILERS OR WHOLESALERS FOR RESALE

Were 75 percent or more of this establishment's sales to retailers or wholesalers for resale in the past 12 months?

- ☐ Yes
☐ No

CLASS OF CUSTOMER PROOF OF BUSINESS OR PROFESSIONAL LICENSE

Did this establishment require proof of business or professional license from new customers in the past 12 months?

- ☐ Yes
☐ No

DETAIL OF SALES, SHIPMENTS, RECEIPTS, or REVENUE DETAIL OF SALES, SHIPMENTS, RECEIPTS, OR REVENUE

Report sales for the principal merchandise lines sold, type of construction work done, products produced, or services provided by this establishment as a whole percent of the total dollar volume of business (e.g. gasoline 85%, auto repairs 10%, oil 5%) in the past 12 months.

Description of Sales, Shipments, Receipts, or Revenue	Whole percent of sales and receipts in the past 12 months
	%
	%
	%
	%
	%
Total:	%

Timing – Importance of Census Years

- Census obtains industry codes from multiple sources: IRS, SSA, BLS and Economic Census (EC).
 - ▶ IRS and SSA industry information derived from tax files, for obtaining EINs. This is self-reported and is considered low quality by Census.
 - ▶ EC requires all domestic non-farm establishments to fill out an Industry Classification Report (ICR) questionnaire
 - ★ *“brief inquiry requesting information necessary to assign a kind-of-business code”* – Commerce Bureau
 - ▶ ICR questionnaire collects information on the physical location and principal business or activity, including class of customer and detail of sales, shipments, receipts, or revenues in order to assign a complete NAICS code.

Mfg job loss primarily driven by firm reorganization (plant shrinkage, plant closings and industry switching)

Dependent variables: growth contribution of component relative to average CZ manufacturing employment

	Net Employment Growth	Job Creation by Continuing Establishments	Job Destruction by Continuing Establishments	Entry of Establishments	Exit of Establishments	Switch In of Establishments from Non-Mfg.	Switch Out of Establishments to Non-Mfg
Panel A: Effect on CZ employment growth component in Manufacturing sector							
Annual D in China IP	-3.558** (1.674)	0.414 (0.686)	-0.842 (0.818)	0.569 (0.767)	-2.588* (1.344)	0.606*** (0.191)	-1.717*** (0.595)
Panel B: Contribution by firms expanding in Non-Manufacturing sector							
Annual D in China IP	-2.600** (1.014)	0.146 (0.310)	-0.814 (0.543)	0.074 (0.404)	-0.922* (0.519)	0.033 (0.058)	-1.118** (0.497)
Panel C: Contribution by importing firms							
Annual D in China IP	-3.896*** (1.365)	0.130 (0.541)	-1.565** (0.745)	0.086 (0.466)	-1.350* (0.812)	0.177 (0.142)	-1.374** (0.543)
Panel D: Contribution by firms with more than 1000 employees							
Annual D in China IP	-2.791** (1.398)	0.523 (0.600)	-0.800 (0.805)	-0.269 (0.478)	-0.910 (0.904)	0.240* (0.137)	-1.363** (0.556)

Non-mfg employment growth decomposition by firm characteristics

Dependent variables: growth contribution of component relative to average non-manufacturing employment

	Net Employment Growth	Job Creation by Continuing Establishments	Job Destruction by Continuing Establishments	Entry of Establishments	Exit of Establishments	Switch In of Establishments from Mfg.	Switch Out of Establishments to Mfg
Panel A: Effect on CZ employment growth component in Non-Manufacturing sector							
Annual Δ in China IP	2.291** (0.945)	-0.018 (0.327)	-0.681** (0.289)	0.949 (0.681)	-0.525 (0.425)	0.192*** (0.061)	0.037 (0.034)
Panel B: Contribution by firms contracting in Manufacturing sector							
Annual Δ in China IP	0.564** (0.225)	-0.053 (0.106)	-0.167 (0.127)	0.281** (0.126)	0.006 (0.134)	0.195*** (0.062)	0.020 (0.026)
Panel C: Contribution by importing firms							
Annual Δ in China IP	1.243*** (0.372)	0.051 (0.287)	-0.480** (0.224)	0.239 (0.208)	-0.363* (0.214)	0.143*** (0.052)	0.034 (0.032)
Panel D: Contribution by firms with more than 1000 employees							
Annual Δ in China IP	2.163*** (0.548)	0.166 (0.364)	-0.522** (0.266)	0.542* (0.313)	-0.831** (0.368)	0.140*** (0.052)	0.039 (0.033)

Negative mfg effect driven in large part by NAICS 33 subsector

	<i>Share of total manufacturing employment</i>	<i>Net Employment Growth</i>	<i>Job Creation by Continuing Establishments</i>	<i>Job Destruction by Continuing Establishments</i>	<i>Entry of Establishments & Firm Birth</i>	<i>Exit of Establishments & Firm Death</i>	<i>Switch In from Other Sector</i>	<i>Switch Out to Other Sector</i>
<i>Effect on CZ employment growth component in Manufacturing sector</i>								
Annual Δ in China IP	100%	-3.558** (1.674)	0.414 (0.686)	-0.842 (0.818)	0.569 (0.767)	-2.588* (1.344)	0.606*** (0.191)	-1.717*** (0.595)
<i>Contribution by NAICS 31 subsector (food & bev, textile mills, apparel, leather)</i>								
Annual Δ in China IP	17%	-0.940 (0.761)	-0.419 (0.353)	0.147 (0.399)	0.319 (0.470)	-0.941 (0.923)	0.095 (0.089)	-0.140 (0.164)
<i>Contribution by NAICS 32 subsector (wood, paper, petro & coal, chemical, plastics & rubber, nonmetallic)</i>								
Annual Δ in China IP	28%	1.686** (0.747)	-0.659* (0.346)	1.517*** (0.431)	-0.446* (0.268)	1.157** (0.530)	0.089 (0.088)	0.028 (0.141)
<i>Contribution by NAICS 33 subsector (metal, machinery, computer & electronic, electrical, transportation equm, furniture)</i>								
Annual Δ in China IP	55%	-4.301** (1.732)	1.494* (0.866)	-2.504*** (0.954)	0.695 (0.686)	-2.803* (1.445)	0.422*** (0.134)	-1.605*** (0.622)

Positive non-mfg effect is concentrated in activities related to mfg and tradable services

Dependent variables: growth contribution of component relative to average non-manufacturing employment

	<i>Share of total non- manufacturing</i>	<i>Net Employment Growth</i>	<i>Job Creation by Continuing Establishments</i>	<i>Job Destruction by Continuing Establishments</i>	<i>Entry of Establishments & Firm Birth</i>	<i>Exit of Establishments & Firm Death</i>	<i>Net Switching from/to Mfg</i>
<i>Effect on CZ employment growth component in Non-Manufacturing sector</i>							
Annual Δ in China IP	100%	2.291** (0.945)	-0.018 (0.327)	-0.681** (0.289)	0.949 (0.681)	-0.525 (0.425)	0.155** (0.077)
<i>Contribution by Non-Manufacturing subsectors 42 (wholesale), 54 (professional services) & 55 (management)</i>							
Annual Δ in China IP	16%	0.744** (0.302)	-0.090 (0.198)	-0.269 (0.207)	0.399** (0.201)	-0.012 (0.236)	0.153** (0.076)
<i>Contribution by Non-Manufacturing subsectors 48-49 (transportation & warehousing), 51 (information) & 52-53 (FIRE)</i>							
Annual Δ in China IP	16%	0.733*** (0.277)	0.054 (0.161)	-0.474*** (0.128)	-0.062 (0.173)	-0.262 (0.169)	0.005 (0.016)
<i>Contribution by other Non-Manufacturing subsectors (mining, utilities, construction, retail, education, health, entertainment, accomodation & food)</i>							
Annual Δ in China IP	68%	0.815 (0.730)	0.018 (0.338)	0.063 (0.206)	0.612 (0.499)	-0.250 (0.330)	-0.003 (0.021)

Manufacturing employment losses for high and low earnings establishments

- Classify establishments as high/low average earnings
 - ▶ Calculate median earnings per worker by NAICS 6-digit industry j
 - ▶ Classify establishment as high average earnings (HAE) if average earnings per worker $>$ national median for industry
 - ▶ Should be corr with establishment productivity (unmeasured for non-mfg, many missing for mfg)

Manufacturing employment losses for high and low earnings establishments

- Classify establishments as high/low average earnings
 - ▶ Calculate median earnings per worker by NAICS 6-digit industry j
 - ▶ Classify establishment as high average earnings (HAE) if average earnings per worker $>$ national median for industry
 - ▶ Should be corr with establishment productivity (unmeasured for non-mfg, many missing for mfg)
- Decompose CZ employment growth across establishments by high/low average earnings per worker (AE); e.g. for job creation in CZ c in sector i

$$JC_{ict}^{cont,HAE} = \sum_{e \in cont_{ic}} \max(E_{et} - E_{et-k}, 0) * 1(AE_{eijt-k} \geq AE_{ijt-k}^{median})$$

$$JC_{ict}^{cont} = JC_{ict}^{cont,HAE} + JC_{ict}^{cont,LAE}$$

Low average earnings establishments are hit harder by China Shock

	(A) Net Employment Growth	(B) Net Switching to Non-Mfg	(A) - (B) = Conventional Employment Growth	Job Creation by Continuing Establishments	Job Destruction by Continuing Establishments	Entry of Establishments	Exit of Establishments
	(1)	(2)	(3)	(4)	(5)	(7)	(6)
Panel A: Effect on CZ employment growth component in Manufacturing sector							
Annual Δ in China IP	-3.558** (1.674)	-1.111* (0.581)	-2.448 (1.574)	0.414 (0.686)	-0.842 (0.818)	0.569 (0.767)	-2.588* (1.344)
Panel B: Contribution by Establishments with Above Median Average Earnings							
Annual Δ in China IP	-1.249 (1.300)	-1.029* (0.546)	-0.221 (1.347)	0.128 (0.128)	0.764 (-0.764)	-0.141 (0.574)	-0.972 (1.002)
Panel C: Contribution by Establishments with Below Median Average Earnings							
Annual Δ in China IP	-2.306** (0.911)	-0.082 (0.168)	-2.224*** (0.863)	0.288 (0.311)	-1.605*** (0.547)	0.710 (0.548)	-1.617** (0.808)

Labor market effects in high vs low HC areas

	Unemp/Pop (LAUS)	NILF/Pop (LAUS)	Total CZ Emp/Pop (LAUS)	Total CZ Emp/Pop Share (LBD)	Difference in Emp/Pop Share (LBD vs. LAUS)
Annual Δ in China IP x 1(HHC)	0.246 (0.249)	0.562 (0.635)	-0.808 (0.539)	0.552 (0.567)	1.360** (0.676)
Annual Δ in China IP x 1(LHC)	-0.191 -0.142	0.939*** -0.351	-0.749** -0.353	-0.580 (0.478)	0.169 (0.489)

- Low HC areas experience substantial drop in labor force participation rate and employment-population rate of *residents* (LAUS).
- Note important difference in employment outcomes for jobs (LBD) versus residents (LAUS) – due either to increase in part-time (unlikely) or changing commuting patterns

Effect of China Shock on average earnings

	Total sector	NAICS subsectors		
Panel A. Manufacturing average earnings		31	32	33
Annual Δ in China IP	1.741 (1.399)	0.106 (1.655)	-1.380 (1.813)	2.097 (1.923)
Panel B. Non-manufacturing average earnings		42, 54 & 55	48-49, 51 & 52-53	All other
Annual Δ in China IP	-3.330*** (1.377)	-1.103 (1.809)	2.659 (1.659)	-6.252*** (2.366)
Panel C. Total CZ average earnings				
Annual Δ in China IP	-1.713 (1.055)			

Differential effects for Right-to-Work states

Dependent variables: annualized log change in sectoral average earnings and employment

	Log Average Earnings	Log Employment
Panel A. Manufacturing		
Annual Δ in China IP * (1-1[RTW])	1.561 (1.438)	-4.303** (1.697)
Annual Δ in China IP * 1[RTW]	1.598 (1.815)	-1.874 (2.871)
Panel B. Non-manufacturing		
Annual Δ in China IP * (1-1[RTW])	-2.179* (1.286)	2.102** (0.988)
Annual Δ in China IP * 1[RTW]	-6.832*** (1.786)	2.865** (1.453)
Panel C. Total CZ		
Annual Δ in China IP * (1-1[RTW])	-1.927* (1.149)	1.094 (0.991)
Annual Δ in China IP * 1[RTW]	-4.419*** (1.442)	1.716 (1.363)

Notes: 1[RTW] is a dummy variable taking the value of one for CZs in right-to-work states. Each stack contains (rounded) 700 CZs. All regressions include original ADH controls and Census division dummies. Reported coefficients estimates are weighted by 1991 CZ population. Robust standard errors reported in parenthesis are clustered at CZ level.

** Significant at 10%; ** Significant at 5%; *** Significant at 1%.*

Large, importing firms that expand in non-manufacturing drive manufacturing job losses

	Manufacturing Employment Growth	Contribution by Firms Expanding in Non-Mfg	Contribution by Importing Firms	Contribution by Firms with 1000+ Employees	Contribution by Estabs with Low Earnings per Worker
Annual Δ in China IP	-3.558** (1.674)	-2.600** (1.014)	-3.896*** (1.365)	-2.791** (1.398)	-2.306** (0.911)

Details

Robustness to all 5-year long-differences

IMPORT PENETRATION FROM CHINA AND CHANGE IN SECTORAL EMPLOYMENT
2SLS ESTIMATES AT CZ LEVEL FOR STACKED ALL 5-YEAR LONG DIFFERENCES 1991-2014

Dependent variable: annualized CZ sectoral growth rate

	Manufacturing Employment		Non-Manufacturing Employment		Total CZ Employment	
Annual Δ in China IP	-5.147** (2.450)	-5.591** (2.727)	2.311** (0.939)	1.305 (0.978)	0.419 (0.901)	-0.242 (0.987)
Annual Δ in China IP x Post 2007		4.466 (7.258)		10.120*** (3.574)		6.652** (3.037)
Observations (rounded)	13700	13700	13700	13700	13700	13700

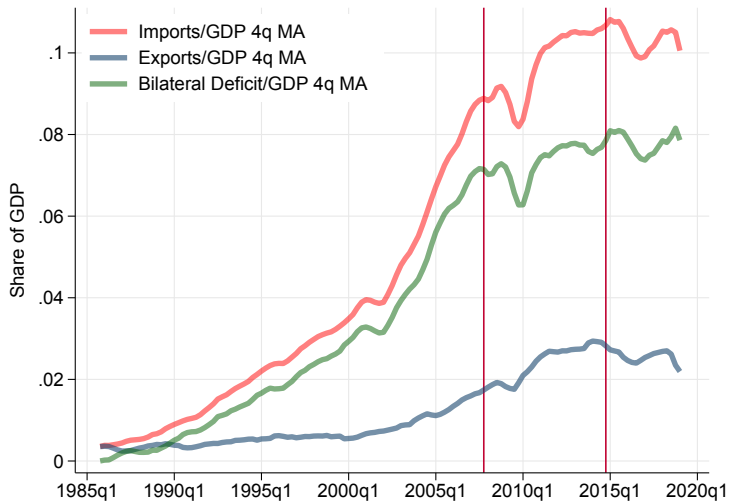
Notes: Each long difference contains (rounded) 700 CZs. All regressions include the original ADH controls and Census division dummies as well as 1980-90 employment growth pretrends. Coefficients estimates are weighted by 1991 CZ population. Robust standard errors in parenthesis are clustered at the CZ level.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Baseline

Benchmark

Bilateral trade deficit with China largely unchanged post 2007



Employment in plants switching out of manufacturing is correlated with higher workforce turnover

<i>Dependent variables: 5-year Average Firm-by-State Labor Force Dynamics</i>			
	Job Reallocation (Job Creation + Job Destruction)	Job Turnover (Hires + Seperations)	Job Churn (Hire - Creation + Seper - Destruction)
Employment Share of Switching Estabs.	0.070*** (0.008)	0.146*** (0.014)	0.076*** (0.011)
<i>Y Mean</i>	0.069	0.168	0.099
R Squared	0.114	0.053	0.019
Observations	5500	5500	5500

Notes: Sample includes all firms observed in the QWI with establishments that switch from manufacturing to non-manufacturing between Economic Census years (1997-2002, 2002-2007, 2007-2012).

Coefficients estimates are weighted by initial firm size. Robust standard errors in parenthesis are clustered at the firm level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

- Plants switching out of manufacturing shrink by approximately 10%, but turnover of workforce increases more.

Labor market effects in high vs low HC areas

	Total CZ Emp/Pop Share (LAUS = workers)	Total CZ Emp/Pop Share (LBD = jobs)	Difference in Emp/Pop Share (LBD vs. LAUS)
Annual Δ in China IP x 1(HHC)	-0.808 (0.539)	0.552 (0.567)	1.360** (0.676)
Annual Δ in China IP x 1(LHC)	-0.749** -0.353	-0.580 (0.478)	0.169 (0.489)

- Low HC areas experience substantial drop in employment-population rate of *residents* (LAUS), but difference between LAUS and LBD extreme in High HC areas. [Back](#)

Non-manufacturing Decomposition

	Net Employment Growth	Job Creation by Continuing Establishments	Job Destruction by Continuing Establishments	Entry of Establishments & Firm Birth	Exit of Establishments & Firm Death	Switch In from Other Sector	Switch Out to Other Sector
Panel B: <i>Effect on CZ employment growth component in Non-Manufacturing sector</i>							
Annual Δ in China IP	1.460* (0.823)	0.001 (0.315)	0.666** (0.285)	-0.096 (0.498)	0.748* (0.430)	0.187*** (0.060)	-0.046 (0.033)

- Less plant shrinking, fewer plant closures and industry switching drive non-manufacturing job gains – not firm entry [Back](#)

Plant shrinkage, plant closure and industry switching drive manufacturing job losses

	Net Employment Growth	Job Creation by Continuing Establishments	Job Destruction by Continuing Establishments	Entry of Establishments & Firm Birth	Exit of Establishments & Firm Death	Switch Outs to Other Sector	Switch Ins from Other Sector
<i>Panel A: Effect on CZ employment growth component in Manufacturing sector</i>							
Annual D in China IP	-5.692*** (1.570)	-0.191 (0.506)	-1.023 (0.650)	-0.606 (0.605)	-1.968** (0.925)	-0.498** (0.194)	-1.406** (0.598)