Import Effects on Regional Job Flows Through Regional and Industry Factors

Masahiro Endoh
Keio

September 2-3, 2020

Purposes

- Estimate the impact of import shocks on regional manufacturing job flows through industry factors
- Address difficulties of two methods Autor et al. (2013; ADH) employ
  - Use some regional variables in reduced-form regression to absorb regional shocks
  - Decompose the variance of imports into supply- and demand-driven components
- This study proposes Amiti-Weinstein (2018; AW) decomposition to sort out regional factors
  - Net job flows = Regional factors + Industry factors + Common factor
- Consider Imports from China, following the previous studies
  - Two import indexes: direct and comprehensive
- Further, estimate the import impact on job creation and destruction
  - Net job flows = Job creation + Job destruction

Main Findings

- Import shocks through industry factors account for less than half of those through net job flows
- Base estimation: implied mfg. job loss due to import from China is 670,000 during 1996-2016
  - 18% of actual mfg. job loss (3.7 million)
- Imports enhance job destruction by 5.5% and depress job creation by 1.2%
  - Trade impact on job churning is small, but the effect on net values become large
- Large establishments are sensitive to import shocks to exit
- Smaller establishments depress both job creation and destruction, while larger establishments enhance both
  - Smaller est. are countercyclical; Larger est. are procyclical

Revision from Previous Version

- Reframing the aim of the paper; focusing on the comparison with ADH
  - Delete the aspect of export; examine only imports from China
  - Use similar IV (Chinese export to eight developed countries)
  - Use region-level observations
- Apply Borusyak et al. (2018) method to obtain exposure-robust standard errors
  - Using a shift-share instrument leads to a downward bias in the standard error estimate (Borusyak et al., 2018; Adão et al., 2019)
  - Programs allow only one IV & one instrumented variable

Road map

- Key concepts
  - Job creation and job destruction
  - Amiti-Weinstein decomposition
- Background information
  - Related literature
  - Data sources
  - Job reallocation in Japan
- Strategy of estimation
  - Regional & Industry factors
  - Import variables & IV
- Estimation results
  - Net job flows
  - Job creation & Job destruction
- Implied job changes

Definition of Job Creation and Destruction

- By using establishment-level panel data, we can decompose net job change into job creation and job destruction

	2006	2016	Dif	
Establishment A	20	35	15	(Job creation)
Establishment B	30	10	-20	(Job destruction)
Establishment C	40	35	-5	(Job destruction)
total	90	80	-10	(Net job flow)

Amiti-Weinstein decomposition

- Decomposition of decadal regional and industry job changes into region, industry, and common factors

		Industry 1	Industry 2	Industry 3	total	change	Regional factor	w. Ind factor
Region	A	10 → 11	10 → 11	10 → 8	30 → 30	0	0.1	0
	B	0 → 1	10 → 8		10 → 9	-0.1	0	0
	C	10 → 8			10 → 8	-0.2	-0.3	0.2
total		20 → 20	20 → 19	10 → 8	50 → 47			
change		0	-0.05	-0.2	-0.06		Common factor	
I. factor		0.2	0	-0.2			-0.1	
weighted R. factor		-0.1	0.05	0.1				

Regional and Industry Factors

- Regional factors: regional demographic dynamics, industrial policy of local government, development of local transportation infrastructure, characteristics of local market, different ripple effects in regional input-output space
  - Regional variables such as skilled/female worker ratio used in ADH are not enough to absorb these factors
- Industry factors: technological progress, demand shift, direct and indirect effects of import shocks
- Common factor: a common factor to shift jobs

- Amiti-Weinstein decomposition discerns which part of an actual variation of job changes belongs to industries or regions
  - Inclusion or exclusion of an industry-region interaction term does not affect the magnitude of industry and regional factors

Related Literature 1: China Shock

- China shock on regional labor market using reduced form
  - Autor et al. (2013): imports from China decrease manufacturing jobs in the US
  - Dauth et al. (2014): trades with the East (Eastern Europe & China) increase manufacturing jobs in Germany
  - Taniguchi (2019): imports from China increase mfg. jobs in Japan
  - Positive effect of trade on employment by including indirect effect on other manudacturing sector or service sector: Dosono et al. (2015); Feenstra et al. (2017); Feenstra and Sasahara (2018); Wang et al. (2018)
- This paper uses industry factor as dependent variables
  - Previous cross-regional analysis may overestimate the impact due to regional factors

Related Literature 2: Shift-share (Bartik) Instrument

- Cross-region estimation uses a shift-share instrument (Bartik instrument) to change industry-level import shocks to region-level ones
- Using a shift-share instrument leads to a downward bias in the standard error estimate (Borusyak et al. 2018; Adão et al., 2019)
- This paper uses Borusyak et al. (2018) method to obtain exposure-robust standard errors

Related Literature 3: Social Costs of Trade

- Many papers investigate economic and social outcome of import shocks
  - Decrease manufacturing employment: Autor et al. (2013); Dauth et al. (2014); Acemoglu et al. (2016)
  - Reduce wages: Autor et al. (2014); Ebenstein et al. (2014); Hummels et al. (2014)
  - Induce physical and mentak illness: Pierce and Schott (2016); Adda and Fawaz (2017); Autor et al. (2018); Fan et al. (2020)
  - Induce crime: Dix-Carneiro et al. (2018); Dell et al. (2019)
  - Election results: Autor et al. (2016); Blanchard et al. (2019)
- Social outcomes are supposed to come from job destruction and resulting job reallocation
  - The appropriate estimation of import impact needs to have the balanced view on social costs

Related Literature 4: Job Reallocation

- Job reallocation attributed to international trade
  - Job reallocation: the sum of jobs created and destructed
  - Seminal study: Davis and Haltiwanger (1992); Davis, Haltiwanger, and Schuh (1996)
  - The effect of international transaction on job reallocation: Klein, Schuh, and Triest (2003) for exchage rate movement, Baumgarten (2015) for exports; Kondo (2018) for impoting competition
- Asquith et al. (2019): China shock affects U.S. employment mainly through deaths of establishments
  - This paper provides the similar result in Japan: the exit of larger establishments is the driving force

Related Literature 5: Worker Reallocation

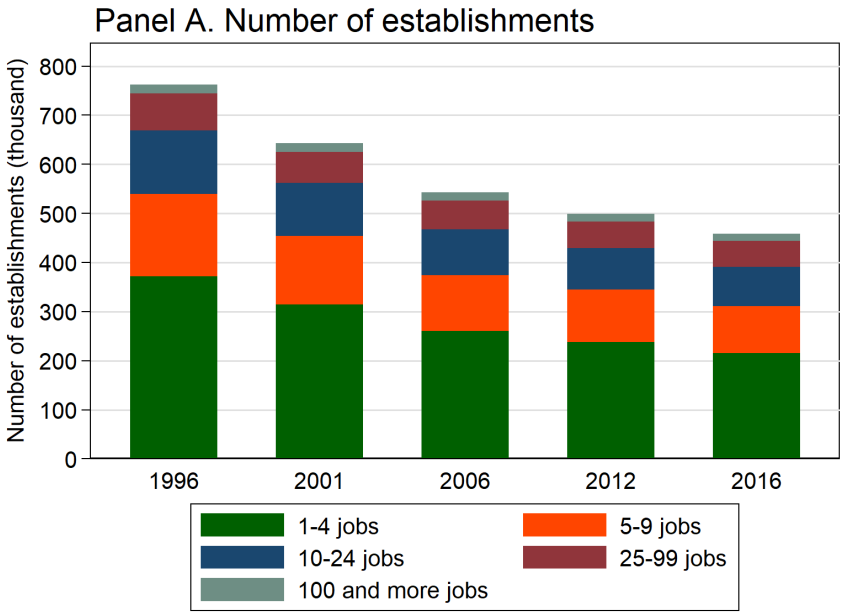
- Trade impact on worker reallocation
  - Reduced-form regression with longitudinal worker data: Autor et al. (2014); Ebenstein et al. (2014); Hummels et al. (2014)
  - Structural estimation of underlying parameters: Artuç et al. (2010); Dix-Carneiro (2014); Artuç and McLaren (2015); Caliendo et al. (2015); Coşar et al. (2016)
- Benefit of analyzing job reallocation in establishments: observe the behavior of labor demand entities

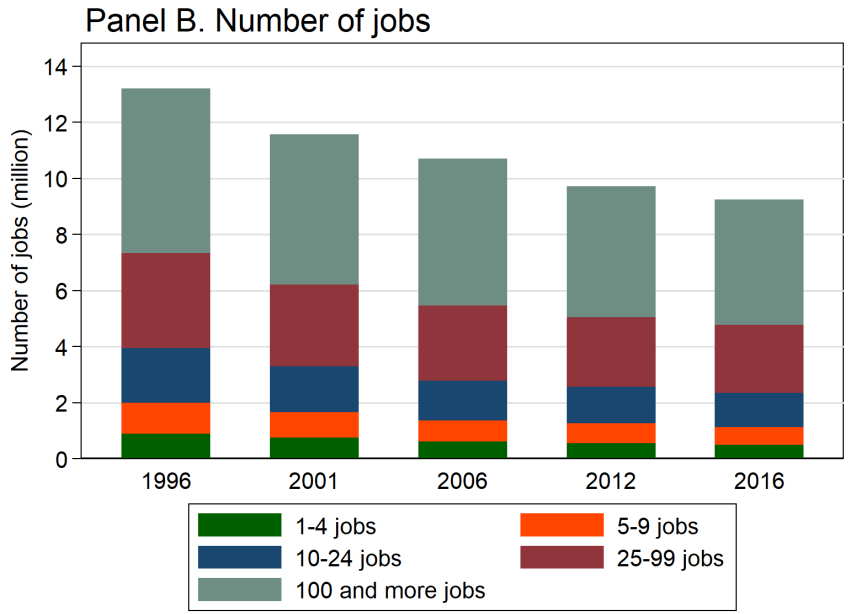
Data Sources

- Panel data of establishments 1996-2016, four five-year periods, constructed from the government survey
  - *The Establishment and Enterprise Census*: 1996, 1999, 2001, 2004, and 2006
  - *The Economic Census for Business Frame*: 2009 and 2014
  - *The Economic Census for Business Activity*: 2012 and 2016
- Japanese imports: Japan Customs
- Chinese exports: World Integrated Trade Solution
- Regional demarcation: Metropolitan and Micropolitan Employment Areas (U. of Tokyo)
  - Some municipalities are deleted from the establishment panel data
    - ★ Municipalities not included in any Employment Areas
    - ★ 11 municipalities hit by disasters (Miyake Island volcano eruption and Fukushima nuclear disasters)
- 108 industries (exclu. oil and metal refining), 228 regions

Numbers of Establishments and Jobs

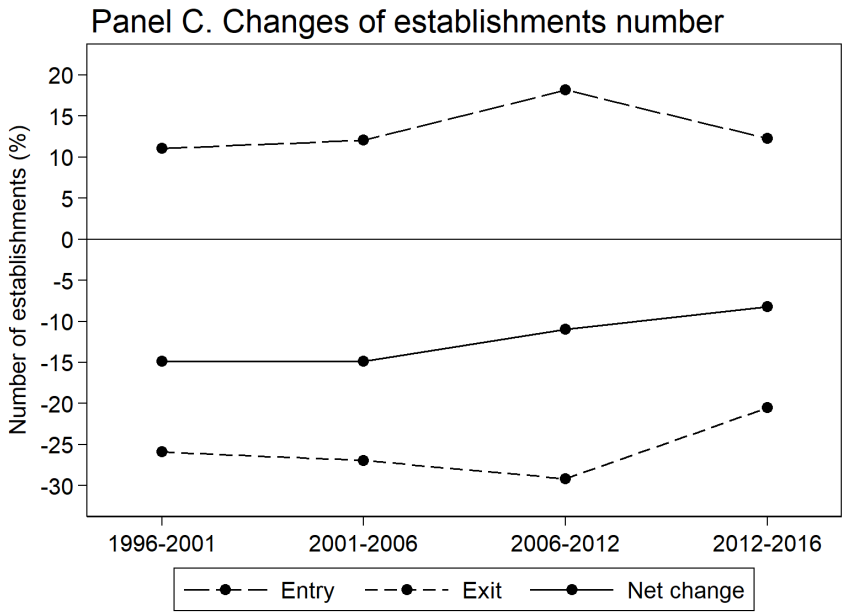
- Manufacturing establishments and jobs decreased by 40% and 30% from 1996 to 2016

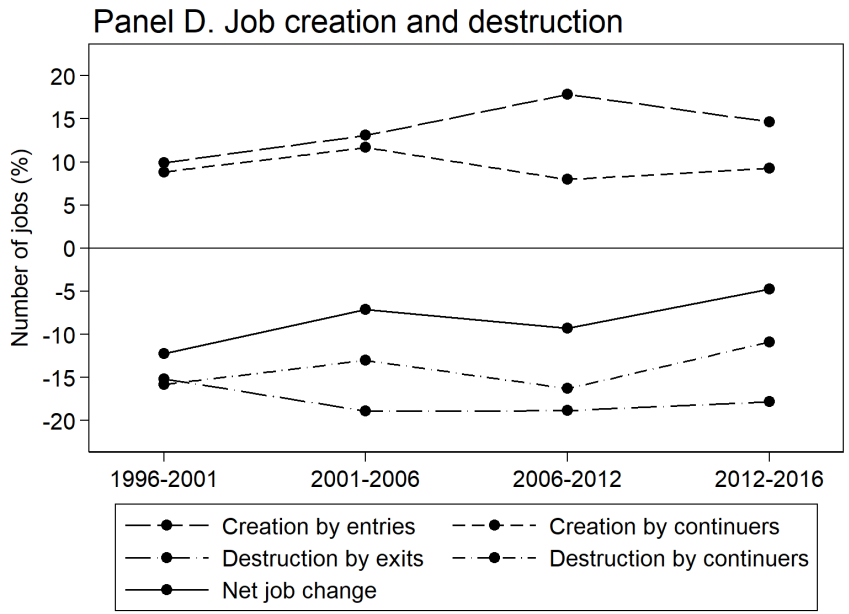




Churning of Establishments and Jobs

- Active churning exists under the steady decline of manufacturing establishments and jobs
  - The entry and exit of establishments predominate in job churning





Percentage Changes of Jobs in Industry and Region

- $E^{e}_{i,r,t}$: total number of jobs in an establishment e, which is the element of a set of industry i, a set of region r, and a set of time t
- $E_{i,r,t} = \sum_{e \in (i,r,t)} E^{e}_{i,r,t}$, $E_{i,t} = \sum_{e \in (i,t)} E^{e}_{i,r,t}$, $E_{r,t} = \sum_{e \in (r,t)} E^{e}_{i,r,t}$
- Percentage changes of $E_{i,t}$ and $E_{r,t}$:

$$DE_{i,t} = \frac{E_{i,t+1} - E_{i,t}}{E_{i,t}}$$

$$DE_{r,t} = \frac{E_{r,t+1} - E_{r,t}}{E_{r,t}}$$

Decomposition of Subgroups

- $E^{j,e}_{i,r,t}$: $E^{e}_{i,r,t}$ in subgroup j
- $E^{j,e+}_{i,r,t}$ and $E^{j,e+}_{i,r,t+1}$ if $E^{j,e}_{i,r,t} < E^{j,e}_{i,r,t+1}$ (Job creation)
- $E^{j,e-}_{i,r,t}$ and $E^{j,e-}_{i,r,t+1}$ if $E^{j,e}_{i,r,t} > E^{j,e}_{i,r,t+1}$ (Job destruction)
- Percentage changes of job creation in industry i:

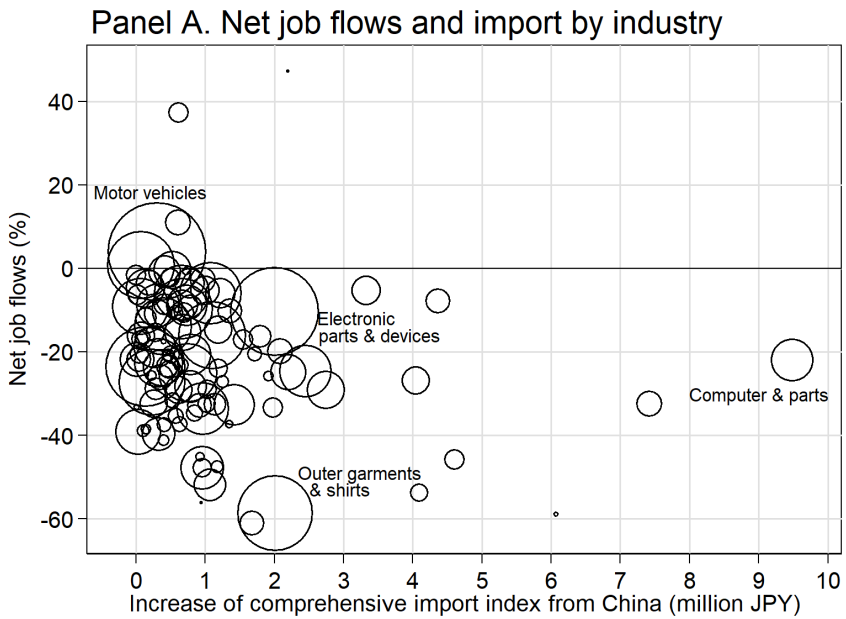
$$DE^{j+}_{i,t} = \frac{E^{j+}_{i,t+1} - E^{j+}_{i,t}}{E_{i,t}}$$

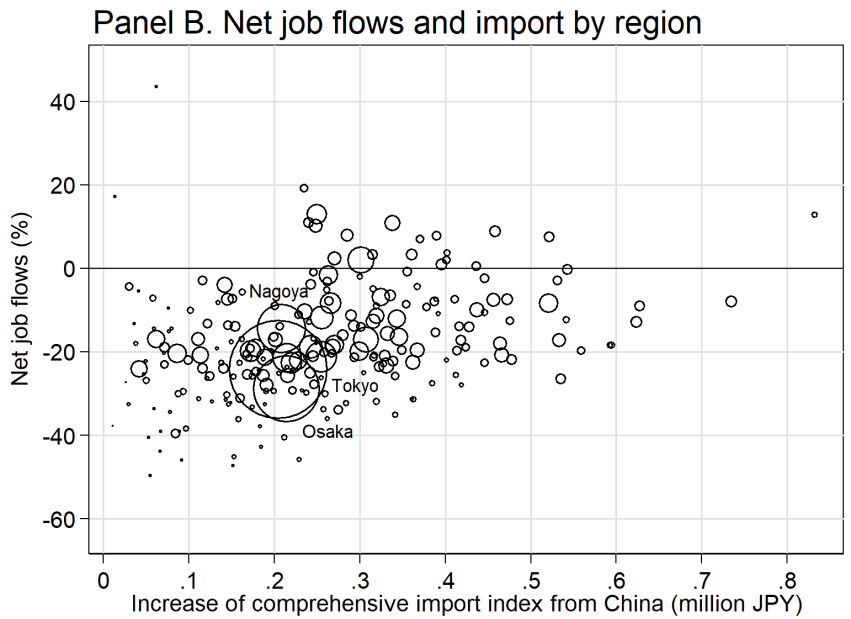
$$DE^{+}_{i,t} = \frac{E^{+}_{i,t+1} - E^{+}_{i,t}}{E_{i,t}}$$

- $DE^{+}_{i,t} = \sum_j DE^{j+}_{i,t}$ from the definition
- Net job change in industry i: $DE_{i,t} = DE^{+}_{i,t} + DE^{-}_{i,t}$

Import and Net Job Flows: 1996-2006

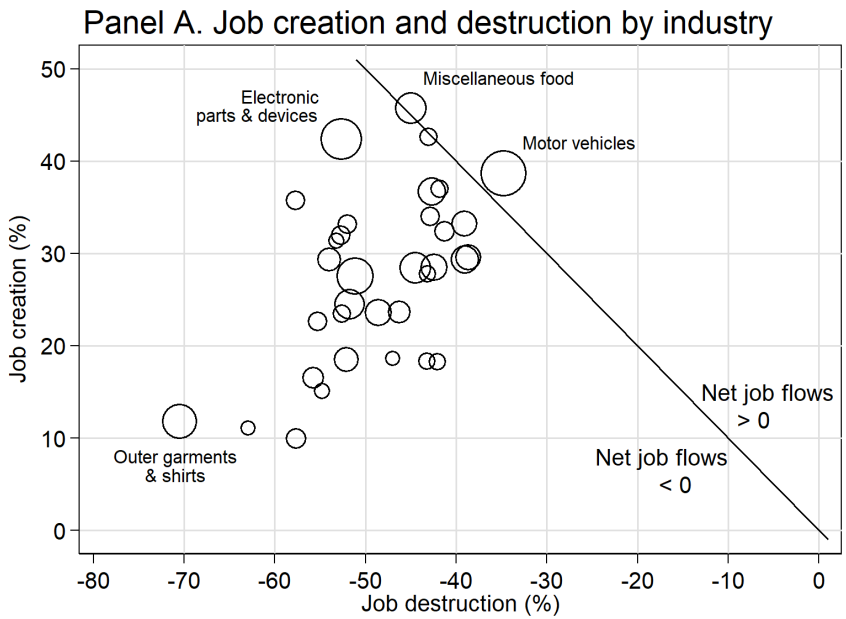
- Panel A: 108 industries, import per worker in a competing industry
- Panel B: 228 regions, import per worker in a region

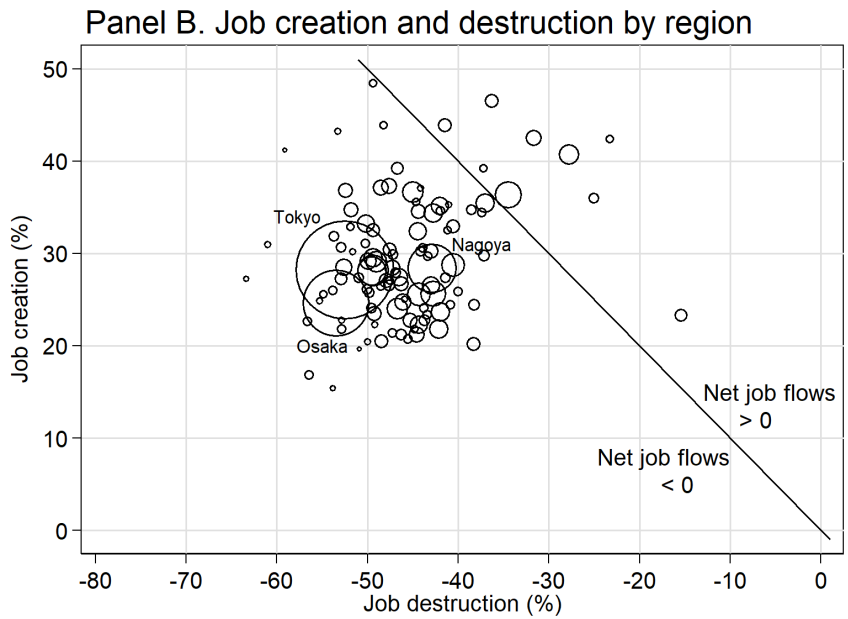




Job Creation and Destruction: 1996-2006

- Panel A: 34 industries which have more than 100,000 jobs, out of all 108 industries
- Panel B: 107 Metropolitan Employment Areas, out of all 228 regions
- Job creation and job destruction have little correlation in Panel B





Amiti-Weinstein Decomposition Equations

- A system of moment equations:

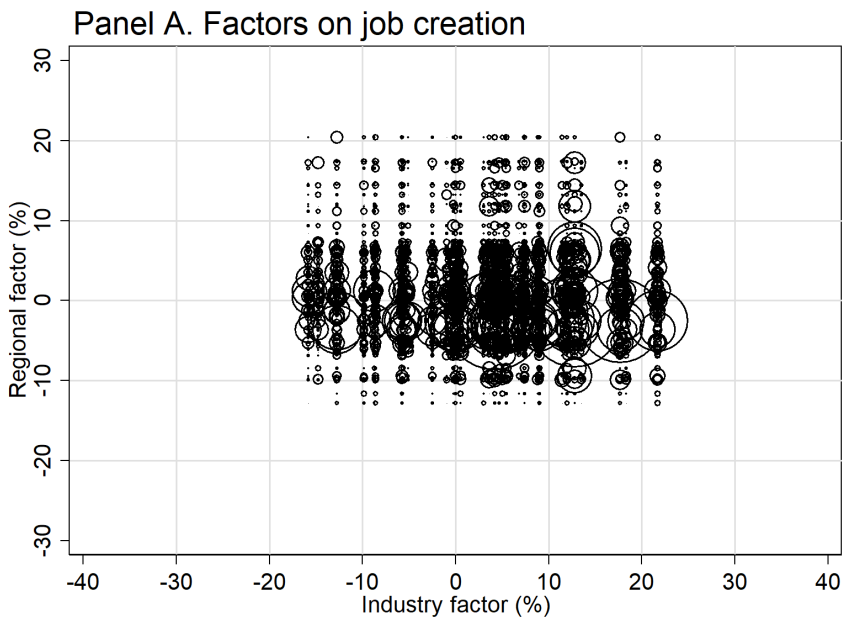
$$DE_{i,t} = \sum_r \left(\frac{E_{i,r,t}}{E_{i,t}} \dot{a}_{r,t} \right) + \dot{b}_{i,t} + \bar{c}_t$$

$$DE_{r,t} = \dot{a}_{r,t} + \sum_i \left(\frac{E_{i,r,t}}{E_{r,t}} \dot{b}_{i,t} \right) + \bar{c}_t$$

  - $\dot{a}_{r,t}$: region-year shock
  - $\dot{b}_{i,t}$: industry-year shock
  - $\bar{c}_t$: common shock (the sum of median regional and industry shocks)

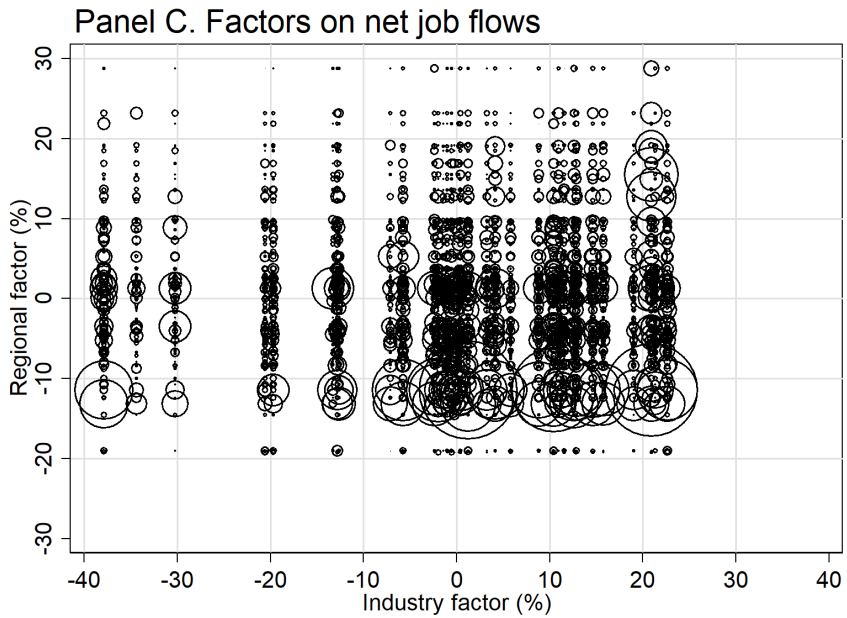
Regional and Industry Factors on Job Creation and Destruction:1996-2006

- Each industry / region has different shocks on job creation and destruction
  - 34 large industries, 107 Metropolitan regions
  - Industry shocks and regional shocks are potentially influential to job changes to the same degree



Regional and Industry Factors on Net Job Flows: 1996-2006

- The ranges of distribution of regional and industry shocks are similar



Trade Indices

- Two indexes of decadal regional import changes
  - Direct import index (Autor et al., 2013; Dauth et al., 2014; etc.)

$$\Delta T_{i,t} \equiv \frac{\Delta IM_{i,t}}{E_{i,t}}$$

$$\Delta T_{r,t} \equiv \sum_i \frac{E_{i,r,t}}{RE_{r,t}} \Delta T_{i,t}$$

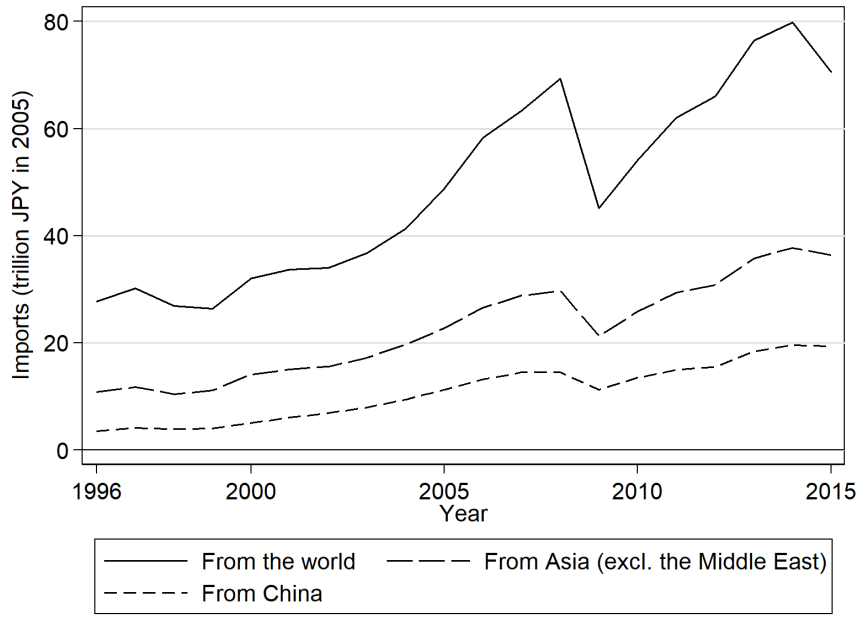
    - ★ $RE_{r,t}$: Total jobs, including non-mfg, in region r
  - Comprehensive import index (Acemoglu et al., 2016): include effects from downstream industries

$$\Delta T_{i,t} \equiv \frac{\Delta IM_{i,t}}{E_{i,t}} + \sum_i \frac{x_{j,i}}{y_i} \frac{\Delta IM_{j,t}}{E_{j,t}}$$

    - ★ $x_{j,i}$: The product industry i sells to industry j in 1996

Manufacturing Imports in Japan

- The ratio of imports from China to total imports increases steadly In Japan



Regression Equations and IV

- Regression equation

$$Y_{r,t} = \beta_1 \Delta T_{r,t} + \mathbf{X}'_{\mathbf{r,t}} \beta_2 + \varepsilon_{r,t}$$

  - Dependent variables $Y_{r,t}$: net job flows ($DE_{r,t}$), regional factors ($\dot{a}_{r,t}$), industry factors ($\dot{B}_{r,t}$)

$$\dot{B}_{r,t} = \sum_i \frac{E_{i,r,t}}{E_{r,t}} \dot{b}_{i,t}, \ \sum_i \frac{E_{i,r,t}}{E_{r,t}} = 1$$

  - $\mathbf{X_{r,t}}$ includes dummies for period-specific nine comprehensive industry groups to absorb some industry-level demand-driven and technological progress effects

- IV for Japanese imports from China: Chinese exports to eight developped countries (Australia, Denmark, Finland, Germany, New Zealand, Spain, Switzerland, U.S.)

Estimates, ADH (2013) net job flows

Trade indexes	Δ direct index		Δ comp. index	
	(1)	(2)	(3)	(4)
Shift-share IV coef.	−0.064	−0.072	−0.064	−0.074
(Exposure-robust SE)	(0.024)	(0.025)	(0.021)	(0.017)
(Conventional SE)	(0.023)	(0.021)	(0.021)	(0.018)
SSIV first-stage F stat.	15.1	23.9	17.7	45.4
Region-level controls				
Base controls	✓	✓	✓	✓
Period-spec. 9 sec. shares		✓		✓
Industry-level controls				
Period indicators		✓		✓
9-sector mfg. shares		✓		✓

- Notes: Dep. var. is the change of the ratio of mfg. job to working age population. Base regional controls are: period indicators, 7-province indicators, female share in employment, and manufacturing share in employment. Models are weighted by working age population.

Estimates, AW (2018) net job flows

Trade indexes	Δ direct index		Δ comp. index	
	(1)	(2)	(3)	(4)
Shift-share IV coef.	−0.497	−0.344	−0.513	−0.353
(Exposure-robust SE)	(0.273)	(0.145)	(0.234)	(0.107)
(Conventional SE)	(0.123)	(0.099)	(0.107)	(0.080)
SSIV first-stage F stat.	14.0	18.3	17.7	32.5
Region-level controls				
Base controls	✓	✓	✓	✓
Period-spec. 9 sec. shares		✓		✓
Industry-level controls				
Period indicators		✓		✓
9-sector mfg. shares		✓		✓

- Note: Models are weighted by the number of manufacturing jobs.

Estimates, AW (2018) regional and industry factors

Trade indexes	Δ direct index		Δ comp. index	
	(1)	(2)	(3)	(4)
Dep. var.: Regional factors				
Shift-share IV coef.	−0.351	−0.197	−0.339	−0.206
(Exposure-robust SE)	(0.207)	(0.099)	(0.167)	(0.078)
(Conventional SE)	(0.111)	(0.083)	(0.102)	(0.070)
Dep. var.: Industry factors				
Shift-share IV coef.	−0.146	−0.147	−0.174	−0.147
(Exposure-robust SE)	(0.077)	(0.053)	(0.076)	(0.036)
(Conventional SE)	(0.047)	(0.027)	(0.042)	(0.022)

- Negative (and statistically less significant) estimates for regional factors show that regional factors which decrease the number of jobs also increase imports from China.
- I focus on the estimates for industry factors hereafter.

Estimates, AW (2018) using regional subsample

Trade indexes	Excluding Tokyo		Excluding Tokyo, Osaka, & Nagoya	
	Δ direct	Δ comp.	Δ direct	Δ comp.
Dep. var.: Regional factors				
Shift-share IV coef.	-0.183	-0.194	-0.184	-0.199
(Exposure-robust SE)	(0.100)	(0.081)	(0.099)	(0.084)
(Conventional SE)	(0.084)	(0.072)	(0.083)	(0.073)
Dep. var.: Industry factors				
Shift-share IV coef.	-0.153	-0.152	-0.153	-0.152
(Exposure-robust SE)	(0.050)	(0.034)	(0.050)	(0.034)
(Conventional SE)	(0.026)	(0.021)	(0.027)	(0.021)

- Use a full set of region- and industry-level controls
- Resutls are similar to the baseline ones
  - Possible peculiar import impact on local labor market is successfully sorted into industry factors.

Actual and implied number of mfg. job flows

	1996-2006	2006-2016	Total	(Ratio)
Actual net mfg. job flows	−2,283	−1,428	−3,711	
ADH (before sorting out suply-driven components)				
Direct import index	−851	−629	−1,480	(40%)
AW, through estimate for net job flows				
Direct import index	−699	−445	−1,144	(31%)
Comp. import index	−981	−629	−1,609	(43%)
AW, through estimate for industry factors				
Direct import index	−299	−190	−489	(13%)
Comp. import index	−408	−262	−670	(18%)

- Units are thousand. Use a full set of region and industry controls.

Estimates, AW (2018) industry factors for job creation and destruction

	Job creation	Job destruction
Est. of less than 100 jobs		
Shift-share IV coef.	−0.038	0.020
(Exposure-robust SE)	(0.013)	(0.027)
Est. of 100 or more jobs		
Shift-share IV coef.	0.019	−0.148
(Exposure-robust SE)	(0.020)	(0.036)
All establishments		
Shift-share IV coef.	−0.019	−0.129
(Exposure-robust SE)	(0.013)	(0.029)

- Smaller est.: countercyclical (depress job creation and destruction)
  - They passively cocoon themselves and do not fill job attrition or cancel launching into business.
- Larger est.: procyclical (enhance job creation and destruction)

Estimates, AW (2018) industry factors for job creation and destruction

	Job creation		Job destruction	
	Continuers	Entries	Continuers	Exits
Est. of less than 100 jobs				
Shift-share IV coef.	−0.014	−0.024	0.015	0.005
(Exposure-robust SE)	(0.004)	(0.009)	(0.008)	(0.020)
Est. of 100 or more jobs				
Shift-share IV coef.	−0.009	0.028	−0.035	−0.113
(Exposure-robust SE)	(0.009)	(0.019)	(0.014)	(0.030)
All establishments				
Shift-share IV coef.	−0.023	0.004	−0.020	−0.108
(Exposure-robust SE)	(0.009)	(0.014)	(0.008)	(0.033)

- Driving force is the exit of larger establishments
  - Larger est. actively decrease their size or totally close under firms' restructuring plans.
  - Large est. produce generic goods for the mass market, competing with imports (Holmes and Stevens, 2014).

Actual and implied number of job creation and destruction

Job creation			Job destruction		
Total	Continuers	Entries	Total	Continuers	Exits
Actual number of job creation and destruction					
7,047	2,050	4,997	−10,758	−3,553	−7,205
Implied number of job creation and destruction from industry factors					
−87	−105	18	−588	−91	−492
Ratio of implied job flows to actual job flows					
−1.2%	−5.1%	0.4%	5.5%	2.6%	6.8%

- Imports enhance job destruction by 5.5% and depress job creation by 1.2%
  - Trade impacts on both job creation and job destruction are small, but the effect on net values become large

Summary

- Examine import effects not only on net job flows but also on job creation and destruction
- Use industry shocks from Amiti-Weinstein decomposition as dependent variable
- Supply-side import shocks affect job flows through industry shocks
- Import shocks through industry factors account for less than half of those through net job flows
- Base estimation: implied mfg. job loss due to import from China is 670,000 during 1996-2016
  - 18% of actual mfg. job loss (3.7 million)
- Large establishments are sensitive to import shocks to exit
- Smaller establishments depress both job creation and destruction, while larger establishments enhance both
  - Smaller est. are countercyclical; Larger est. are procyclical
- Imports enhance job destruction by 5.5% and depress job creation by 1.2%
  - Trade impact on job churning is small, but the effect on net values become large

（Abstract 翻訳文）

まとめ（スライドの最後の“Summary”の和訳）：

- 輸入が純雇用変化数だけでなく雇用創出や雇用喪失に与える影響を調べた。
- Amiti-Weinstein 分解法から得た産業ショックを説明変数に用いた。
- 供給要因から来る輸入ショックは、産業ショックを通じて雇用変化に影響を及ぼす。
- 産業要因を通じた輸入ショックは、純雇用変化を通じた輸入ショックの約半分である。
- 基本結果：中国からの輸入による雇用喪失は、1996 年から 2016 年で 67 万人。
  これは実際の雇用喪失（370 万人）の 18%。
- 大規模事業所は輸入ショックから廃業しやすい。
- 小規模事業所では雇用創出も雇用喪失も抑えるが、大規模事業所は両方高まる。
  輸入ショックで、雇用変動は小規模事業所で縮小し、大規模事業所では拡大する。
- 輸入によって、雇用喪失は 5.5%増加し、雇用創出は 1.2%減少する。
  貿易が雇用創出・喪失に与える影響は小さいが、ネットの効果で見ると大きくなる。