Trade and Establishments: Reevaluating Why Location Matters

Mina Kim (BLS)
Jooyoun Park (Kent State University)
Benjamin Raymond (BLS)

January 7, 2022
AEA/ASSA

All views are those of the authors and do not necessarily reflect the views of the Bureau of Labor Statistics.

Since the 2000's, we saw...

The rise in imports from low-wage countries (e.g. China) has caused massive destruction of manufacturing jobs.

- Acemoglu et al (2016), Autor, Dorn Hanson (2013)

In response to rising import competition from low-wage countries (LWCs), firms/establishments adopt cost-saving strategies:

- ▷ Product mix upgrade: Bernard, Redding, & Schott (2011)
- ▷ Routine-biased technology change: Goos, Manning & Salomons (2014)
- ▷ Automation and innovation: Bloom, Draca & Van Reenen (2016)
- ▷ Offshoring: Bernard, Fort, Smeets & Warzynski (2020)

Adoption of these strategies leads to destruction of routine jobs and wage reduction for these jobs.

- Kim, Park & Schaur (2021), Lu & Ng (2013), Goos et al (2014), Ebenstein et al (2014), Autor et al (2014)

Research Question

How does the interaction between industry-specific forces and local forces influence an establishment's decision to respond with adjustments in labor inputs?

- Industry-specific forces: cost-saving pressures from the product markets induced by import competition
- Local forces: labor market supply at commuting-zone level

We investigate the impact of such interaction on:

a. Composition of tasks utilized at manufacturing establishments
b. Occupation-level wage dynamics

Intuition

- Areas with high exposure to import competition from LWCs might experience an excess supply of experienced routine workers due to a large number of layoffs.

$\rightarrow$ This results in a reduction in real wages for these workers.

$\rightarrow$ Hiring these workers at a lower pay could be a potential cost-saving strategy.

$\rightarrow$ Surviving establishments might be able to survive with their existing production technology by taking advantage of lower wages.

Hypotheses

1. Establishments in CZs with high exposure to LWC imports remain more routine compared to those in the same industry located in CZs with low exposure.

2. Entrants and young establishments in CZs with high exposure to LWC imports are more routine compared to those in the same industry located in CZs with low exposure.
   - ▷ Existing establishments may not be able to take full advantage of lower wages due to unions and other contractual issues.
   - ▷ New and young establishments may better be able to fully benefit from the situation.

Summary of Results

- Greater industry-level import competition is associated with a reduced use of routine tasks and an increased use of non-manual non-routine tasks.

- Young establishments and entrants located in CZs facing high import competition, compared to their counterparts located in low exposure CZs, tend to be more routine.

- Within-establishment analysis shows that as industry-level import exposure rises,
    - ▷ establishments in low exposure CZs reduce their use of routine tasks.
    - ▷ establishments in high exposure CZs do not change their task composition. This pattern is driven by older establishments.

- Production occupations suffer from a significant decline in wages, but this impact occurs mainly in high exposure CZs.

- Large wage impacts are observed within industries, but not within establishments. This result suggests that establishment exits and entries play an important role in wage dynamics.

DATA: Establishment-Level Data

- Sample period: 2000-2013
- 537,000 observations of manufacturing establishments
  (About half is observed more than once during the sample period.)

- Occupational Employment and Wage Statistics (OEWS):
  - Survey of employment and wages in non-farm establishments for about 800 SOC occupations
  - Wage information is collected as employment in twelve different wage intervals for a given occupation.

- Quarterly Census of Employment and Wages (QCEW):
  - All establishments in the unemployment insurance system
  - Size, age, date of exit, 6-digit NAICS, location

Establishment-Level Task Content: ALM (2003)

Use Dictionary of Occupational Titles to characterize occupations à la Autor, Levy, and Murnane (2003).

For each task type, we construct an establishment-level task intensity measure as a weighted average of the task scores of all occupations using the occupational employment as a weight (z-scored to 2000 levels).

Skill	Types of Tasks	Examples of Occupations
Analytic Non-routine	Forming Hypotheses, Medical Diagnosis	Engineers, Scientists, Architects
Interactive Non-routine	Managing Others, Persuading/Selling	Managers, Teachers, Administrators
Manual Non-routine	Janitorial Services, Driving	Industrial Equip Operators, Truck Drivers
Cognitive Routine	Record-Keeping, Calculations, Repetitive interactions	Mechanics, Electricians, Machine Operators
Manual Routine	Picking, Sorting, Repetitive Assembly	Assemblers, Machinists, Painters

Import Penetration

Import penetration for industry j: $\quad IP_{jt} = \dfrac{M_{jt}^{US,China}}{D_{j,1998}^{US} + M_{j,1998}^{US,World} - X_{j,1998}^{US,World}}$

- ▷ US trade data from Census
- ▷ Domestic shipments data from NBER-CES database

- Instrument: equivalent measure using 8 OECD countries' imports from China (UN Comtrade) and 1995 domestic absorption

  Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, Switzerland

Import penetration of commuting zone k: Indicator *HighCZ*

- CZ-level import penetration constructed as an employment-weighted industry IP using County Business Patterns
- The indicator, *HighCZ*, is 1 if a CZ's import penetration is in the top quartile for the entire sample period, 2000- 2013
- Out of 740 CZs, 160 (21.6%) are identified as *HighCZ*.

Empirical Identification

$$Outcome_{ijkt} = \beta_0 + \beta_1 IP_{j,t-1} + \beta_2 IP_{j,t-1} x HighCZ_{k,t-1}$$
$$+ \beta_3 HighCZ_{k,t-1} + X_{it} + \delta_j + \delta_t + \epsilon_{ijkt}$$

<u>Outcomes</u>:

1. 5 ALM task intensity measures
2. Establishment-level mean wage for 2-digit SOC occupation groups

<u>RHS</u>:

$IP_{j,t-1}$: Lagged IP (instrument) to allow for delays in firm response.

$HighCZ_{k,t-1}$: Lagged indicator for commuting zones with top quartile CZ-level IP

X_{it} Establishment-level controls: age and size ($ln(emp_{t-1})$)

δ_j: Industry fixed effect

δ_t: Year fixed effect

Task Content: Within-Industry Adjustments

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
$IP_{j,t-1}$	0.572*	0.753***	-0.163	-0.528**	-0.592**
	(0.3050)	(0.2500)	(0.1170)	(0.2340)	(0.2710)
N	531,065	531,065	531,065	531,065	531,065
R^2	0.371	0.157	0.450	0.232	0.387

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	0.28	0.588**	-0.103	-0.525**	-0.572*
	(0.287)	(0.256)	(0.131)	(0.243)	(0.308)
IP × HighCZ	0.358***	0.216*	-0.0751	-0.0203	-0.0508
	(0.121)	(0.116)	(0.071)	(0.121)	(0.138)
HighCZ	0.0252***	0.0449***	-0.0369***	-0.0421***	-0.0278***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.010)
N	530,372	530,372	530,372	530,372	530,372
R^2	0.371	0.158	0.45	0.233	0.387

IP is lagged industry-level import penetration.

2SLS with year and 6-digit NAICS fixed effects. Age and size control not shown.

Task Content: Within-Industry Adjustments - By Age

(A) Young Establishments: Less than 5 years

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	0.169	0.325	-0.0119	-0.272	-0.634
	(0.428)	(0.366)	(0.237)	(0.353)	(0.490)
IP x HighCZ	0.098	0.0168	0.0385	.422**	0.240
	(0.129)	(0.129)	(0.107)	(0.195)	(0.240)
HighCZ	0.0245	0.0368**	-0.0363***	-0.0541***	-0.0162
	(0.017)	(0.017)	(0.012)	(0.016)	(0.021)
N	80,813	80,813	80,813	80,813	80,813
R^2	0.341	0.171	0.373	0.218	0.3513

(B) Mature Establishments: 5 years or older

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	0.289	0.666**	-0.103	-0.608**	-0.561*
	(0.301)	(0.288)	(0.142)	(0.276)	(0.339)
IP x HighCZ	0.457***	0.296**	-0.115	-0.182	-0.146
	(0.150)	(0.145)	(0.091)	(0.155)	(0.173)
HighCZ	0.0247***	0.0457***	-0.0367***	-0.0382***	-0.0323***
	(0.009)	(0.008)	(0.008)	(0.009)	(0.010)
N	449,559	449,559	449,559	449,559	449,559
R^2	0.384	0.160	0.475	0.245	0.403

IP is lagged industry-level import penetration.

2SLS with year and 6-digit NAICS fixed effects. Size control not shown.

Task Content: Within-Establishment Adjustments

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
$IP_{j,t-1}$	0.0972	0.0353	0.252	-0.118	-0.101
	(0.227)	(0.173)	(0.094)	(0.161)	(0.273)
N	398,973	398,973	398,973	398,973	
R^2	0.786	0.701	0.813	0.741	0.792

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	-0.158	0.192	-0.0762	-0.323*	-0.544**
	(0.216)	(0.187)	(0.160)	(0.185)	(0.215)
IP x HighCZ	0.312	0.0759	0.137	0.255	0.545**
	(0.300)	(0.187)	(0.165)	(0.203)	(0.233)
HighCZ	-0.0565***	-0.0322**	-0.00227	-0.0218	-0.0381*
	(0.019)	(0.016)	(0.013)	(0.021)	(0.022)
N	398,660	398,660	398,660	398,660	398,660
R^2	0.786	0.700	0.813	0.741	0.792

IP is lagged industry-level import penetration.
2SLS with year and establishment fixed effects

Task Content: Within-Establishment Adjustments - By Age

(A) Young Establishments - Less than 5 years

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	-1.274	0.435	-0.891	-0.993	-2.062
	(1.108)	(1.106)	(0.639)	(1.071)	(1.268)
IP × HighCZ	1.515	0.491	0.778	0.075	0.885
	(1.422)	(1.077)	(0.630)	(1.154)	(1.457)
HighCZ	-0.220*	-0.152	-0.023	-0.00801	-0.0315
	(0.116)	(0.130)	(0.057)	(0.099)	(0.111)
N	15,757	15,757	15,757	15,757	15,757
R^2	0.834	0.771	0.785	0.833	0.840

(B) Mature Establishments - 5 years or older

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	-0.129	0.25	-0.114	-0.438**	-0.612**
	(0.230)	(0.225)	(0.158)	(0.216)	(0.275)
IP × HighCZ	0.265	-0.0142	0.18	0.357	0.682**
	(0.357)	(0.251)	(0.176)	(0.244)	(0.284)
HighCZ	-0.0552**	-0.0208	-0.0143	-0.0360*	-0.0618***
	(0.025)	(0.016)	(0.016)	(0.021)	(0.024)
N	348,803	348,803	348,803	348,803	348,803
R^2	0.787	0.699	0.816	0.743	0.793

IP is lagged industry-level import penetration.
2SLS with year and establishment fixed effects

Task Content: Entry

(A) ENTRY, High CZ

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	1.646***	1.344***	-0.114	-0.841	-1.149**
	(0.444)	(0.361)	(0.320)	(0.731)	(0.543)
IP × Entry	0.172	-0.045	0.184	0.200	0.405*
	(0.169)	(0.176)	(0.168)	(0.187)	(0.209)
Entry	-0.023	-0.005	-0.001	-0.005	-0.028**
	(0.018)	(0.017)	(0.010)	(0.016)	(0.014)
N	164,652	164,652	164,652	164,652	164,652
R^2	0.366	0.164	0.409	0.212	0.364

(B) ENTRY, Low CZ

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	-0.434	-0.288	0.427	0.364	-0.191
	(0.613)	(0.535)	(0.420)	(0.481)	(0.624)
IP × Entry	0.489	0.200	-0.047	-0.081	0.007
	(0.309)	(0.149)	(0.111)	(0.253)	(0.217)
Entry	-0.028*	-0.022*	0.009	0.007	-0.011
	(0.016)	(0.012)	(0.012)	(0.016)	(0.015)
N	80,453	80,453	80,453	80,453	80,453
R^2	0.385	0.126	0.476	0.265	0.426

2SLS with year and 6-digit NAICS fixed effects. Size and age control not shown.

Task Content: Summary

Within-Industry Adjustments:

- High import competition leads to a strong shift from routine tasks toward non-manual non-routine tasks.

- Young establishments in high exposure CZs are more routine than those in low exposure CZs even within the same 6-digit NAICS industry.

Within-Establishment Adjustments:

- Overall, establishments reduce the use of manual routine tasks as IP rises.

- Establishments in high exposure CZs become relatively more routine compared to those in low exposure CZs as IP increases.

- Older establishments in low exposure CZs decrease their manual routine tasks as IP rises. Establishments in high exposure CZs do not react much.

  $\rightarrow$ Surviving establishments in high exposure CZs are surviving with less changes to their existing operations.

Task Content: Summary

Entrants:

- In high exposure CZs, entrants are significantly more routine than the rest.

- In low exposure CZs, entrants do not differ from the rest.

  $\rightarrow$ In high exposure CZs where there is a large excess supply of routine workers, new establishments enter the market with a greater focus on manual routine activities compared to the rest.

Establishment-Level Mean Wage: 2-digit SOC

We found evidence that establishments in high exposure CZs remain with the routine production technology at a higher rate than those in low exposure CZs. We want to find whether there is evidence of suppressed wages on routine-task occupations.

Dependent Variables

1. Employment-weighted average wage of all

2. Establishment-level mean wage for 2-digit SOC occupation groups.

   We'll focus on a few production-related occupation groups.

Establishment-Level Mean Wage: 2-digit SOC

SOC2	Occupation group title
11	Management Occupations
13	Business and Financial Operations Occupations
15	Computer and Mathematical Occupations
17	Architecture and Engineering Occupations
19	Life, Physical, and Social Science Occupations
21	Community and Social Service Occupations
23	Legal Occupations
25	Education, Training, and Library Occupations
27	Arts, Design, Entertainment, Sports, and Media Occupations
29	Healthcare Practitioners and Technical Occupations
31	Healthcare Support Occupations
33	Protective Service Occupations
35	Food Preparation and Serving Related Occupations
37	Building and Grounds Cleaning and Maintenance Occupations
39	Personal Care and Service Occupations
41	Sales and Related Occupations
43	Office and Administrative Support Occupations
45	Farming, Fishing, and Forestry Occupations
47	Construction and Extraction Occupations
49	Installation, Maintenance, and Repair Occupations
51	Production Occupations
53	Transportation and Material Moving Occupations

Establishment-Level Mean Wage

	(a) Within-industry Analysis					(b) With-establishment Analysis				
	ALL	11	49	51	53	ALL	11	49	51	53
IP	1.554***	0.668	9.148	0.499	-4.501**	0.436*	0.474	-156.4	-0.484	-13.78
	(0.564)	(0.581)	(5.727)	(0.350)	(2.181)	(0.261)	(0.743)	(633.500)	(0.578)	(17.940)
IP × HighCZ	0.255	0.794**	-1.267	-0.710**	-2.098**	0.703*	0.709	137.1	0.215	13.65
	(0.169)	(0.319)	(2.096)	(0.289)	(0.904)	(0.400)	(0.836)	(572.100)	(0.525)	(49.660)
	(0.564)	(0.581)	(5.727)	(0.350)	(2.181)	(0.261)	(0.743)	(633.500)	(0.578)	(17.940)
HighCZ	0.281***	0.401***	0.356***	0.323***	0.388***	-0.0204	0.108**	0.125	-0.119	-0.254
	(0.020)	(0.017)	(0.096)	(0.039)	(0.086)	(0.022)	(0.054)	(1.340)	(0.079)	(0.450)
	(0.564)	(0.581)	(5.727)	(0.350)	(2.181)	(0.261)	(0.743)	(633.500)	(0.578)	(17.940)
N	530,373	328,933	4,006	48,544	2,940	398,661	246,030	508	15,299	421
R2	0.218	0.130	0.323	0.223	0.435	0.808	0.691	-0.023	0.823	0.898

Panel (a): 2SLS with year and 6-digit NAICS fixed effects. Size and age controls not shown.
Panel (b): 2SLS with year and establishment fixed effects.

11 Management Occupations
49 Installation, Maintenance, and Repair Occupations
51 Production Occupations
53 Transportation and Material Moving Occupations

Establishment-Level Mean Wage: Summary

- The negative wage effect of imports on production occupations (SOC 51) only occurs in CZs with high import exposure.
    - This suggests that the size of the excess supply of routine workers has a significant influence on the extent of wage decline.

- There is no evidence of within-establishment changes in wages for these occupations.
    - The large decline in production worker wages must occur mainly at the extensive margin.

Conclusion

Geography matters for how establishments respond to import competition.

- How they respond to rising import competition is influenced by local labor markets.
- While establishments in low exposure CZs reduce their routine tasks in response to rising industry-level import competition, establishments in high exposure CZs do not show significant changes in their task content.
- Entrants in high exposure CZs seem to absorb the excess supply of routine workers in the area.
- Wage declines in production and related occupations are concentrated in high exposure CZs and seem to be largely driven by establishment exits and entries.

Work to Do

Survival Analysis of Entrants

- Kim et al (2021) finds that among entrants, those that survive the first five years are significantly less routine.
- Do routine entrants in high exposure CZs survive as well as their non-routine counterparts? That is, does the low wage due to the excess supply of labor offers a long term cost advantage for these establishments?

Wage Analysis for Exits and Entries

- We find that the decline in the wages of production occupations occur at the extensive margin.
- We want to investigate the following two channels:
  - ▷ Establishments that were paying higher wage than the rest exit at a higher rate due to their cost disadvantage.
  - ▷ Entrants are fully taking advantage of the local labor market situation and are able to hire experienced production workers at lower pay.

THANK YOU!

Any comments:

Jooyoun Park: jpark8@kent.edu

Mina Kim: Kim.Mina@bls.gov

Ben Raymond: Raymond.Benjamin@bls.gov

Task Content: Exits

(A) EXIT, High CZ

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	-2.220***	0.315*	0.595***	-0.315**	0.283
	(0.167)	(0.172)	(0.165)	(0.157)	(0.271)
IP x Exit	-1.243*	-0.678	1.202***	1.101**	2.277***
	(0.746)	(0.529)	(0.419)	(0.505)	(0.546)
Exit	-0.0708*	-0.0204	-0.0107	0.0158	-0.114***
	(0.038)	(0.032)	(0.018)	(0.032)	(0.040)
N	164,523	164,523	164,523	164,523	164,523
R^2	0.053	0.042	0.028	0.021	0.081

(B) EXIT, Low CZ

	Analytic Non-routine	Interactive Non-routine	Manual Non-routine	Cognitive Routine	Manual Routine
IP	-3.205***	-0.0573	-0.233	-0.0247	0.391*
	(0.188)	(0.103)	(0.148)	(0.187)	(0.208)
IP x Exit	1.038**	0.121	0.957***	0.0798	0.235
	(0.420)	(0.358)	(0.321)	(0.426)	(0.487)
Exit	-0.104***	-0.0407*	-0.0564**	0.0214	-0.0551*
	(0.028)	(0.021)	(0.026)	(0.034)	(0.033)
N	80,377	80,377	80,377	80,377	80,377
R^2	0.067	0.071	0.059	0.04	0.089

2SLS with year and 6-digit NAICS fixed effects. Size and age control not shown.

◄ Entry