Trade and Multipliers: The Impact of Chinese Import Competition on the Local Structure of Employment and Wages

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Motivation 1: The rise of China

From 3 to 25% of world manufacturing production in 20 years

Motivation 2: China's outward growth

Figure: Share of imports in EU and US from low wage countries

Notes: Source: Comtrade (via WITS). The list of low-wage countries is taken from Bernard, Andrew and Jensen JIE (2006).

▸ More on trade stats

Motivation 3: China and the labor market

The rapid emergence of China as a major trading partner has caused concerns among developed economies, regarding its impact on employment and wages.

1. Employment in manufacturing:
   - China's exports growth coincides with a strong decline in mfg employment in developed economies (particularly since 2001).
2. Beyond manufacturing: multiplier effect.
   - The disappearance of local mfg jobs is likely to be transmitted to the rest of the local economy.
3. Inequality
   - Are middling jobs destroyed by import competition?
   - Wage inequality between sectors (R-V) and occupations/skill-level (H-O).
   - Wage dispersion within occupations and sectors:
     - *"The textiles, clothing and footwear industries [in Western Europe] are dividing, as [Chinese] competition brings out the best in some companies and others fail to adapt."* The Economist, February 23rd, 2006
     - *"Trade in industries with heterogenous firms could contribute toward increases in wage inequality not only through an increase in skill-premium but also through an increase in residual wage inequality."* Pavcnick (2011)

This paper

Measure the *direct* and *indirect* local effect of rising Chinese import competition on the structure of *employment* and *wages*

1. Building on ADH (2013), I exploit variation in initial local specialization and the unequal growth of Chinese exports across subsets the mfg sector.
2. Direct employment effect on manufacturing and local spill-overs onto the non-traded sector.
3. Impact on the occupational structure: job polarization?
4. Impact along the wage distribution and the degree of local inequality.
    - How did the minimum wage interact with these trade shocks in shaping the degree of local (hourly) wage inequality?

Relation to previous literature

- Trade and Local Labor Markets
  - Trade liberalization in developing countries: Topalova (2007,2010), Kovak (2013)
  - Autor, Dorn and Hanson (2013a): Chinese import competition in US local labor markets.
  - Dauth, Findeisen and Suedekum (2014): Germany (opposite to the US in terms of trade balance), net employment gains from rising trade with "the East".
- Local multipliers:
  - Moretti (2010), Moretti and Thulin (2013): traded on non-traded employment effect
- Trade and inequality:
  - Large literature testing H-O model and R-V models ...
  - Firm-level literature: Import competition increases the within-sector dispersion of several firm-level outcomes.
    Bloom et al. (2011); Méjean and Julien (2014); Amiti and Davis (2012)
  - Local labor market: Autor, Dorn and Hanson (2013b), job polarization; Lindley and Machin (2014), college-wage premium
  - Trade and labor market institutions: Topalova (2010); Carluccio, Fougère and Gautier (2015)

Preview of findings

- Employment effects:
  - 1 s.d. increase in exposure to Chinese import competition causes a 31% s.d. decline in mfg employment growth.
  - Aggregate effects are substantial: under conservative assumptions, China competition is found to have destroyed 75,000 jobs over the 2001-2007 period, 13% of overall decline.
  - Large spillovers beyond the mfg sector
- Trade shocks and the occupational structure
  - Polarizing effect in the mfg sector
  - Less clear outside of manufacturing
- Wages:
  - Uniform negative effect on wages in the mfg sector.
  - Decline concentrated in the middle of the distribution in the non-traded sector.
  - Decline in lower-tail inequality in non-traded sector ... in places where the minimum wage is binding.

Outline

Outline

How to measure local exposure to import competition?

- Following Autor, Dorn and Hanson, AER (2013).
- Surge in China's exports is unequal across industries.
- Each employment zone is affected differently depending on its "initial" specialization.
- "Import-Per-Worker" (as in ADH):

$$\Delta IPW_{ct} = \frac{1}{L_{ct}} \sum_{s \in \mathbb{T}} \frac{L_{sct}}{L_{st}} \Delta M_{st}$$

where c is an employment zone and $\mathbb{T}$ the set of sectors s that are tradable. M: imports, L: employment.

- Two main sources of variation:
  Importance of mfg sector and Exposure within mfg

$$\Delta IPW_{ct} = \underbrace{\frac{L^{\mathbb{T}}_{ct}}{L_{ct}}}_{Share^{\mathbb{T}}_{ct}} \times \underbrace{\frac{1}{L^{\mathbb{T}}_{ct}} \sum_{s \in \mathbb{T}} \frac{L_{sct}}{L_{st}} \Delta M_{st}}_{\Delta IPW^{\mathbb{T}}_{ct}}$$

Main datasets

Sectoral employment and trade

1. Data on local employment:
   - Data: DADS administrative, exhaustive data on French workers in the salaried competitive sector.
   - Fine sectorial classification 4-digits NACE (477 sectors)
   - Detailed information on wages, hours and occupation (no education)
   - I aggregate at the "employment zone", tradable/non-tradable. 348 units over 2 periods: 1995-2001, 2001-2007
2. Trade data
   - Comtrade, imports per products (HS-6 digits) from 1992.
   - Map from HS 6-digits to NACE (10% of trade value not mapped uniquely, reallocated to sector based on initial employment shares)

Outline

Specification

How does import competition exposure affects a given labor market outcome Y in employment zone c during period t.

- Main Specification:

$$\Delta \log Y_{S,ct} = \beta_S \Delta IPW_{ct} + X'_{ct}\delta + Share^{\mathbb{T}}_{ct}\eta + \alpha_t + \gamma_{r(c)} + \varepsilon_{ct} \qquad (1)$$

  where $S = \mathbb{T}, \mathbb{N}$ and $\gamma_{r(c)}$ is a region fixed-effect.

- X_{ct} include controls on:
  - Initial share of "production" jobs (*ouvriers*)
  - Lagged (1990, 1999 census) share of college graduates
  - Lagged (1990, 1999 census) women participation rate
  - Lagged (1990, 1999 census) share of foreigners
- Local multiplier effect: elasticity of non-traded to traded employment: $\beta_{lm} = \beta_{\mathbb{N}}/\beta_{\mathbb{T}}$

Identification

- In this framework, a threat to identification is the presence of sector-specific nationwide shocks that drive both labor market outcome and imports.

$$\Delta \log Y_{S,ct} = \beta_S \Delta IPW_{ct} + X'_{ct}\delta + Share^{\mathbb{T}}_{ct}\eta + \alpha_t + \gamma_{r(c)} + \varepsilon_{ct}$$

- The sign of the bias is not clear. For instance, sectoral supply shocks and demand shocks have similar implications for labor demand but different for imports.
- Time fixed-effects do not solve the problem as sectoral shocks affect each community differently.
- Solution: Instrumental variable estimation, using Chinese (main LWC country in the sample) exports to other high-income countries (OHIC) whose economic cycle is not related to that of France.
- Identifying assumption:
  - Evolution of Chinese exports to OHICs is independent from sectoral shocks in France.
  - Supply-side factors in China (industrial developments and trade policies) drive the correlation between China's exports to France and its exports to OHICs.

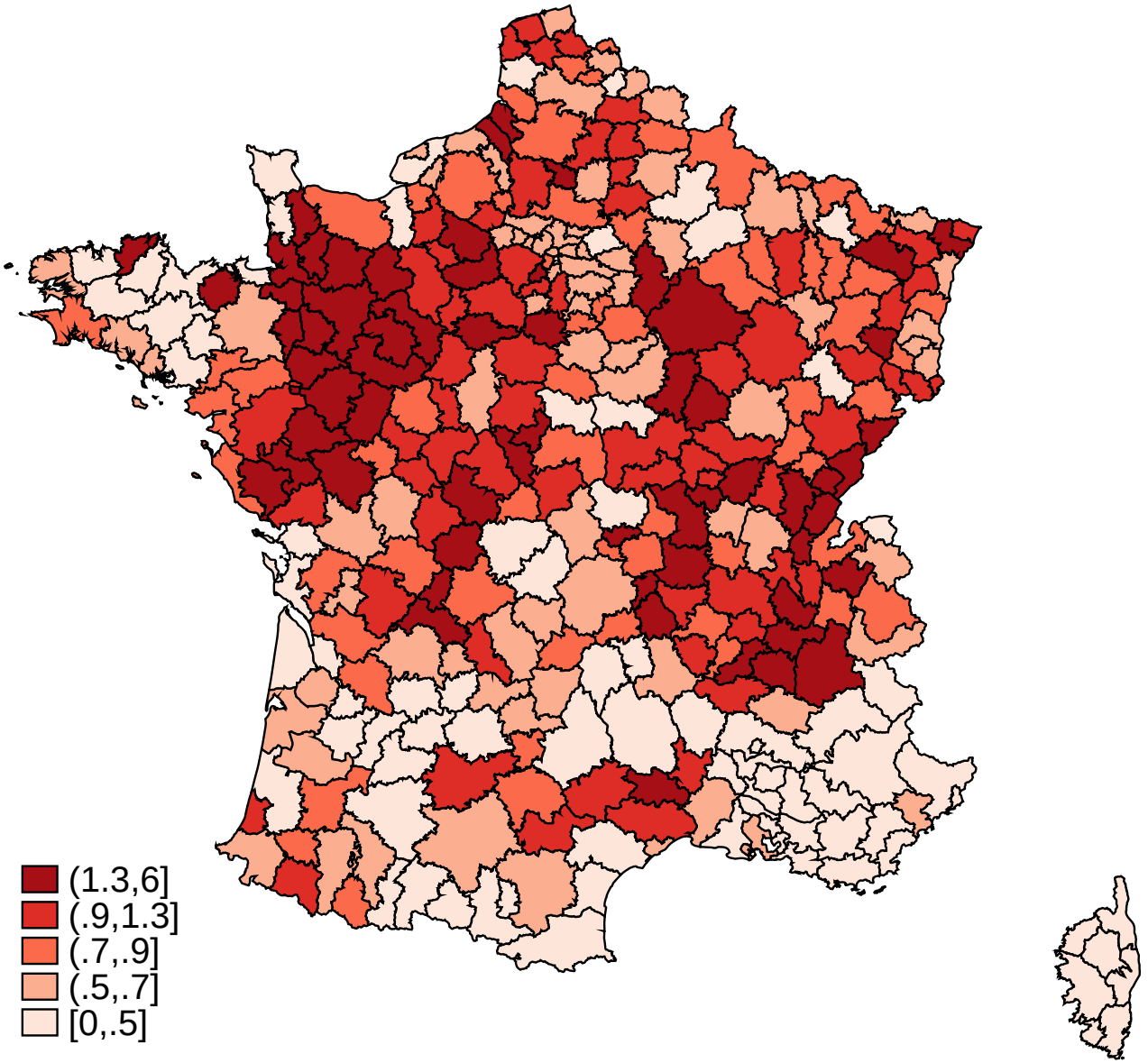
  ▸ More on identification
- We denote the variable: ΔIPW^{o}_{ct}.

Outline

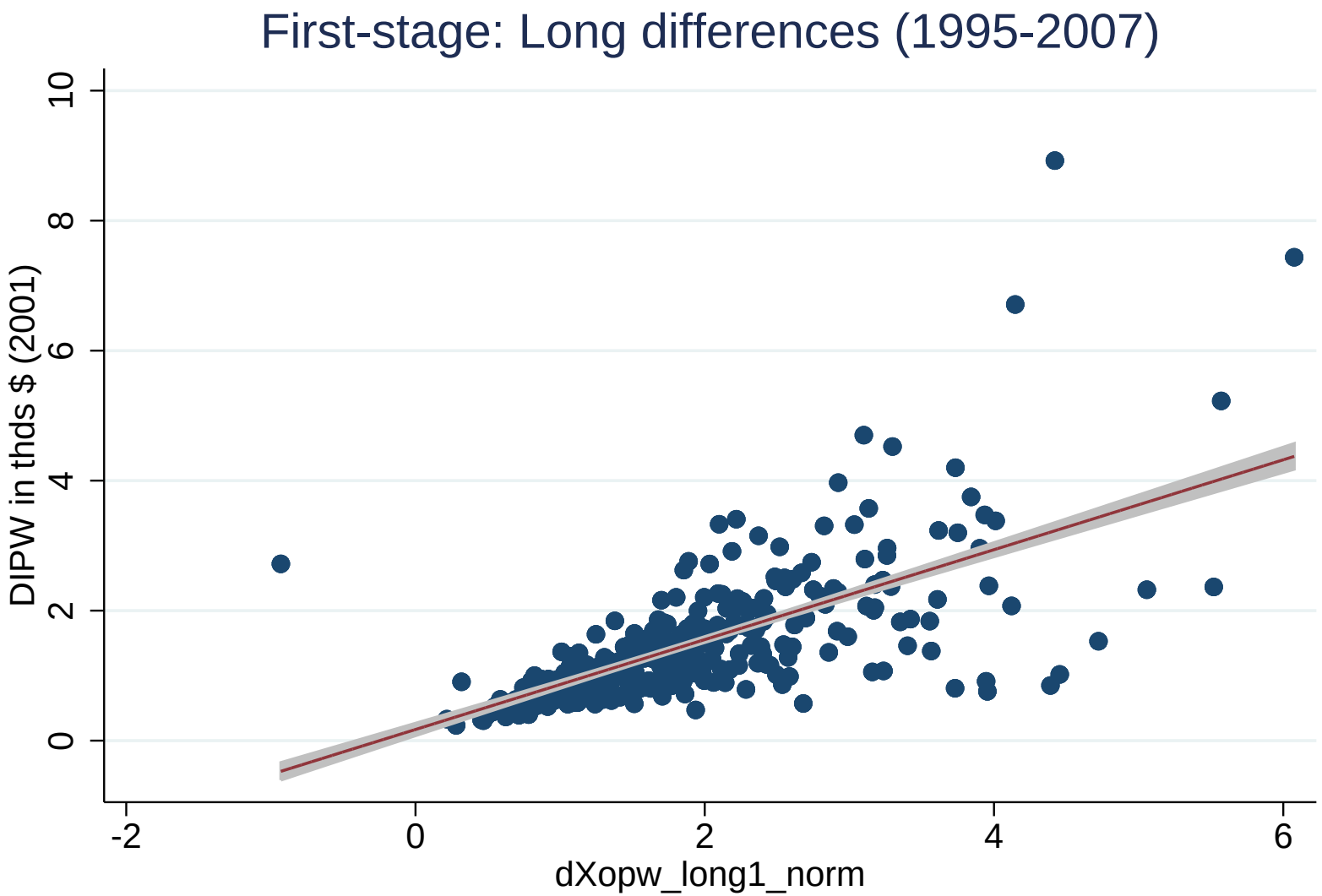
Summary statistics

	Period 1995-2001			Period 2001-2007		
	Mean	Std dev.	Median	Mean	Std dev.	Median
Initial employment in thousands	180.3	220.2	88.2	197.2	241.4	103.3
% employment in mfg (initial)	28.8	9.4	27.6	24.4	8.7	23.5
% chge in manufacturing empl.	-1.7	10.1	-1.0	-13.3	9.1	-13.1
% chge in non-tradable sector empl.	25.4	5.5	25.3	8.0	7.0	8.1
Hours worked per job: manufacturing	1609.7	69.6	1614.1	1491.5	65.2	1492.7
Hours worked per job: non-traded sector	1293.8	42.4	1298.7	1153.6	42.3	1153.7
ΔIPW in \$-thousands (2001)	0.168	0.121	0.134	0.898	0.585	0.718
ΔDPW in \$-thousands (2001)	0.148	0.131	0.117	0.698	0.621	0.0512
Ratio: q_{90}/q_{10}, all sectors	2.91	0.52	2.76	2.84	0.56	2.67
Ratio: q_{90}/q_{50}, all sectors	1.89	0.19	1.84	1.87	0.204	1.83
Ratio: q_{50}/q_{10}, all sectors	1.52	0.11	1.51	1.47	0.137	1.43
Chge Log Ratio : $\Delta \log q_{90}/q_{10}$, all sectors	-2.95	3.18	-3.15	0.74	3.23	0.96
Chge Log Ratio : $\Delta \log q_{90}/q_{50}$, all sectors	-1.13	2.14	-1.03	3.59	2.35	3.79
Chge Log Ratio : $\Delta \log q_{50}/q_{10}$, all sectors	-1.81	2.34	-2.28	-2.85	2.57	-2.74

Geography of trade shocks (2001-2007)

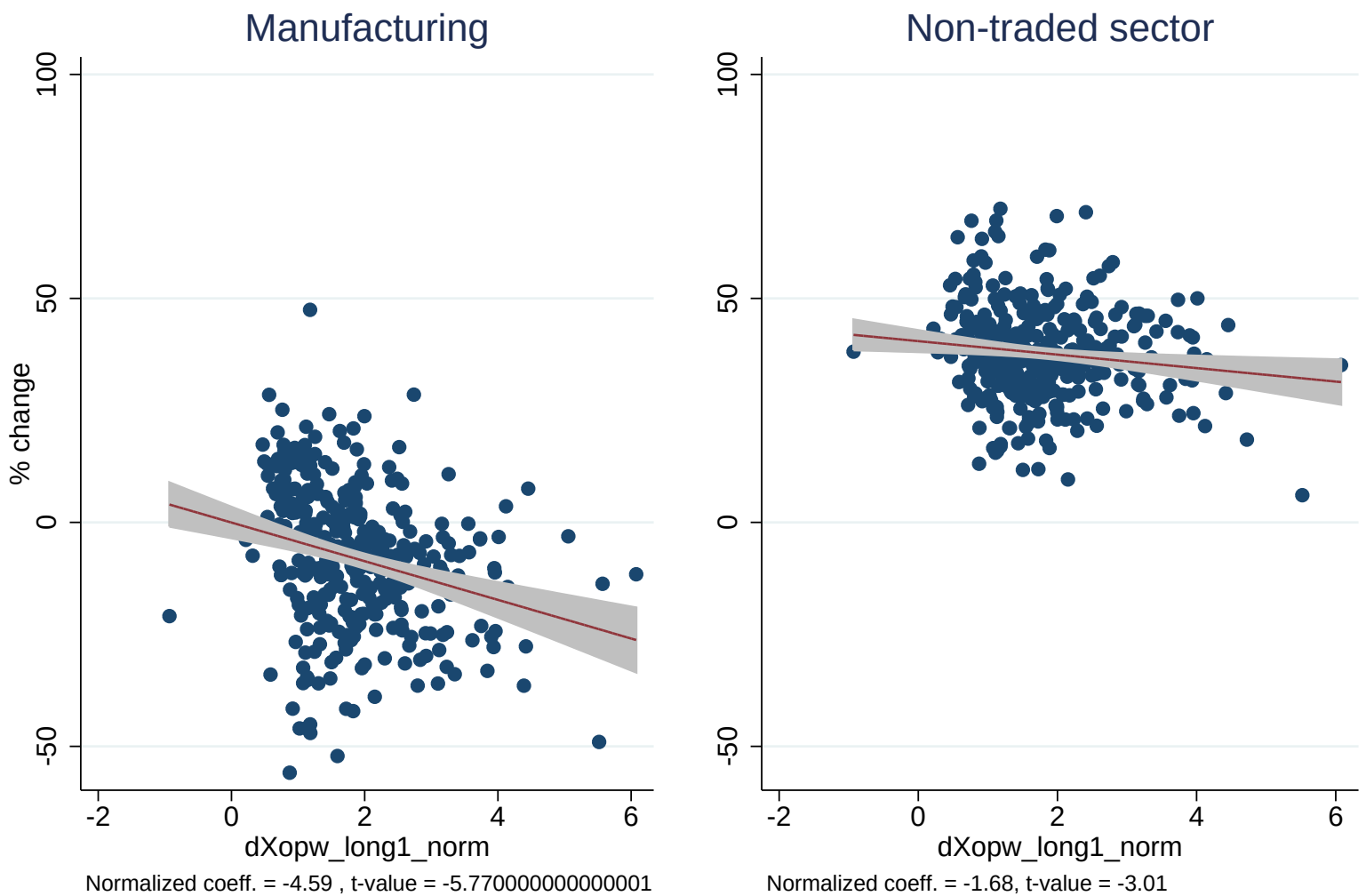


First-stage: Long differences



Reduced-form: Long differences

Reduced form: Employment, Long Differences



Outline

Effect on manufacturing

Employment, hours, total labor earnings

	(1) OLS: Jobs b/se	(2) IV b/se	(3) IV b/se	(4) IV b/se	(5) IV b/se	(6) IV: Hrs b/se	(7) IV: Emp. earnings b/se
ΔIPW	-5.876***	-8.349***	-6.262***	-6.313***	-6.224***	-6.084***	-8.636***
	(1.242)	(1.618)	(1.782)	(1.789)	(1.667)	(1.621)	(1.885)
% employment in mfg			-0.151***	-0.205***	-0.097	-0.095	0.040
			(0.059)	(0.069)	(0.067)	(0.072)	(0.076)
% college				-0.653***	-0.368**	-0.405***	-0.442***
				(0.174)	(0.143)	(0.148)	(0.157)
% production workers				-0.362***	-0.181	-0.189*	-0.208
				(0.111)	(0.114)	(0.115)	(0.127)
% particip. women				-1.462**	-1.948***	-2.106***	-2.345***
				(0.650)	(0.506)	(0.596)	(0.687)
% foreigners				-0.465**	-0.496**	-0.498**	-0.543**
				(0.213)	(0.193)	(0.211)	(0.231)
KP stat		48.66	31.09	31.72	32.51	32.51	32.51
Region fixed-effect					√	√	√

Notes: $N = 696$. Baseline sample is a balanced panel of 348 employment zones. Outcomes variables are expressed in percentage change over six-year period. All specifications include period fixed effect and log of initial total employment. Robust standard errors are clustered at the employment zone level. *p<.10 ** p<.05, *** p<.01.

Effect on manufacturing

How big is it?

- Assuming that a job lost in region a is lost for all other regions. β represent "absolute" variation in growth rate.
- Share of variance of ΔIPW due to Chinese supply shocks: partial R^2 of first stage (reg ΔIPW on ΔIPW^o)

$$R^2 \widehat{\Delta L_{\mathbb{T}}} = R^2 \hat{\beta} \sum_c \frac{L_{ct}}{L_t} \Delta IPW_c = -0.27\% \quad \text{(period 1995-2001)}$$

$$= -1.69\% \quad \text{(period 2001-2007)}$$

- Decline in manufacturing in France over the period 2001-2007: $\Delta L_{\mathbb{T}} = -13.3\%$
- The share of that decline attributable to Chinese rising productivity is: $\frac{\Delta \hat{L}_{\mathbb{T}}}{\Delta L_{\mathbb{T}}} \cdot R^2 = 13\%$ which amounts to 90,000 jobs lost.
- Probably a lower bound ...
  - Very small (-0.7) insignificant impact on population (number of fiscal households or alternatively registered voters in '95, '02, '07)

Pre-trends: placebo

Regressing past growth in private employment on lead values of ΔIPW

1. ΔIPW could be picking up the effect of a omitted factor that is correlated with Chinese import competition.
2. If this omitted factor is present before the period we consider and is stable over time, then past value of local labor market outcomes should be "affected" by lead values of ΔIPW.

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	(1) OLS: Private b/se	(2) IV: Private b/se	(3) OLS: Pre-trend b/se	(4) IV: Pre-trend b/se	(5) OLS: Lagged b/se	(6) IV: Lagged b/se
ΔIPW	-2.495***	-3.755***	-2.383***	-4.512***	-0.785	2.741**
	(0.405)	(0.790)	(0.405)	(0.959)	(0.632)	(1.300)
Pre-trend			0.142***	0.138***		
			(0.038)	(0.037)		
KP stat		32.16		35.52		32.16
Full set of controls (see notes)	√	√	√	√	√	√
Region fixed-effect	√	√	√	√	√	√

Notes: Column 1 and 2 respectively report OLS and IV estimates of specification shown in Equation (1) where the dependent variable is current employment growth rate in the overall private sector. Column 5 and 6 respectively report OLS and IV estimates of the same specification where employment growth in the private sector is lagged (1982-1990 for period 1995-2001, 1990-1999 for period 2001-2007, employment is now computed based on Census data). In case, long run unobserved factor driving down manufacturing employment in local labor markets is correlated with future exposure to Chinese import competition, one would expect to find negative coefficients in the Column 5 and 6.

Robustness checks and extensions

- Including imports from other low-wage countries
  - ◇ Adding Eastern Europe and Developing Asia.
  - ◇ Lower coefficient (-4) but larger average exposure leads to somewhat larger aggregate impact: -2.5% or 128,000 jobs from 2001 to 2007.
  - ◇ Lower coefficient is consistent with several firm-level studies (Bloom et al. 2011, Mion and Zhu, 2013)
- Very small (-0.7), insignificant effect on population (measured by fiscal households).
- Net exports ▸ Show
  - ◇ Difficult to estimate separately export and import

    China's import from the rest of the world are much less predictive of its imports from France than its exports to the ROW are of its exports to France.
  - ◇ Using net exports lead to larger coefficients and somewhat smaller aggregate prediction (50,000 jobs) largely due to smaller partial-R^2

Beyond manufacturing

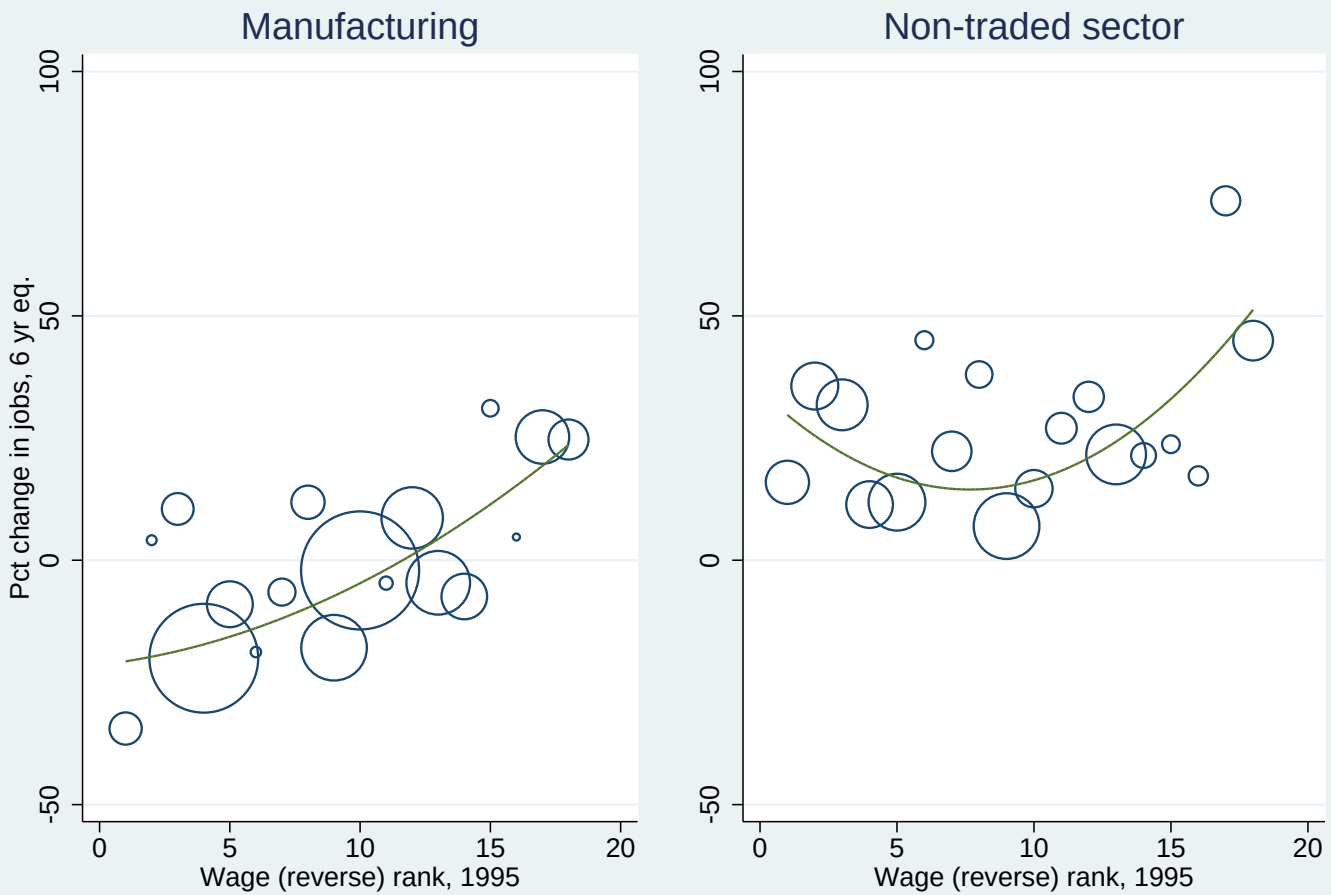
	(1) OLS: Jobs b/se	(2) IV b/se	(3) IV b/se	(4) IV b/se	(5) IV b/se	(6) IV: Hrs b/se	(7) IV: Emp. earnings b/se
ΔIPW	-1.845***	-3.640***	-3.937***	-4.071***	-3.645***	-1.765**	-2.363***
	(0.558)	(0.982)	(1.092)	(1.095)	(0.850)	(0.760)	(0.840)
% employment in mfg			0.022	0.003	0.170***	0.146***	0.177***
			(0.046)	(0.049)	(0.048)	(0.046)	(0.049)
% college				-0.360**	-0.099	-0.187*	-0.351***
				(0.143)	(0.117)	(0.113)	(0.121)
% production workers				-0.140	0.135	0.065	0.036
				(0.085)	(0.091)	(0.085)	(0.092)
% particip. women				-0.731	-0.936**	-1.140**	-1.076**
				(0.448)	(0.472)	(0.453)	(0.503)
% foreigners				0.062	-0.082	-0.154	-0.190
				(0.146)	(0.159)	(0.155)	(0.172)
KP stat		48.66	31.09	31.72	32.51	32.51	32.51
Region fixed-effect					√	√	√

Notes: $N = 696$. Baseline sample is a balanced panel of 348 employment zones. Outcomes variables are expressed in percentage change over six-year period. All specifications include period fixed effect and log of initial total employment. Robust standard errors are clustered at the employment zone level. *p<.10 ** p<.05, *** p<.01.

- Aggregate predictions: $R^2 \hat{\beta}_{\mathbb{N}} \overline{\Delta IPW} \times L_{\mathbb{N}} \approx 180,000$ jobs affected over the period 2001-2007. (Large size of the non-mfg sector).
- Considering hours worked reverses the conclusion: more hours worked destroyed in the manufacturing sector.
- "Local multiplier": $\beta_{\mathbb{N}}/\beta_{\mathbb{T}} = 0.58(jobs), 0.29(hours)$

Trade and job polarization

Descriptives 1: employment growth and initial wage rank (1995-2007)

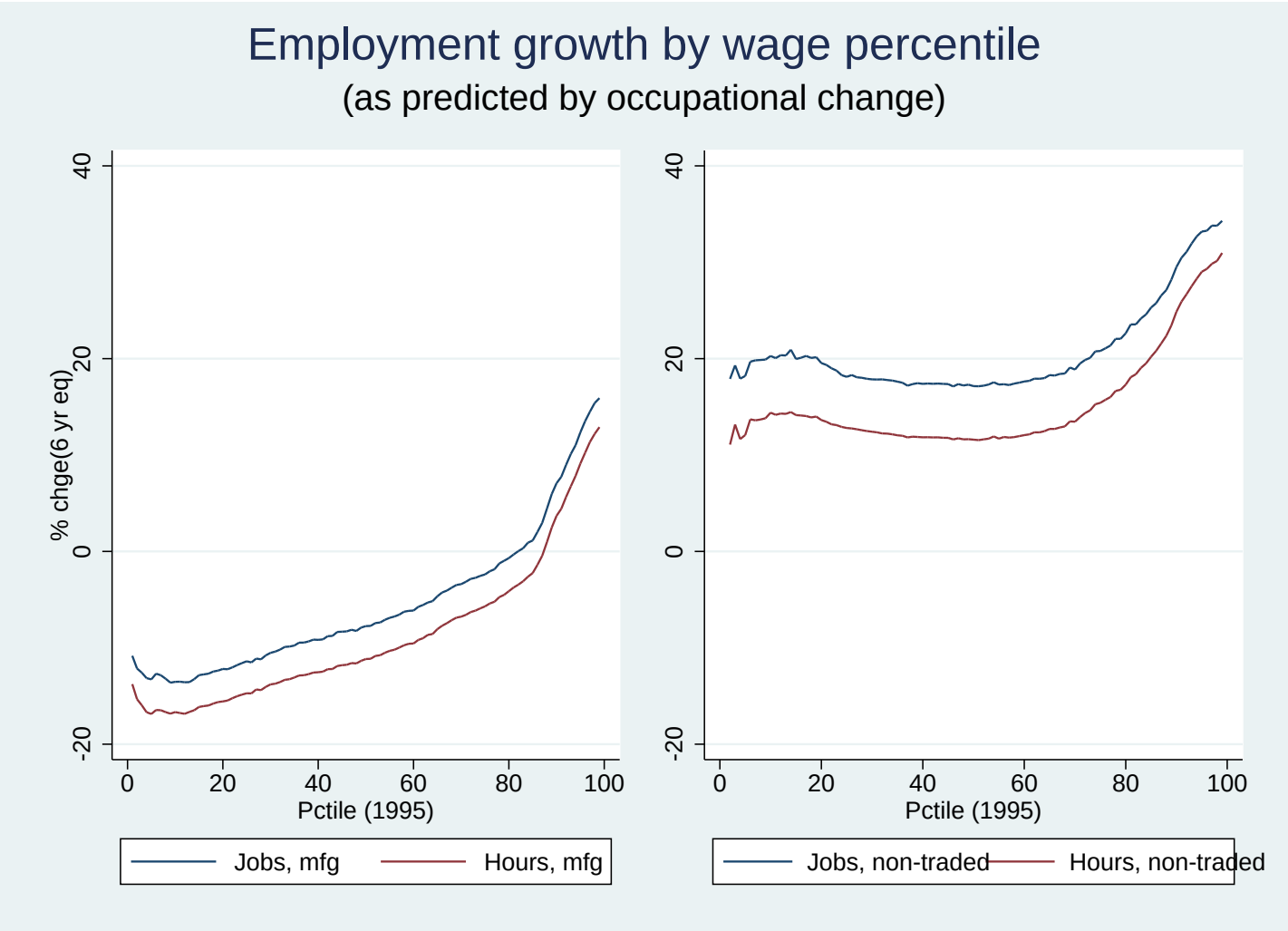


Each occupation is weighted by initial (1995) share in employment.

Trade and job polarization

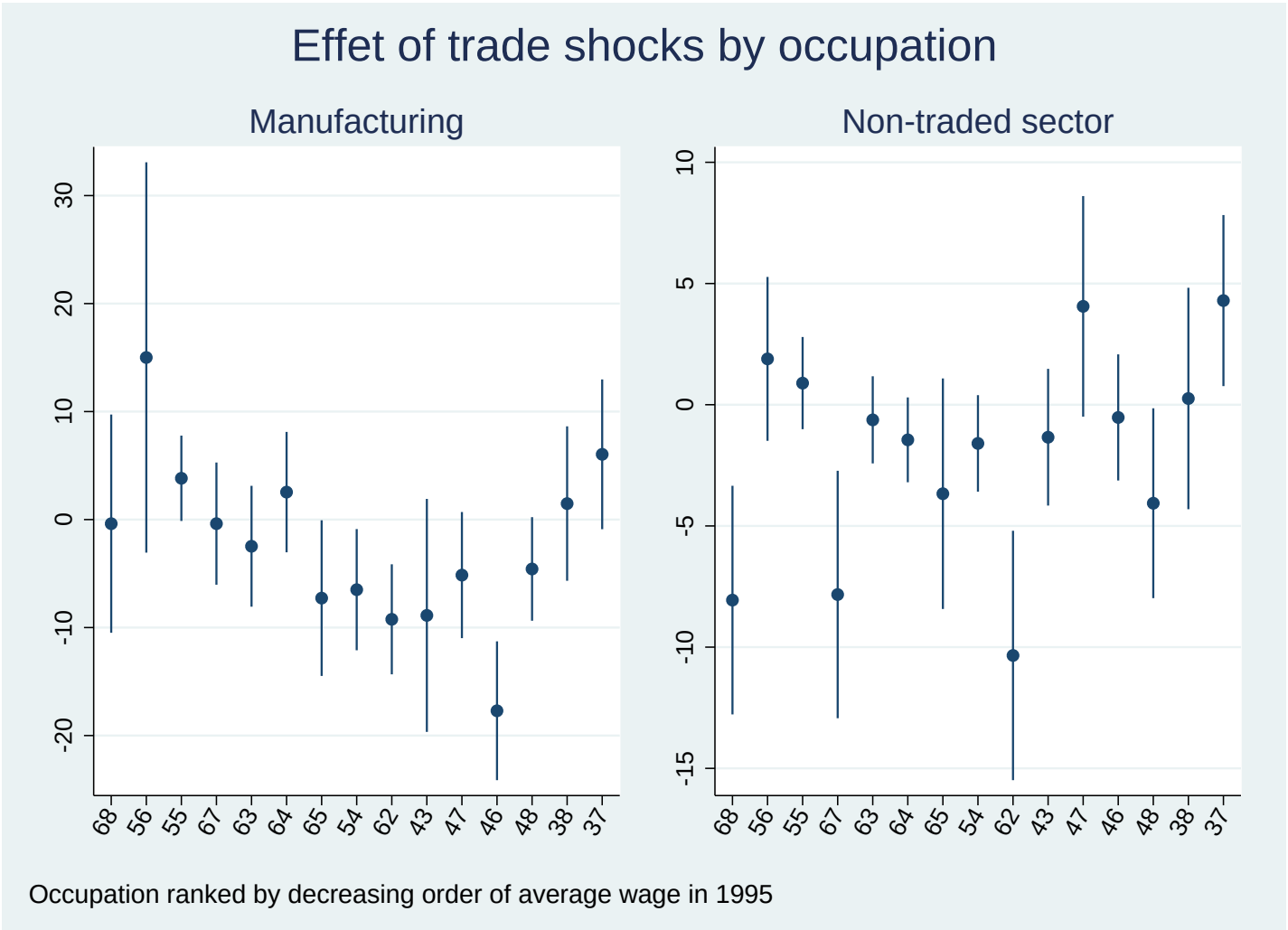
Descriptives 2: Accounting for within-occupation initial wage variation

(Juhn, Murphy and Pierce, JPE 1993 ▸ Details)



Trade and job polarization

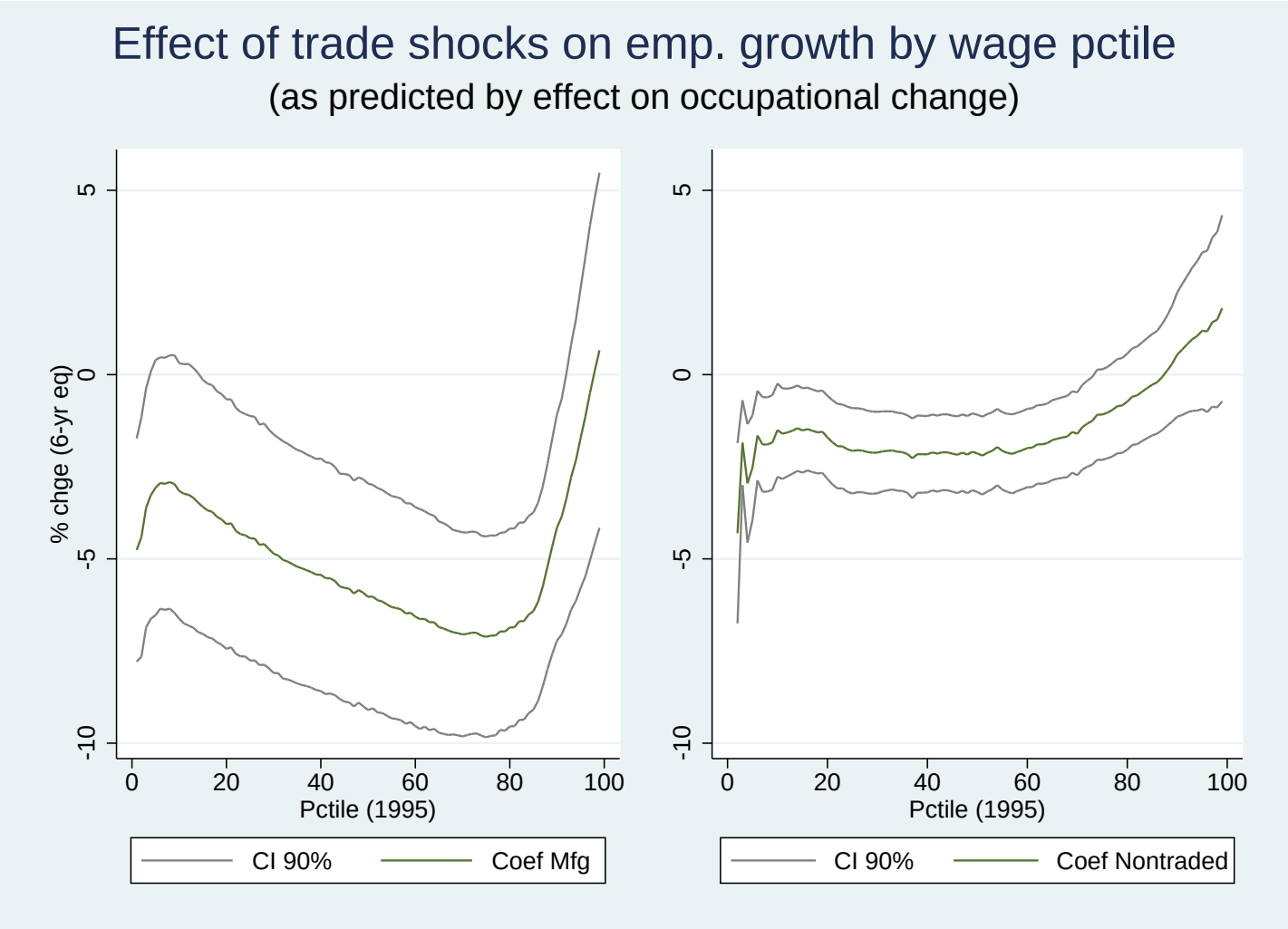
Occupation-specific impact of Chinese imports competition



▸ Broader categories

Trade and job polarization

Reweighin Juhn, Murphy and Pierce (1993)



Outline

Impact along the wage distribution

Manufacturing and non-tradable sector

	(1) avwage b/se	(2) 10th b/se	(3) 20th b/se	(4) 30th b/se	(5) 40th b/se	(6) 50th b/se	(7) 60th b/se	(8) 70th b/se	(9) 80th b/se	(10) 90th b/se
Mfg sector										
ΔIPW	-1.752***	-2.838	-1.385*	-1.513**	-1.348*	-1.176	-1.261	-1.470*	-2.238**	-2.250**
	(0.809)	(1.969)	(0.769)	(0.769)	(0.775)	(0.782)	(0.798)	(0.862)	(0.880)	(0.972)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
Non-traded sector										
ΔIPW	-0.598*	0.049	-0.714***	-0.883***	-1.137***	-1.068***	-1.014***	-0.934***	-0.429	0.049
	(0.320)	(0.245)	(0.235)	(0.240)	(0.258)	(0.263)	(0.293)	(0.329)	(0.369)	(0.465)
KP stat	32.51	32.51	32.51	32.51	32.51	32.51	32.51	32.51	32.51	32.51
Full set of controls		√	√	√	√	√	√	√	√	√
Region fixed-effect		√	√	√	√	√	√	√	√	√

Notes: $N = 696$. Baseline sample is a balanced panel of 348 employment zones. Outcomes variables are expressed in percentage change over six-year period. All specifications include period fixed effect and log of initial total employment. Robust standard errors are clustered at the employment zone level. *p<.10 ** p<.05, *** p<.01. Control variables include: initial share of manufacturing jobs, of female employees, of production employees, of foreign-born employees and of college educated employees. Decile are computed based on jobs reporting positive hours worked and wages, weighing by hours worked.

- Uniform decline in the manufacturing sector.
- Effect concentrated in the middle of the distribution in the non-tradable sector.
- Lowest decile is not affect in none of the sector.

▸ Plot coefficients ▸ Wage by broad category

Impact on inequality: inter-decile ratios

	(1) $\Delta \log \frac{q\_90}{q\_10}$ b/se	(2) $\Delta \log \frac{q\_90}{q\_50}$ b/se	(3) $\Delta \log \frac{q\_50}{q\_10}$ b/se
Manufacturing			
ΔIPW	0.588	-1.074	1.662
	(1.914)	(0.929)	(1.547)
Non-traded sector			
ΔIPW	0.000	1.116**	-1.116***
	(0.500)	(0.443)	(0.298)
KP stat	32.51	32.51	32.51
Full set of controls	√	√	√
Region fixed-effect	√	√	√

- Absence of overall impact holds for other measures of wage dispersion:
  - ◇ Sd of: log wage, residual, within-sector (NACE 3d)
- Heterogenous firms might be located in different EZs, hence the increase in wage dispersion might arise *between* rather than *within* local labor markets in the manufacturing sector.
- Reallocation of workers from manufacturing to non-tradable sector might put downward pressure on the median wage in the latter sector.

Assessing the role of the minimum wage

Interaction between ΔIPW with $S_{15} = \mathbf{1}_{\{share\ min\ wage<15\%\}}$

$$\Delta \log q^{\mathbb{N}}_{15,ct} = \Delta IPW_{ct} \cdot \beta_1 + \Delta IPW_{ct} \times S_{15,ct} \cdot \beta_2 + X'_{ct}\delta + Share^{\mathbb{T}}_{ct}\eta + \alpha_t + \gamma_{r(c)} + \varepsilon_{ct}$$

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	(1) $\Delta \log q_{15}$	(2) $\Delta \log \frac{q_{85}}{q_{10}}$	(3) $\Delta \log \frac{q_{85}}{q_{50}}$	(4) $\Delta \log \frac{q_{50}}{q_{15}}$	(5) $\Delta \log q_{15}$	(6) $\Delta \log \frac{q_{85}}{q_{10}}$	(7) $\Delta \log \frac{q_{85}}{q_{50}}$	(8) $\Delta \log \frac{q_{50}}{q_{15}}$
ΔIPW	-0.462**	0.323	0.929**	-0.606***	0.291	-0.166	0.856**	-1.022***
	(0.832)	(0.565)	(0.314)	(0.311)	(0.832)	(0.565)	(0.314)	(0.311)
$\Delta IPW \times S_{15}$					-1.341***	0.736**	-0.024	0.760***
					(0.237)	(0.359)	(0.343)	(0.199)
S_{15}					0.213	0.327	0.506*	-0.179
					(0.173)	(0.326)	(0.298)	(0.165)
KP stat	32.51	32.51	32.51	32.51	16.79	16.79	16.79	16.79
Controls	√	√	√	√	√	√	√	√
Region FE	√	√	√	√	√	√	√	√

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Outline

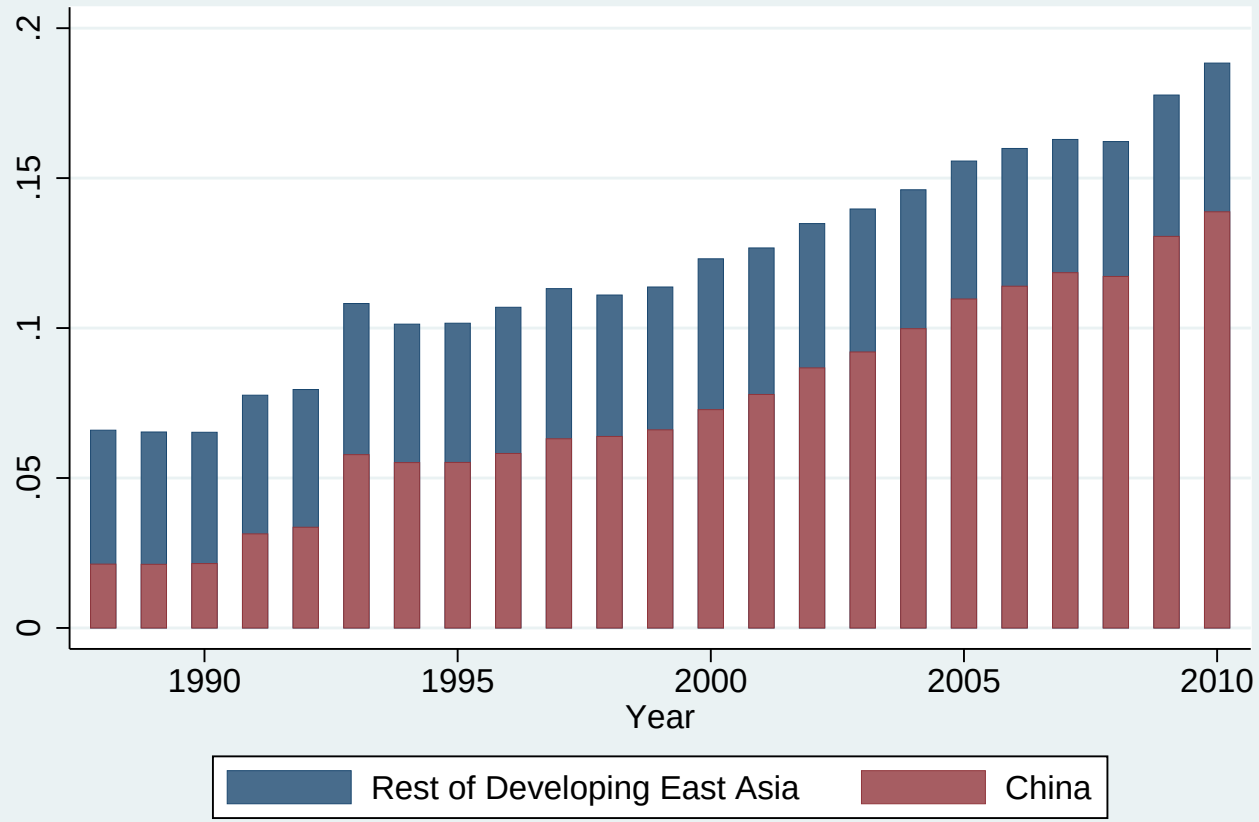
Conclusion

- Large local employment effect of trade shocks
  - Not confined to manufacturing, no detectable population adjustments.
  - Exposure to trade is a function of both sector/occupation and location.
- Job and wage polarization:
  - Across the board decline in hourly wages in mfg and no rise in wage dispersion in spite of the job-polarizing effect of trade.
  - Increase in upper-tail and decrease in lower-tail inequality in the non-traded sector, the latter appears to be driven by the bite of the minimum wage.
- Beyond the labor market:
  - Consumer welfare: Import competition is skill-biased but is also likely to be pro-poor in terms of consumer welfare. Combining estimates on price impact of import competition and consumption shares by income level would give a more complete picture of the distributional incidence of import competition.
  - Voting behavior: In a context where trade policy is a EU-level competency, import competition seems likely to boost local support for radical and anti-globalization political parties.

Extra-slides

Focus on Developing East Asia

Figure: Share of imports in high income countries from Developing East Asia



Source: Comtrade, Developing East Asia refers to World Bank category low, lower and upper middle income in East Asia.

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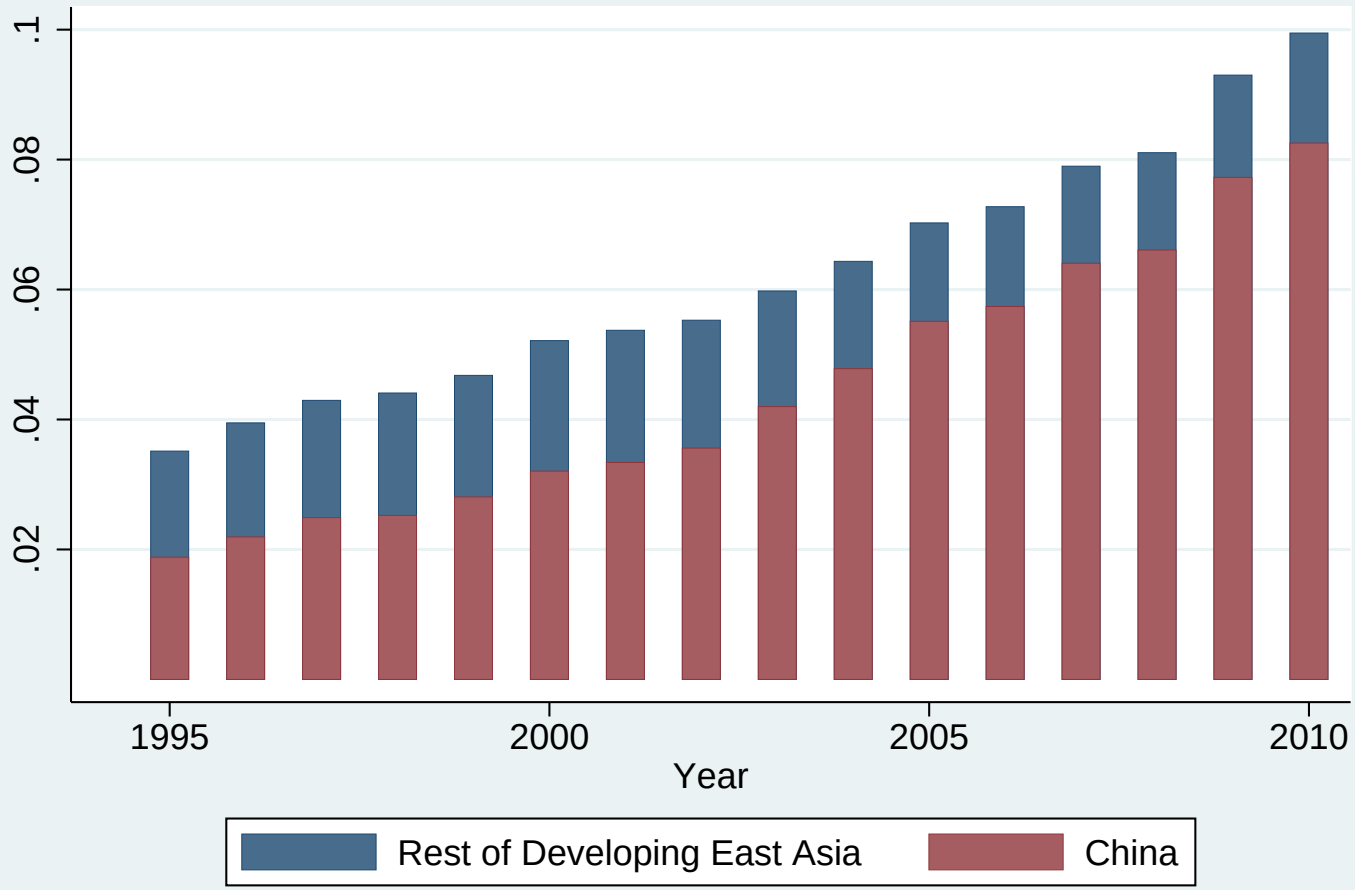
China's share in French imports

Figure: Share of Imports in France from Developing East Asia



Source: Comtrade, Developing East Asia refers to World Bank category low, lower and upper middle income in East Asia.

More on Identification

$$\Delta \log Y_c = \beta \Delta IPW_c + e_c \quad \text{where} \quad \Delta IPW_c = \sum_s \underbrace{\frac{L_{cs}}{L_c}}_{\theta_{cs}} \underbrace{\frac{\Delta M_s}{L_s}}_{m_s} = \theta_c' \mathbf{m} \tag{2}$$

We consider the case where the error term e_i is composed of (i) a weighted sum of nation-wide sectoral supply and demand shocks and (ii) a standard error term:

$$e_c = a_S \sum_s \lambda_{cs} w_s + a_D \sum_s \lambda_{cs} x_s + \varepsilon_c = \lambda_c' (a_S \mathbf{w} + a_D \mathbf{x}) + \varepsilon_c$$

where w_s and x_s represent, respectively, supply and demand shocks. λ_{cs} is a parameter that determines the local magnitude of shock s in location c. We suppose $a_D,\ a_S > 0$

$$\Delta \log Y_c = \beta \theta_c' \mathbf{m} + \lambda_c' (a_S \mathbf{w} + a_D \mathbf{x}) + \varepsilon_c \tag{3}$$

Panel with interactive fixed-effects. Source of bias:

$$\begin{aligned}
\text{cov}(\theta_c' \mathbf{m}, \lambda_c' (a_S \mathbf{w} + a_D \mathbf{x})) &= a_S \theta_c' \text{cov}(\mathbf{m}, \mathbf{w}) \lambda_c + a_D \theta_c' \text{cov}(\mathbf{m}, \mathbf{x}) \lambda_c \\
&= a_S \sum_s \theta_{cs} \lambda_{cs} \text{cov}(m_s, w_s) + a_D \sum_s \theta_{cs} \lambda_{cs} \text{cov}(m_s, x_s) \\
&= \sum_s \theta_{cs} \lambda_{cs} \left[a_S \text{cov}(m_s, w_s) + a_D \text{cov}(m_s, x_s) \right]
\end{aligned}$$

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More on Identification

$$\text{cov}(\theta_c'\mathbf{m}, \lambda_c'(a_S\mathbf{w} + a_D\mathbf{x})) = \sum_s \theta_{cs}\lambda_{cs}\left[a_S \underbrace{\text{cov}(m_s, w_s)}_{<0} + a_D \underbrace{\text{cov}(m_s, x_s)}_{>0}\right]$$

Instrumental variable approach based on the notion that:

- Chinese exports to OHICs are independent from French domestic sectoral shocks
- Correlation between between Chinese exports to OHICs and to France reflects increase in productivity in China.

Hence the assumption is:

$$\text{cov}(m_s^o, w_s) = \text{cov}(m_s^o, x_s) = 0 \tag{4}$$

in which case $\theta_i'\mathbf{m}^o$ can be used to instrument for $\theta_i'\mathbf{m}$

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JMP (1993)'s method to describe employment polarization

- Median or average wage rank: simple ranking but ignores within occupation variation (particularly problematic when number of documented occupations is not very large)
- Compute the contribution of each occupation g to each percentile p of the wage distribution:

$$a_{gp} = \frac{L_{gp}}{L_p}$$

- Apportion each change in occupation employment $\Delta \log L_g$ across percentiles up to the occupation contribution to employment in each percentile a_{gp}.
- Change in employment at percentile p as predicted by occupational change is computed as follow:

$$\widehat{\Delta \log L_p} = \sum_{g=1}^{G} a_{gp} \Delta \log L_g$$

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Employment effect by skill-category

	(1) Low Skill b/se	(2) Intermediate Skill b/se	(3) High skill b/se	(4) Low Skill b/se	(5) Intermediate Skill b/se	(6) High skill b/se
Manufacturing						
ΔIPW	-4.066**	-15.096***	-1.466	-3.253*	-14.561***	-1.544
	(1.864)	(3.847)	(4.154)	(1.676)	(3.699)	(4.072)
Non-traded sector						
ΔIPW	-5.909***	-2.980*	5.686**	-4.987***	-1.899	4.950**
	(1.420)	(1.662)	(2.513)	(1.099)	(1.386)	(2.400)
KP stat	27.84	27.84	27.84	27.84	27.84	27.84
Controls (see notes)	√	√	√	√	√	√
Region fixed-effect				√	√	√

Notes: $N = 696$. Baseline sample is a balanced panel of 348 employment zones. Outcomes variables are expressed in percentage change over six-year period. All specifications include period fixed effect and log of initial total employment. Robust standard errors are clustered at the employment zone level. *p<.10 ** p<.05, *** p<.01. Control variables include: initial share of manufacturing jobs, of female employees, of production employees, of foreign-born employees and of college educated employees. Skill categories are based on occupation. Clerk and unskilled production workers are considered low skill occupations. Intermediate professions and low-rank managers are considered medium skill occupations, while intellectual professions, senior management are considered high-skill occupations.

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Wage effect by skill-category

	(1) All b/se	(2) Low Skill b/se	(3) Intermediate Skill b/se	(4) High skill b/se
Mfg				
ΔIPW	-2.552***	-0.420	-3.157***	1.548
	(0.809)	(0.656)	(0.937)	(1.743)
Non-traded				
ΔIPW	-0.598**	-0.668**	-0.484	-1.409
	(0.260)	(0.286)	(0.377)	(0.893)
KP stat	32.51	32.51	32.51	32.51
Full set of controls	√	√	√	√
Region fixed-effect	√	√	√	√

Notes: $N = 696$. Baseline sample is a balanced panel of 348 employment zones. Outcomes variables are expressed in percentage change over six-year period. All specifications include period fixed effect and log of initial total employment. Robust standard errors are clustered at the employment zone level. *p<.10 ** p<.05, *** p<.01. Control variables include: initial share of manufacturing jobs, of female employees, of production employees, of foreign-born employees and of college educated employees. Skill categories are based on occupation. Clerk and unskilled production workers are considered low skill occupations. Intermediate professions and low-rank managers are considered medium skill occupations, while intellectual professions, senior management are considered high-skill occupations.

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Trade Deficit per Workers

Manufacturing sector

	(1) OLS: Jobs b/se	(2) IV b/se	(3) IV b/se	(4) IV b/se	(5) IV b/se	(6) IV: Hrs b/se	(7) IV: Hourly Wage b/se
ΔDPW	-5.023***	-12.470***	-10.344***	-9.116***	-8.231***	-8.044***	-2.287*
	(1.237)	(2.999)	(3.374)	(3.144)	(2.760)	(2.563)	(1.228)
% mfg			-0.117	-0.143*	-0.072	-0.070	0.101***
			(0.072)	(0.078)	(0.075)	(0.078)	(0.034)
% college				-0.690***	-0.312**	-0.350***	0.182***
				(0.164)	(0.127)	(0.128)	(0.061)
% prod. workers				-0.500***	-0.192	-0.210*	0.030
				(0.104)	(0.117)	(0.119)	(0.057)
% women				-1.489**	-1.866***	-2.002***	-0.102
				(0.696)	(0.505)	(0.592)	(0.325)
% foreigners				-0.354	-0.483**	-0.471**	-0.074
				(0.225)	(0.214)	(0.231)	(0.062)
KP stat		20.42	12.18	12.57	13.61	13.61	13.61
Region fixed-effect					√	√	√

Notes: $N = 696$. Baseline sample is a balanced panel of 348 employment zones. Outcomes variables are expressed in percentage change over six-year period. All specifications include period fixed effect and log of initial total employment. Robust standard errors are clustered at the employment zone level. *p<.10 ** p<.05, *** p<.01.

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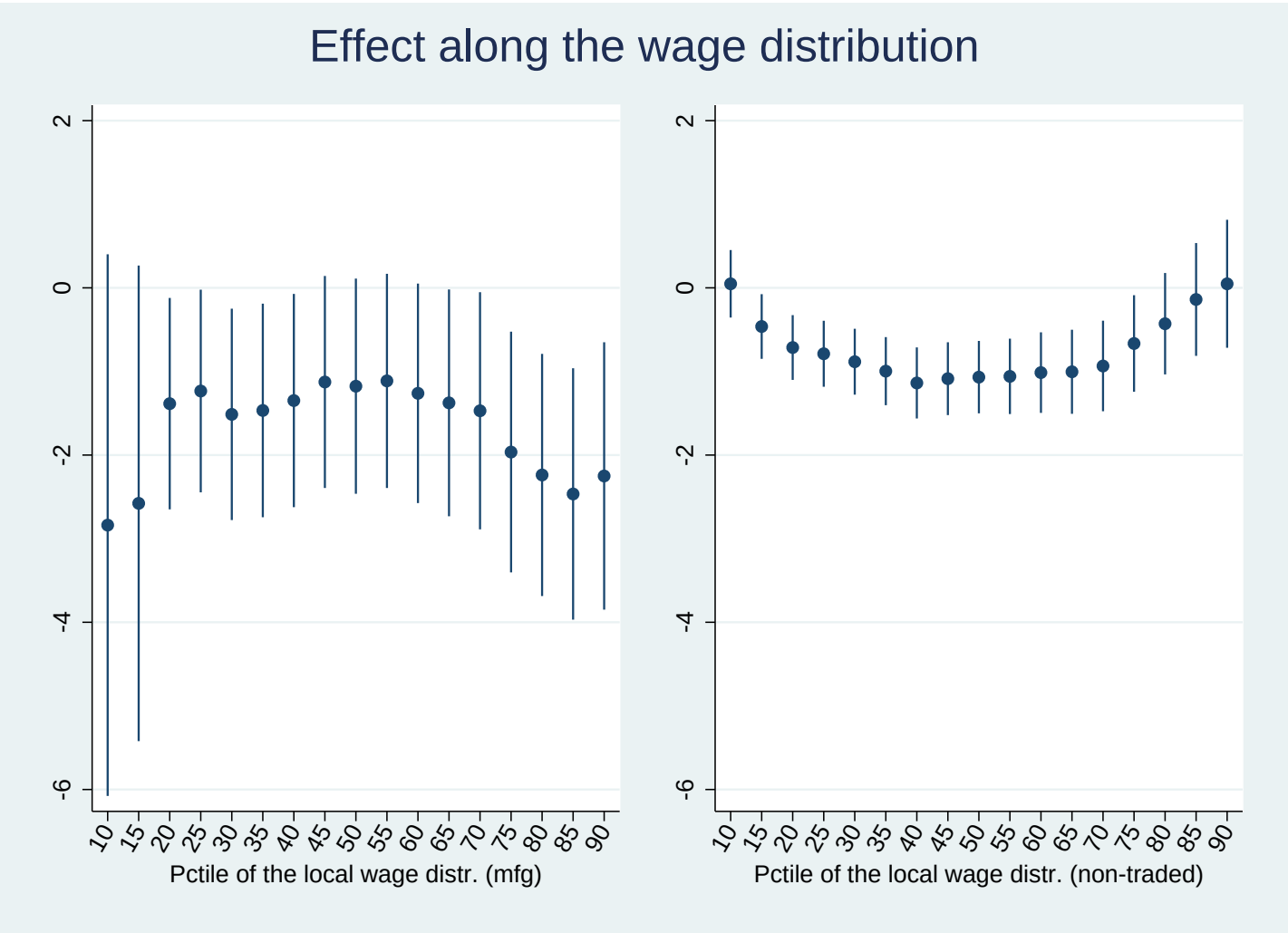
Impact along the local wage distribution



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Impact on inequality: variance of log(wage)

(Dep. var × 100)	(1) ΔVar log w b/se	(2) ΔResidual b/se	(3) ΔResidual Within-Sector b/se
		Manufacturing	
Δ*IPW*	1.66*	1.545	1.054
	(0.997)	(0.944)	(0.72)
		Non traded sector	
Δ*IPW*	-0.064	-0.146	-0.042
	(0.322)	(0.271)	(0.245)
N	696	696	696
KP stat	27.84	27.84	27.84
Controls	√	√	√
Region fixed-effect	√	√	√

Notes: $N = 696$. Baseline sample is a balanced panel of 348 employment zones. Outcomes variables are expressed in percentage change over six-year period. All specifications include period fixed effect and log of initial total employment. Robust standard errors are clustered at the employment zone level. *p<.10 ** p<.05, *** p<.01. Control variables include: initial share of manufacturing jobs, of female employees, of production employees, of foreign-born employees and of college educated employees. Variance of log(wage) computed based on jobs reporting positive hours worked and wages, weighing by hours worked. Δ Residual: refers to changes in the variance of the residual from a wage regression including the following individual controls: age (bins of 4 years), gender and foreign dummies. Δ Residual Within-Sector refers to changes in the variance of the residual from the same regression with additionally NACE 3-digit dummies (200 categories).

- Heterogenous firms might be located in different EZs, hence the increase in wage dispersion might arise between rather than within local labor markets in the manufacturing sector.
- An industry-level specification could help investigate this interpretation.

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