

Adjusting to Globalization

Evidence from Worker-Establishment Matches in Germany

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The German Labour Market in a Globalised World - Challenges through Trade, Technology, and Demographics

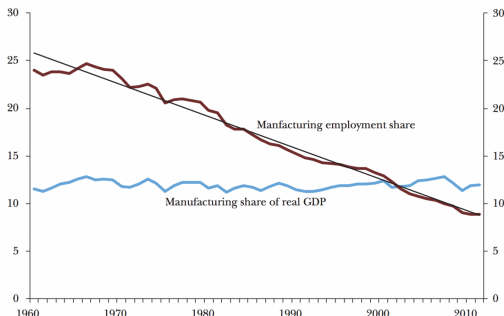
Geneva Trade and Development Workshop, 10 May 2017

Secular decline of manufacturing jobs in the US

Figure 1

Manufacturing Value Added and Employment as a Share of the Total US Economy, 1960–2011

(in 2005 prices)



Source: Industry Accounts of the Bureau of Economic Analysis.

Note: Output is measured as value added in 2005 prices, and employment is reported as persons engaged in production (full-time equivalent employees plus the self-employed).

- Main driver of the manufacturing decline: technological change (Rodrik 2016; Krugman 2016; Sachs 2016; Herrendorf et al. 2014, etc.)

Another culprit: increasing trade with China!

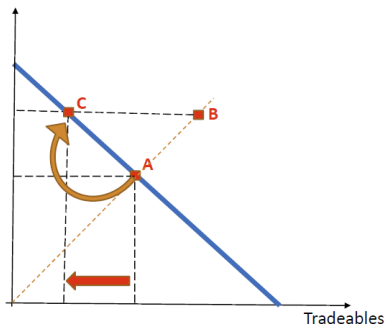
- 5 million manufacturing jobs less in 2014 than in 2000.
Roughly 1 million due to the “China shock” (Acemoglu et al. 2016; Krugman 2016)
- Adverse impacts on workers in import-competing manufacturing industries
 - Job displacement, reduced labor earnings, and other problems for exposed workers
 - Adjustment costs to trade-induced changes in labor markets

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 - Adjustment costs to trade-induced changes in labor markets
- General story? Or specific for the US, given its huge trade deficit?
- This paper: Germany
 - Traditional manufacturing focus, aggregate trade surplus
 - Trade with China and Eastern Europe (“the East”) much more balanced
- ❶ Dauth, Findeisen, Südekum (JEEA 2014, AER-PP 2017): Aggregate effect of trade on manuf employment, and impacts across German local labor markets
- ❷ This paper: Worker-level impact on job biographies, adjustment to import *and* export exposure in individual earnings profiles

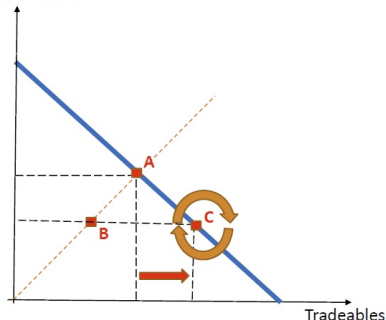
A stylized model for US and Germany (Krugman, NYT 2016)

Non-tradeables



(a) USA: Current account deficit

Non-tradeables



(b) Germany: Current account surplus

- No impact of trade on aggregate employment, but on its sectoral composition
- Trade surplus tends to raise manuf share, possibly overridden by technology trend
- Common feature: Trade-induced structural change may cause adjustment costs

Agenda

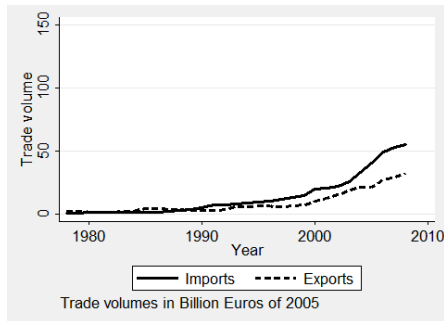
- ➊ Descriptive overview
 - Trade
 - Labor market
- ➋ Medium-run cross-sectional analysis (ADHS for Germany)
- ➌ Short-run panel analysis
 - Trade and sorting
 - Differential effects for heterogeneous worker-establishment matches
- ➍ Event study approach
 - Dynamics of individual adjustment to rising trade exposure
- ➎ Impact of trade on labor market (re-)entry flows (if time allows)
- ➏ Conclusions

Literature

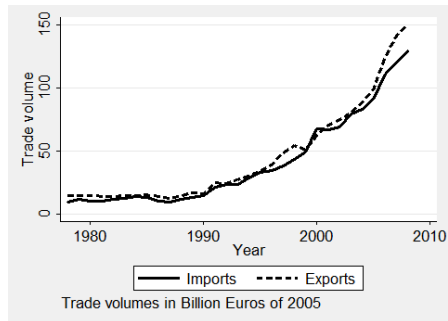
- The “China Shock” in industrialized countries: Autor et al. (AER 2013, QJE 2014), Pierce and Schott (AER 2016), Dauth, Findeisen, Suedekum (JEEA 2014), . . .
 - Using LEED to study the labor market effects of trade: Menezes-Filho and Muendler (2011), Krishna et al. (JIE 2014), Dix-Carneiro and Kovak (2015), Hummels et al. (AER 2014), Davidson et al. (JIE 2014), . . .
 - Sorting across and assortative matching of workers and firms within sectors: Helpman et al. (2016), Caliendo et al. (2015), Galle et al. (2015), Fan (2015), Sampson (2014), Dix-Carneiro (2014), . . .
- ⇒ Endogenous mobility responses of heterogeneous workers across heterogeneous firms, industries, and/or regions in the wake of trade shocks

The rise of the East

“Globalization” = The rise of China and Eastern Europe (“the East”)



(c) China

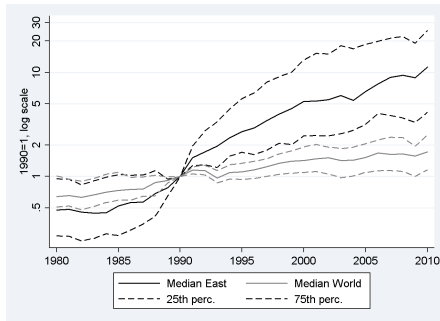


(d) Eastern Europe

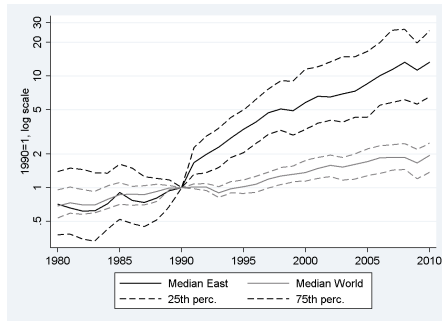
- Massive increase in Chinese imports, but also exports to China
- Even stronger increases in trade volumes with respect to Eastern Europe
- (Slight) overall trade surplus vis-a-vis "the East"

The rise of the East

“Globalization” = The rise of China and Eastern Europe (“the East”)



(e) Imports



(f) Exports

- Growth in trade volumes across industries: 25th, 50th, and 75th quantile
- Increases much stronger for trade with "the East" than for trade in general

Which industries? - Exports

Industry	1990	2000	2010
341 motor vehicles	0.58	4.99	18.49
343 parts and accessories for motor vehicles	0.37	4.51	13.22
295 other special purpose machinery	2.29	4.68	10.00
291 mach. for the prod. and use of mech. power	0.54	2.61	8.96
241 basic chemicals	1.10	2.76	7.19
312 electricity distribution and control apparatus	0.22	2.54	6.80
292 other general purpose machinery	0.82	2.38	6.25
252 plastic products	0.21	2.85	5.70
294 machine-tools	1.36	2.09	5.61
244 pharmaceuticals	0.33	1.41	5.16

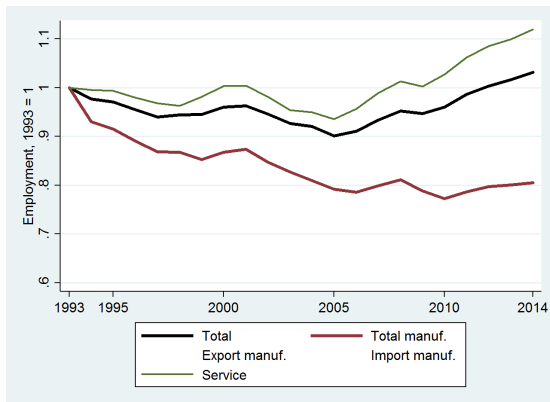
Notes: The ten top exporting industries by trade volumes in 2010 (bln. Euros of 2010).

Which industries? - Imports

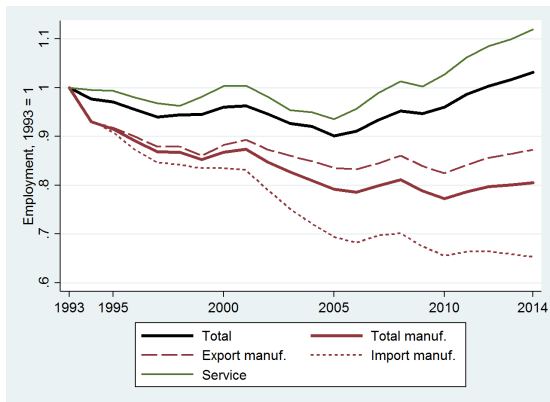
Industry	1990	2000	2010
300 office machinery and computers	0.05	3.71	13.61
341 motor vehicles	0.21	7.62	8.89
343 parts and accessories for motor vehicles	0.04	2.80	8.64
321 electronic valves and other components	0.02	0.82	8.25
182 other wearing apparel and accessories	2.57	6.52	7.86
323 television and radio receivers, recording app.	0.53	2.12	7.04
274 basic precious and non-ferrous metals	1.03	3.40	5.57
361 furniture	0.53	3.09	5.29
351 Building and repairing of ships and boats	0.01	0.27	5.14
316 electrical equipment n.e.c.	0.11	2.75	4.87

Notes: The ten top importing industries by trade volumes in 2010 (bln. Euros of 2010).

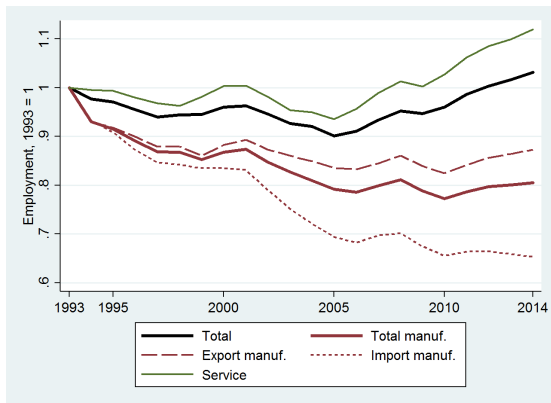
Sectoral employment trends in Germany (1993-2014)



Sectoral employment trends in Germany (1993-2014)



Sectoral employment trends in Germany (1993-2014)



- Similar aggregate trend as in the US: Shift from manuf to services
- Export-manuf stable ($\approx 5m$ jobs) since 1997, continuing losses in import-manuf
- Micro-anatomy behind those aggregate trends all but smooth (DFS, AER 2017)
 - Few direct switches manuf $\rightarrow$ serv, or import $\rightarrow$ export-manuf
 - Mostly driven by new entrants or returnees out of non-employment

[Details](#)

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Labor market data

- Sample of Integrated Labour Market Biographies (IEB)
 - 15% random sample of all German employees subject to social security
 - Registry spell data: precise employment biographies 1990-2010
 - Info on workplace establishment, wages, personal characteristics, occupation, etc.
- Identify all manufacturing workers in 1990 or 2000
- Only full-time workers between 22 and 54 years in base year (~ 1.2 m people)
- Construct a balanced 11-year panel for each worker (1990-2000, 2000-2010)

Trade data

- **United Nations Commodity Trade Statistics Database (Comtrade)**

- Annual trade flows converted into 2010-Euros
- 4-digit SITC codes converted to 93 3-digit manufacturing industries

- **Trade exposure of industry j in year t :**

Aggregate import/export volumes normalized by (lagged) wage bill

$$ImE_{jt}^{EAST \rightarrow D} = \frac{IM_{jt}^{EAST \rightarrow D}}{\bar{w}_{j(t-1)} L_{j(t-1)}} \quad \text{and} \quad ExE_{jt}^{EAST \rightarrow D} = \frac{EX_{jt}^{D \rightarrow EAST}}{\bar{w}_{j(t-1)} L_{j(t-1)}}$$

- The “EAST”: China and 21 Eastern European countries

Medium-run cross-sectional analysis

$$Y_{ijt} = \alpha \cdot \mathbf{x}'_{ijt} + \beta_1 \cdot \Delta \text{Im}E_{jt}^{EAST \rightarrow D} + \beta_2 \cdot \Delta \text{Ex}E_{jt}^{D \rightarrow EAST} + \phi_{REG(i),J(j),t} + \epsilon_{ij}$$

- Y_{ijt} : cumulated earnings of worker i during the respective time window (1991-2000, 2001-2010), divided by base year earnings. Worker starts of in industry j in base year $t = 1990, 2000$.
- $\mathbf{x}_{ijt}$: Standard worker/industry-level controls
- $\phi_{REG(i),J(j),t}$: dummies for interactions of 10 broad industry-group dummies, time period dummy, Federal State dummies
- $\Delta \text{Im}E_{jt}; \Delta \text{Ex}E_{jt}$: Change of import/export exposure of the worker's **initial** 3-digit manufacturing industry j during the respective decade.

► Descriptives

Identification issues

1. Unobserved shocks affecting both trade and domestic labor markets

- Instrument trade variables with trade flows of other high wage countries (IV group: Aus, Can, Nor, NZ, Swe, UK)
- Construct trade variables from residuals of gravity equations

2. Confounding long-run trends (structural change)

- Identify all effects within 10 broad industry groups
- Placebo regression to test if future trade exposure predicts 1980s earnings profiles (it doesn't!)

3. Confounding region specific trends (German reunification)

- State-fixed effects
- Dropping Eastern states does not change results

Trade and cumulative earnings

► Identification and Robustness

	Dependent variable: 100 x cumulated earnings relative to earnings in base year				
	(1)	(2)	(3)	(4)	(5)
	All employers	Manufacturing sector			Other Sector
Same 2-dig industry		yes	yes	no	no
Same employer		yes	no	no	no
import exposure	-0.1665*** (0.042)	-0.2859*** (0.090)	-0.0760 (0.056)	0.0002 (0.036)	0.1952*** (0.046)
export exposure	0.5719*** (0.151)	0.7092** (0.324)	0.2275 (0.244)	-0.0410 (0.116)	-0.3238*** (0.124)
R ²	0.160	0.085	0.027	0.042	0.046

Notes: 1,177,112 workers. Further controls include indicators for gender, foreign nationality, 3 skill categories, 3 tenure categories, 7 age groups, 5 plant size groups, individual (log) earnings in the base year, and interactions of base period $\times$ 10 manuf. industry groups $\times$ Federal States. Standard errors, clustered by 3-digit industry $\times$ base year in parentheses

Trade and cumulative earnings

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Benchmarking: Cumulated earnings impact over ten years for worker with median annual income (37,478 € in the 1st period) and 75% versus 25% rise in import / export exposure

- Import effect: $-0.1665 \times (34.45 - 7.37) \times 37478/100 \approx -1,689 \text{ €}$ (2nd period: -1,673 €)

Trade and cumulative earnings

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- Export effect: $+0.5719 \times (29.53 - 9.87) \times 37478/100 \approx +4,214 \text{ €}$ (2nd period: 7,418 €)

Trade and cumulative earnings

Dependent variable: 100 x cumulated earnings relative to earnings in base year					
	(1)	(2)	(3)	(4)	(5)
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- Decomposition: adding (2) thru (5) gives (1)

Trade and cumulative earnings

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Push effect of import exposure: Lower cumulated earnings in original industry.
Higher earnings in the service sector, but not in other manufacturing industries.

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Intra-industry earnings gains of export exposure:

Higher earnings on-the-job and in other firms within the original industry.

Melitz reallocation (but not significant)

Worker flows: Linear prob model

	Dependent variable: dummy=100 if worker ever				
	(1) becomes unemployed	(2) stays in manufacturing sector	(3)	(4)	(5) Leaves Sector
Stays in 2-dig industry		yes	yes	no	no
Stays in firm		yes	no	no	no
import exposure	0.0194*** (0.006)	-0.0324** (0.013)	-0.0046 (0.006)	-0.0064 (0.005)	0.0434*** (0.012)
export exposure	-0.0478** (0.019)	0.0745 (0.051)	0.0101 (0.022)	0.0167 (0.022)	-0.1013*** (0.037)
R ²	0.153	0.079	0.014	0.023	0.061

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Push effects of import penetration: Into unemployment & into service jobs, but no evidence for worker reallocations *within* manufacturing (no “pull effects”)

Rising export opportunities: Lower unemployment risk, higher job stability.
Worker reallocation to other firms in the same manuf industry (Melitz-effect)

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R ²	0.153	0.079	0.014	0.023	0.061

Benchmarking: Mean prob to become unemployed for ≥ 1 day $\approx 52\%$.

- Import effect: $+0.0194 \times (32.17 - 5.9) \approx +0.51\text{-points}$ increase
- Export effect: $-0.0478 \times (52.69 - 18.76) \approx -1.62\text{-points}$ reduction

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Medium-run panel analysis

Potential problem: Panel data under-exploited!

- Cross-sectional analysis, no account for unobserved heterogeneity via FEs.
 - An individual is assigned the trade shock of the initial industry j , even if he left j immediately after base year
 - Idea: Industry affiliation in base year orthogonal to shock; shock induces longer-term effects on exposed individual despite possible mobility response.
- ⇒ Ignores the dynamics of individual adjustment and may lead to mis-measurement

Short-run panel analysis

$$Y_{ipjt} = \mathbf{x}'_{it}\boldsymbol{\alpha} + \beta_1 \cdot \text{Im}E_{jt}^{EAST \rightarrow D} + \beta_2 \cdot \text{Ex}E_{jt}^{D \rightarrow EAST} + \phi_{t,J(j),REG(r)} + \gamma_{i,u} + \epsilon_{ipjt}$$

- Y_{ipjt} are annual earnings of worker i in plant p , industry j , region r , in year t (relative to base year earnings in the year 1990 or 2000, respectively)
- State $\times$ broad industry-group $\times$ year interaction dummies

Short-run panel analysis

$$Y_{ipjrt} = \mathbf{x}'_{it}\alpha + \beta_1 \cdot ImE_{jt}^{EAST \rightarrow D} + \beta_2 \cdot ExE_{jt}^{D \rightarrow EAST} + \phi_{t,J(j),REG(r)} + \gamma_{i,u} + \epsilon_{ipjrt}$$

Main issue with short-run approach: Sorting/selection into particular industries!

- Tackled by the choice of $u = \{p, jr, j, r\}$, which restricts identifying variation.
- γ_i -model picks up direct effect of trade *and* indirect compositional effects (i.e. mobility and/or matching correlated with trade).
- $\gamma_{i,p}$ -model only exploits within-job variation, purges compositional/sorting effects.

High-dimensional fixed effects models

[▶ Descriptives](#)

2SLS		Dependent variable: 100 x annual earnings normalized by base year earnings			
	(1)	(2)	(3)	(4)	(5)
import exposure	-0.0248*** (0.0064)	-0.0249*** (0.0065)	-0.0263*** (0.0065)	-0.0233*** (0.0040)	-0.0189*** (0.0036)
export exposure	0.0789*** (0.0246)	0.0768*** (0.0245)	0.0816*** (0.0246)	0.0860*** (0.0151)	0.0879*** (0.0148)
Fixed effects	i x p	i x j x r	i x j	i x s	i
Groups	1612499	1527922	1478652	1329072	1176490
R ²	0.629	0.623	0.615	0.595	0.571
KP	10.855	9.928	9.938	20.317	23.349

Notes: 13,531,749 observations of 1,230,159 workers.

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- Import exposure: Negative effect within job spells/industries stronger negative than the effect across job spells/industries (“**push effects**”).

High-dimensional fixed effects models

► Smooth Work Biographies

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Notes: 13,531,749 observations of 1,230,159 workers.

- Export exposure: Positive earnings effect within jobs spells / industries.
- No evidence for strong compositional effects (sorting into export-oriented industries) as coefficients don't differ much across models (no "pull effects")

Heterogeneous effects (sample splits)

- **By age:** Young workers much more affected by trade than old workers (+ and –).
- **By gender:** Import penetration affects men and women similarly, but only men reap export gains! Consistent with Boler, Javorcik and Ultveit-Moel (2015).
- **By education:** Import effects similar for low- and high-skilled, but export gains only for HQ! Increase of between-group inequality through trade.
- **By unobservable worker ability (CHK-effects):** Stronger import effects, weaker export effects for “bad workers”. Increase of within-group inequality through trade. Consistent with Helpman et al. (2012) or Felbermayr et al. (2014)
- **By unobservable workplace characteristics (CHK-effects):** No clear differences. Inequality driven by worker-specific, not plant-specific wage components

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Event study

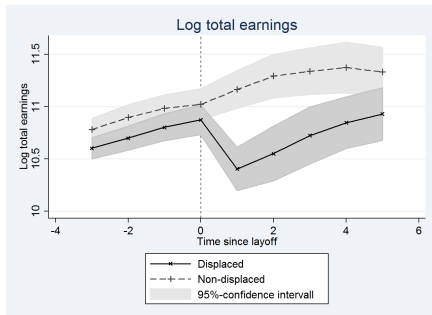
- Displacement group: Age 24-50, with tenure at current job ≥ 4 years
- Spell ends with notification “end of job”, subsequent spell (min 1 day) is UI-benefit
- Very likely an *involuntary* job loss! (but not mass layoff due to low NOBS)
- Control group: Nearest neighbor matching with propensity score
- Score based on employment and earnings in previous 2 years, age, tenure, sex, education, firm size, and industry. Sibling must come from same industry!

Event study estimation similar as in Jacobson, LaLonde, Sullivan (1993):

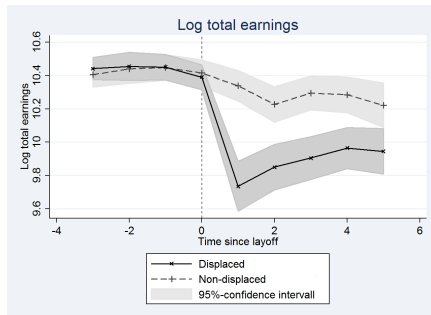
$$y_{it} = \sum_{k=-3}^5 \delta_k I(t = t^* + k) I(\text{disp}) + \tau_{-4} I(t = -4) I(\text{control}) + \sum_{k=-3}^5 \tau_k I(t = t^* + k) I(\text{control}) + x'_{it} \beta + \alpha_{tc} + \varepsilon_{it}$$

- y_{it} : outcome (log annual earnings) for worker i , k years before/after the job loss in industry j . Coefficients of interest: δ_k and τ_k for movers/stayers
- Robustness check: Model with individual fixed effects μ_i
Removes permanent differences between displaced worker and statistical sibling

Comparing industry movers and stayers: Examples



341: Automobile

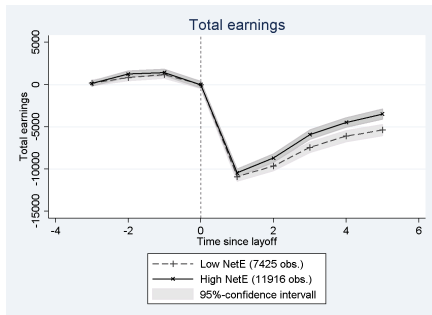
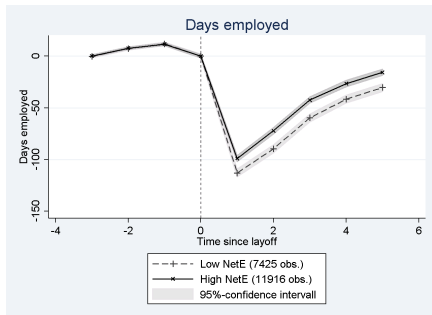


323: Radio and television sets

Notes: 95%-CIs obtained from standard errors clustered by birth year and calendar year interactions.

- Upward trend for workers who permanently stay in automobile industry, downward trend for workers in highly import-exposed radio/TV-industry
- Displaced workers generally suffer, but worse in radio/TV than in automobile
- All workers lose firm-specific but not necessarily industry-specific human capital

Comparing displacements in import/export manufacturing



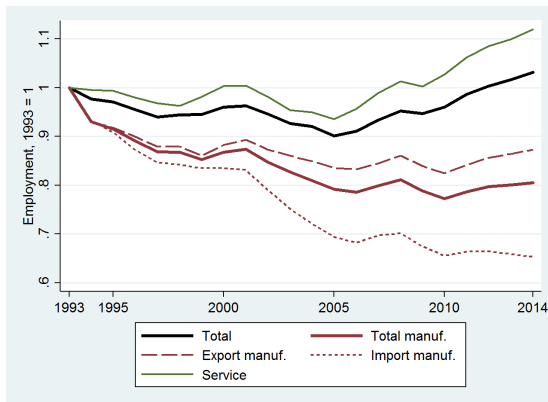
Notes: 95%-CIs obtained from standard errors clustered by birth year and calendar year interactions.

- Comparing equivalent displaced workers out of import- and export-manufacturing
 - Event study with μ_i fixed effects to capture individual differences
- Displacement always hurts, regardless of where you're displaced from
- But it happens more often *and* has more adverse effects in import-manufacturing

Agenda

- ➊ Descriptive overview
 - Trade
 - Labor market
- ➋ Medium-run cross-sectional analysis (ADHS for Germany)
- ➌ Short-run panel analysis
 - Trade and sorting
 - Differential effects for heterogeneous worker-establishment matches
- ➍ Event study approach
 - Dynamics of individual adjustment to rising trade exposure
- ➎ **Impact of trade on labor market (re-)entry flows**
- ➏ Conclusions

Sectoral employment trends in Germany (1993-2014)



- Focus so far: Incumbent manufacturing workers
- But aggregate employment trends are mostly driven by new entrants or returnees out of non-employment

Micro-anatomy of aggregate trends

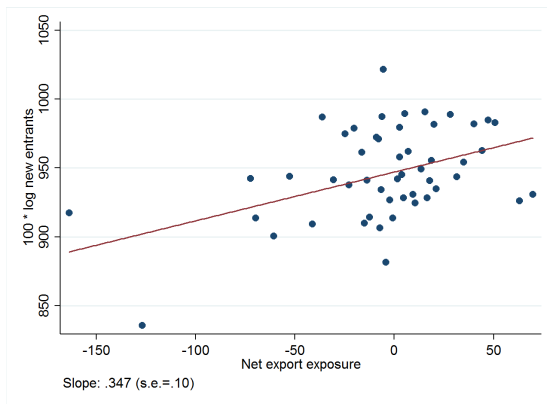
Origin in (t-1)	Destination in t					Total Origin
	Service	Exp-manuf	Imp-manuf	Other jobs	Non-empl.	
Service	10,870	135	62	102	1,579	12,747
<i>orig perc.</i>	85.3	1.1	0.5	0.8	12.4	[43.6]
<i>dest perc.</i>	84.8	2.8	3.2	1.5	54.6	
Exp-manuf	117	4,341	28	18	383	4,888
<i>orig perc.</i>	2.4	88.8	0.6	0.4	7.8	[16.7]
<i>dest perc.</i>	0.9	89.5	1.5	0.3	13.2	
Imp-manuf	62	30	1,670	9	184	1,956
<i>orig perc.</i>	3.2	1.5	85.4	0.5	9.4	[6.7]
<i>dest perc.</i>	0.5	0.6	87.3	0.1	6.4	
Other jobs	112	18	8	5,828	748	6,712
<i>orig perc.</i>	1.7	0.3	0.1	86.8	11.1	[23.0]
<i>dest perc.</i>	0.9	0.4	0.4	86.3	25.8	
New entry	428	97	41	228		793
<i>orig perc.</i>	54.0	12.2	5.1	28.7		[2.7]
<i>dest perc.</i>	3.3	2.0	2.1	3.4		
Returnees	1,223	230	101	567		2,124
<i>orig perc.</i>	57.6	10.8	4.9	26.7		[7.3]
<i>dest perc.</i>	9.5	4.7	5.5	8.4		
Total dest	12,811	4,850	1,913	1,686	2,895	29,220
<i>[share total]</i>	[43.9]	[16.6]	[6.6]	[23.1]	[9.9]	

Notes: Absolute numbers in 1000s in bold, row and column percentages below. New entrants are employed in t but not in (t-1), and never appear before in IAB data since 1978. Returnees are not employed in (t-1), but are employed in t and in at least one previous year since 1978. Non-employed have worked in (t-1) but not in t. This includes permanent exits and workers who return to jobs in later years.

- 29.2m workers in the labor market in the average year, most of them work in the same sector as previous year
- Conditional on leaving sector, most persons move into non-employment
- Net-flows from manufacturing to services almost balanced!
- Rise of service economy does *not* come from manufacturing workers who directly switch sectors
- Comes solely from new labor market entrants and from re-entrants out of non-employment

Local (Re-)Entry flows

- Industry level analyses show that workers are more likely to enter into manufacturing industries with higher net export exposure - conditional on (re-)entering into manufacturing



Local (Re-)Entry flows

- Industry level analyses show that workers are more likely to enter into manufacturing industries with higher net export exposure - conditional on (re-)entering into manufacturing
- Looking at (re-)entry patterns across local labor markets allows to examine if trade has fueled or slowed down the overall decline of manuf. thru this channel
- 402 German counties are similarly exposed to overall trends but differ in industrial specialization patterns
- Measure trade exposure of local labor markets as in Autor/Dorn/Hanson (2013):

$$NET_r = \sum_j \frac{L_{rj}}{L_j} \frac{\Delta EXP_j^{D \rightarrow east} - \Delta IMP_j^{east \rightarrow D}}{L_r}$$
- Dependent variable: change in the local manufacturing shares of new labor market entrants over the 1994-2014 period

Regional Entry Regressions

	(1) OLS	(2) 2 SLS	(3) OLS	(4) 2 SLS
	Δ (new entrants manuf / all new entrants in region r)		Δ (returnees manuf / all returnees in region r)	
net export	0.190**	0.289**	0.535***	0.560***
exposure of r	(0.09)	(0.12)	(0.10)	(0.15)
other controls	yes	Yes	yes	yes
N	402	402	402	402
avg. implied effect		0.265		0.514
conservative effect		0.130		0.252

- **Transition matrix:** Each year $12.2 + 5.1 = 17.3$ percent of the new entrants and $10.8 + 4.9 = 15.7$ percent of returnees enter into manufacturing.
- Use entry probabilities in case of zero trade to obtain a **counterfactual transition matrix:** Without trade with the East, manufacturing would have declined by 3.2 (conservative: 1.6) percentage points *faster*
- Amounts to around **261,000** jobs that would no longer be in manufacturing without the rise of the East

Conclusion

- Rising trade with “the East” did not speed up decline of German manufacturing because of the stabilizing effects of rising export exposure
- But inside manufacturing: considerable distributional effects of trade, frictional adjustment
- Asymmetric response: “push” effects of import competition more important than “pull” effects from exporting industries! At odds with naive, frictionless world view
- Involuntary job displacements are always painful for the worker who is hit.
- But they happen more often and have worse consequences in import-exposed manufacturing

Thank you!

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Appendix

Micro-anatomy of aggregate trends

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Origin in (t-1)	Destination in t					Total Origin
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→ Adjustment frictions

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Descriptives (medium-run approach)

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	mean	sd	1st quartile	median	3rd quartile
1990-2000					
100 × rel. Earnings	864.25	408.07	577.02	951.71	1091.94
avg. prev. Earnings / yr	42636	22177	30569	37478	47429
Δ ImE	24.45	30.99	7.37	16.07	34.45
Δ ExE	21.61	17.91	9.87	18.68	29.53
2000-2010					
100 × rel. Earnings	903.10	372.19	739.43	966.39	1071.80
avg. prev. Earnings / yr	45334	31348	30557	38231	48784
Δ ImE	30.73	67.11	5.90	15.11	32.17
Δ ExE	37.79	32.32	18.76	37.24	52.69

Robustness Checks (medium-run)

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	Dependent variable: 100 x cumulated earnings relative to earnings in base year			
	OLS	1st Stage ImE	1st Stage ExE	2SLS
import exposure (Δ ImE)	-0.0715*** (0.023)	0.5963*** (0.030)	0.1131*** (0.018)	-0.1665*** (0.042)
export exposure (Δ ExE)	0.3357*** (0.057)	0.2175*** (0.030)	0.2523*** (0.056)	0.5719*** (0.151)
R ²	0.160	0.710	0.486	0.160
1st Stage F		391.1	32.040	
	Incl. downstream links	Net, 2SLS	Gravity	Placebo
import exposure	-0.1656*** (0.040)			
export exposure	0.5727*** (0.139)			
net trade exposure		0.1022*** (0.032)	0.6721*** (0.128)	0.0274 (0.032)

Downstream linkages: Define ImE/ExE of industry j to include trade exposure of downstream industries of j with weights determined from aggregate IO matrix.

Descriptives II (medium-run approach)

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	mean	sd	1st quartile	median	3rd quartile
1990-2000					
dummy, ever non-employed=100	57.39	49.45	0	100	100
dummy, stays in orig. firm=100	62.88	48.31	0	100	100
dummy, leaves plant, stays in industry=100	8.95	28.55	0	0	0
dummy, leaves industry stays in sector=100	6.26	24.22	0	0	0
dummy, leaves sector=100	21.91	41.36	0	0	0
2000-2010					
dummy, ever non-employed=100	47.00	49.91	0	0	100
dummy, stays in orig. firm=100	60.25	48.94	0	100	100
dummy, leaves plant, stays in industry=100	8.75	28.25	0	0	0
dummy, leaves industry stays in sector=100	5.51	22.83	0	0	0
dummy, leaves sector=100	25.49	43.58	0	0	100

Descriptives III (short-run panel approach)

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	mean	sd	1st quartile	median	3rd quartile
1990-2000					
100 × rel. Earnings	86.75	52.26	74.04	100.00	108.56
prev. Earnings / yr	41836	20897	30387	37251	46785
import exposure (ΔImE_{jt})	2.17	11.30	0.04	0.80	2.46
export exposure (ΔExE_{jt})	1.79	7.77	0.00	1.23	3.25
2000-2010					
100 × rel. Earnings	90.65	46.69	84.18	100.00	106.64
prev. Earnings / yr	44507	28807	30386	37995	48332
import exposure (ΔImE_{jt})	2.49	33.50	-0.20	0.87	3.64
export exposure (ΔExE_{jt})	2.97	15.06	0.00	2.23	6.55

Effects by Age

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2SLS		Dependent variable: 100 x earnings relative to avg. earnings in pre-period			
	(1)	(2)	(3)	(4)	(5)
Younger than median of cohort (approx. 38yrs), N=606,233					
ImE	-0.0391*** (0.0084)	-0.0383*** (0.0084)	-0.0391*** (0.0084)	-0.0266*** (0.0048)	-0.0194*** (0.0041)
ExE	0.1323*** (0.0311)	0.1266*** (0.0306)	0.1286*** (0.0310)	0.1032*** (0.0186)	0.0972*** (0.0176)
Older than median of cohort (approx. 38yrs), N=613,205					
ImE	-0.0107* (0.0063)	-0.0115* (0.0063)	-0.0135** (0.0062)	-0.0174*** (0.0037)	-0.0158*** (0.0035)
ExE	0.0222 (0.0254)	0.0222 (0.0246)	0.0298 (0.0241)	0.0568*** (0.0145)	0.0661*** (0.0148)
Fixed effects	i x p	i x j x r	i x j	i x r	i

- Young workers more strongly hit by import shocks
- But also stronger export gains
- No on-the-job gains for old workers, some compositional effects

Effects by Gender

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2SLS		Dependent variable: 100 x earnings relative to avg. earnings in pre-period			
	(1)	(2)	(3)	(4)	(5)
Male, N=909,677					
ImE	-0.0234*** (0.0069)	-0.0234*** (0.0070)	-0.0249*** (0.0071)	-0.0190*** (0.0043)	-0.0136*** (0.0037)
ExE	0.0988*** (0.0242)	0.0971*** (0.0240)	0.1019*** (0.0242)	0.0903*** (0.0148)	0.0838*** (0.0145)
Female, N=266,813					
ImE	-0.0051 (0.0084)	-0.0046 (0.0088)	-0.0057 (0.0087)	-0.0174*** (0.0049)	-0.0188*** (0.0046)
ExE	0.0002 (0.0336)	-0.0047 (0.0347)	-0.0011 (0.0342)	0.0565*** (0.0202)	0.0797*** (0.0194)
Fixed effects	i x p	i x j x r	i x j	i x r	i

- Similar import effects after adjustment
- Much stronger export effects on-the-job for males
- Globalization increases the gender pay gap

Effects by Educational Attainment

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2SLS	(1)	(2)	(3)	(4)	(5)
Unskilled (no formal post-secondary education), N= 207,693					
ImE	0.0091 (0.0126)	0.0071 (0.0126)	0.0047 (0.0121)	-0.0081 (0.0061)	-0.0104** (0.0051)
ExE	-0.0685 (0.0551)	-0.0620 (0.0537)	-0.0540 (0.0511)	0.0060 (0.0254)	0.0333 (0.0214)
Skilled (University and vocational training), N=968,797					
ImE	-0.0344*** (0.0066)	-0.0340*** (0.0066)	-0.0352*** (0.0067)	-0.0263*** (0.0042)	-0.0207*** (0.0037)
ExE	0.1214*** (0.0237)	0.1179*** (0.0233)	0.1220*** (0.0236)	0.1049*** (0.0155)	0.1019*** (0.0158)
Fixed effects	i x p	i x j x r	i x j	i x r	i

- Skilled workers have stronger import effects, but better adjustment
- Much stronger export effects for skilled workers

Unobservable worker and workplace characteristics

- From Card, Heining and Kline (QJE 2013): pre-estimated fixed-effects
- AKM-Model on 100% Sample of German Individual Data:
$$\ln(\text{wage}_{it}) = \alpha_i + \psi_{j(it)} + x'_{it} + r_{it}$$
- α_i : skills and other factors that are rewarded equally across employers
- $\psi_{j(it)}$: proportional pay premium (or discount) paid by plant j to all employees (e.g. rent-sharing, efficiency wage). Proxy for workplace quality.
- Observable worker characteristics (education-specific age/experience profiles) filtered out by $x'_{it} \rightarrow \alpha_i$ orthogonal to educational attainment.
- We use fixed effects from preceding time windows 1985-1991 and 1996-2002

Unobserved Skills

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2SLS	Dependent variable: 100 x earnings relative to avg. earnings in pre-period		
	(1)	(2)	(3)
33% good workers, N=374,404			
ImE	-0.0180*** (0.0061)	-0.0187*** (0.0062)	-0.0130*** (0.0035)
ExE	0.0653*** (0.0250)	0.0631** (0.0247)	0.0793*** (0.0184)
34% medium workers, N=363,390			
ImE	-0.0298*** (0.0061)	-0.0314*** (0.0062)	-0.0180*** (0.0038)
ExE	0.1108*** (0.0211)	0.1108*** (0.0212)	0.0892*** (0.0160)
33% bad workers, N=363,387			
ImE	-0.0152* (0.0086)	-0.0172** (0.0087)	-0.0175*** (0.0044)
ExE	0.0234 (0.0341)	0.0277 (0.0335)	0.0567*** (0.0157)
Fixed effects	i x p	i x j	i

Import Effects Come from Unemployment

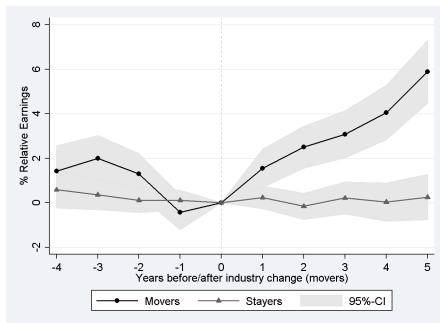
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2SLS		Dependent variable: 100 x earnings relative to avg. earnings in pre-period			
	(1)	(2)	(3)	(4)	(5)
ImE	-0.0142*** (0.0049)	-0.0148*** (0.0050)	-0.0147*** (0.0049)	-0.0092*** (0.0031)	-0.0079*** (0.0029)
ExE	0.0788*** (0.0177)	0.0812*** (0.0178)	0.0799*** (0.0179)	0.0549*** (0.0120)	0.0541*** (0.0127)
Fixed effects	i x p	i x j x r	i x j	i x r	i
Groups	697435	653886	635071	585178	546843
R ²	0.509	0.501	0.495	0.478	0.462
KP	12.319	11.477	11.478	19.619	18.743

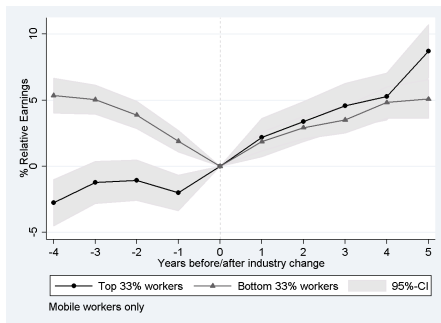
Notes: 6,266,898 observations of 569,718 workers.

- Positively selected sample of workers who never became unemployed
- Smaller effects from imports: workers with bumpy careers affected more
- Adjustment to imports still visible

Push effects of import shocks: Event study

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(g) Without worker-FE



(h) With worker-FE

Figure: Movers versus stayers (industries with top-25 % net import exposure)

- Movers adjust perfectly when not forced to move by unemployment
- Compatible with Roy-model: selection on costs vs. returns