Labor Market Polarization in Advanced Countries: Impact of GVCs, Technology, Import Competition from China and Labor Market Institutions

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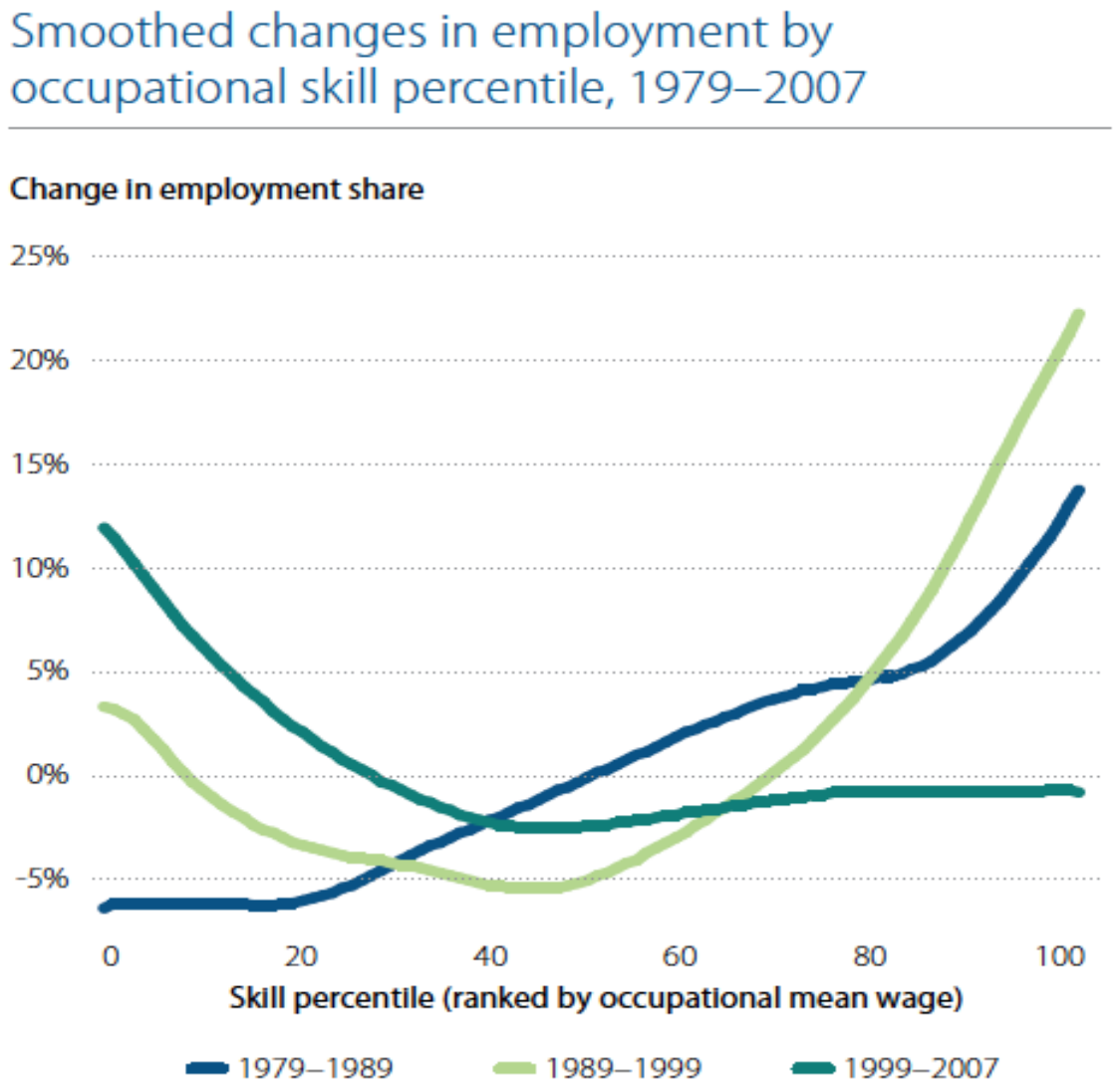
Motivation

- Developments in the labor markets in advanced countries since 1970s:
  - a shift in demand toward more educated workers
- Broadly accepted explanation for this shift in the 1990s:
  - skill-biased technological change (SBTC), Autor and Katz (1999)
- However…
  - this would predict a uniform shift of employment from low-skilled to high-skilled labor

While...

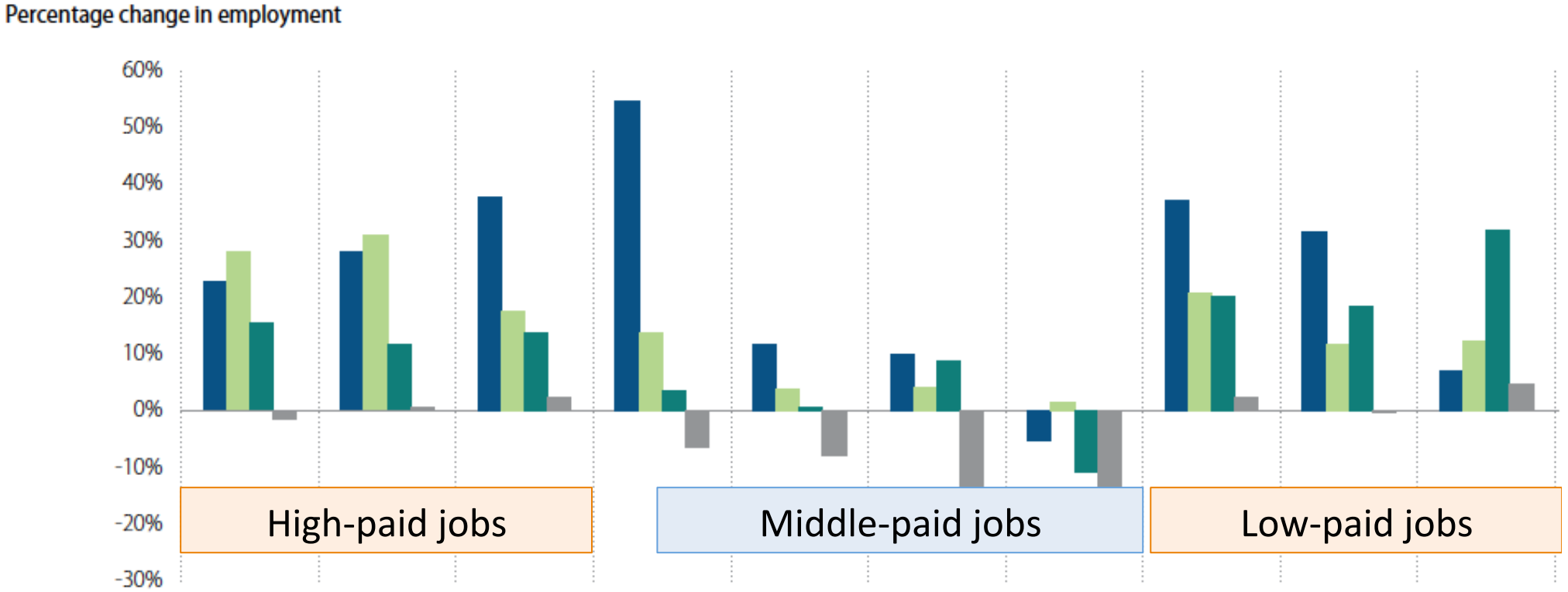
- Evidence of polarization in the labor markets:
  - an U-shaped evolution of employment wrt occupational wage in U.S.



Autor, Katz and Kearney (2006), Autor (2010)

U-shaped polarization

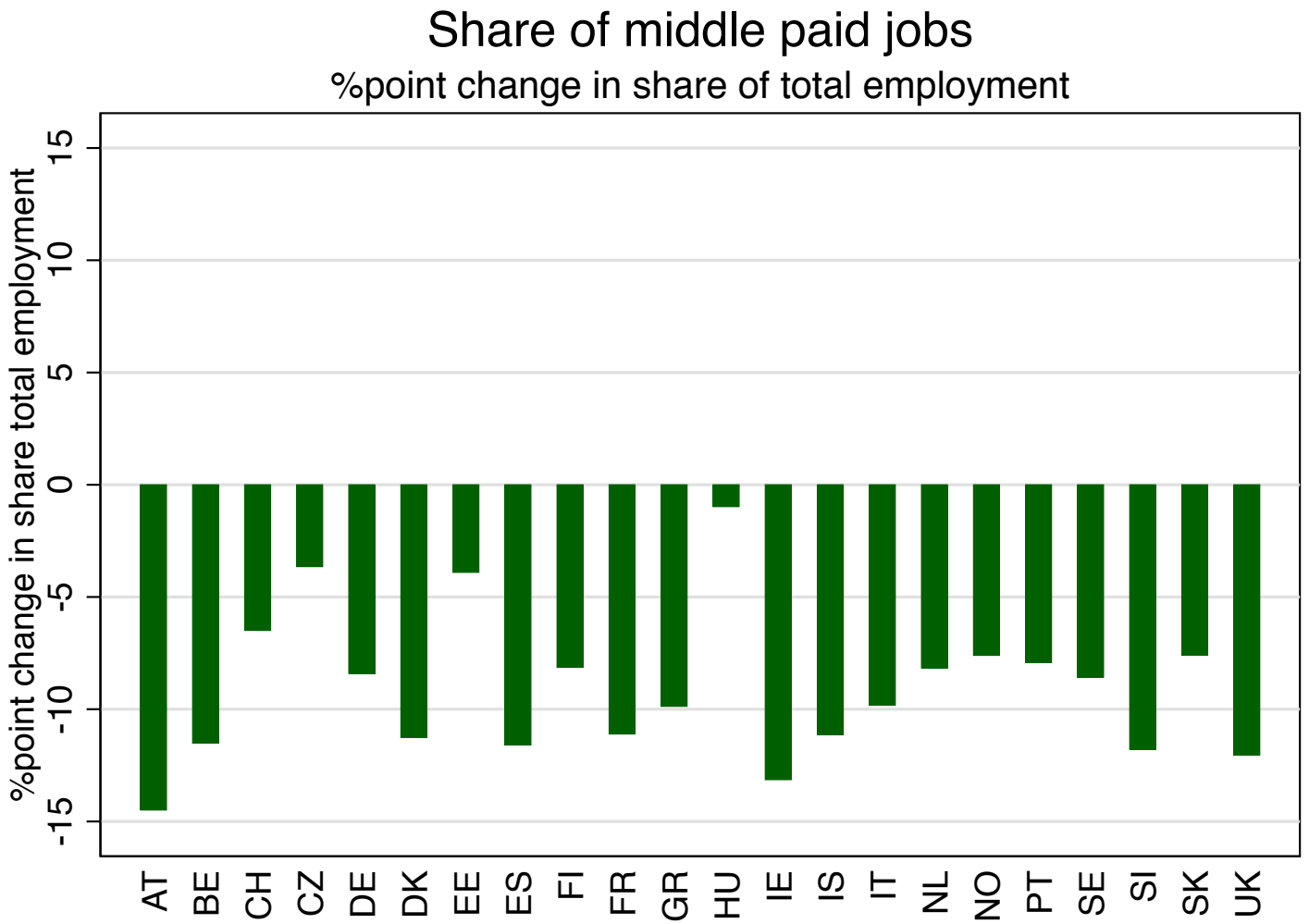
- By occupation: U.S., 1979-2009 (Autor, 2010)



	Managers	Professionals	Technicians	Sales	Office and admin	Production, craft, and repair	Operators, fabricators, and laborers	Protective services	Food prep, building and grounds cleaning	Personal care and personal services
1979–1989	22%	28%	37%	54%	11%	10%	-5%	36%	31%	7%
1989–1999	27%	30%	17%	14%	3%	4%	1%	20%	11%	12%
1999–2007	15%	11%	14%	4%	1%	8%	-11%	20%	18%	31%
2007–2009	-1%	0%	2%	-7%	-8%	-17%	-15%	2%	0%	5%

A similar trend in Europe

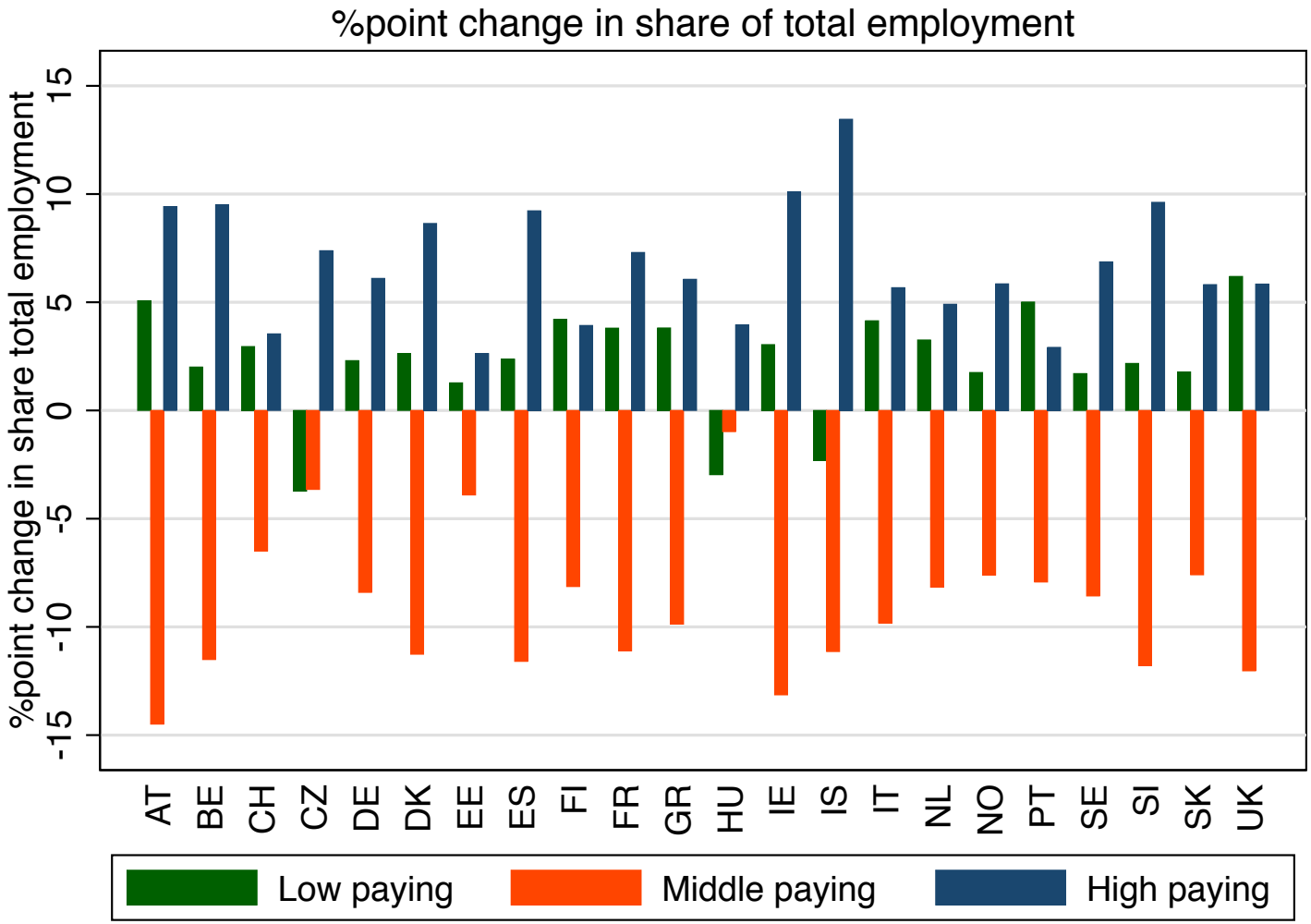
22 EU countries, LFS data, 1995-2010



Middle-paid jobs disappear (7-12%pts in 15 years.
But less so in new MSs

A similar trend in Europe

22 EU countries, LFS data, 1995-2010



… replaced by Low- & High-paid jobs

Explanations

- "Routinization hypothesis" (Autor, Levy & Murnane, 2003)
  - the effect of technological progress is to replace "routine" labor, which is in the middle of the wage distribution
- Globalization and offshoring (Blinder, 2009)
  - "Routine jobs" (assembly lines) are being progressively offshored to lower-wage countries,
  - Import competition in low tech & middle-low tech industries
- Polarization and wage inequality (Manning (2004), Mazzolari & Ragusa (2013)
  - A surge in the share of income going to the rich may have contributed to the shift in demand for low-skill labor to provide "services to the rich"
  - U.S. & UK only?

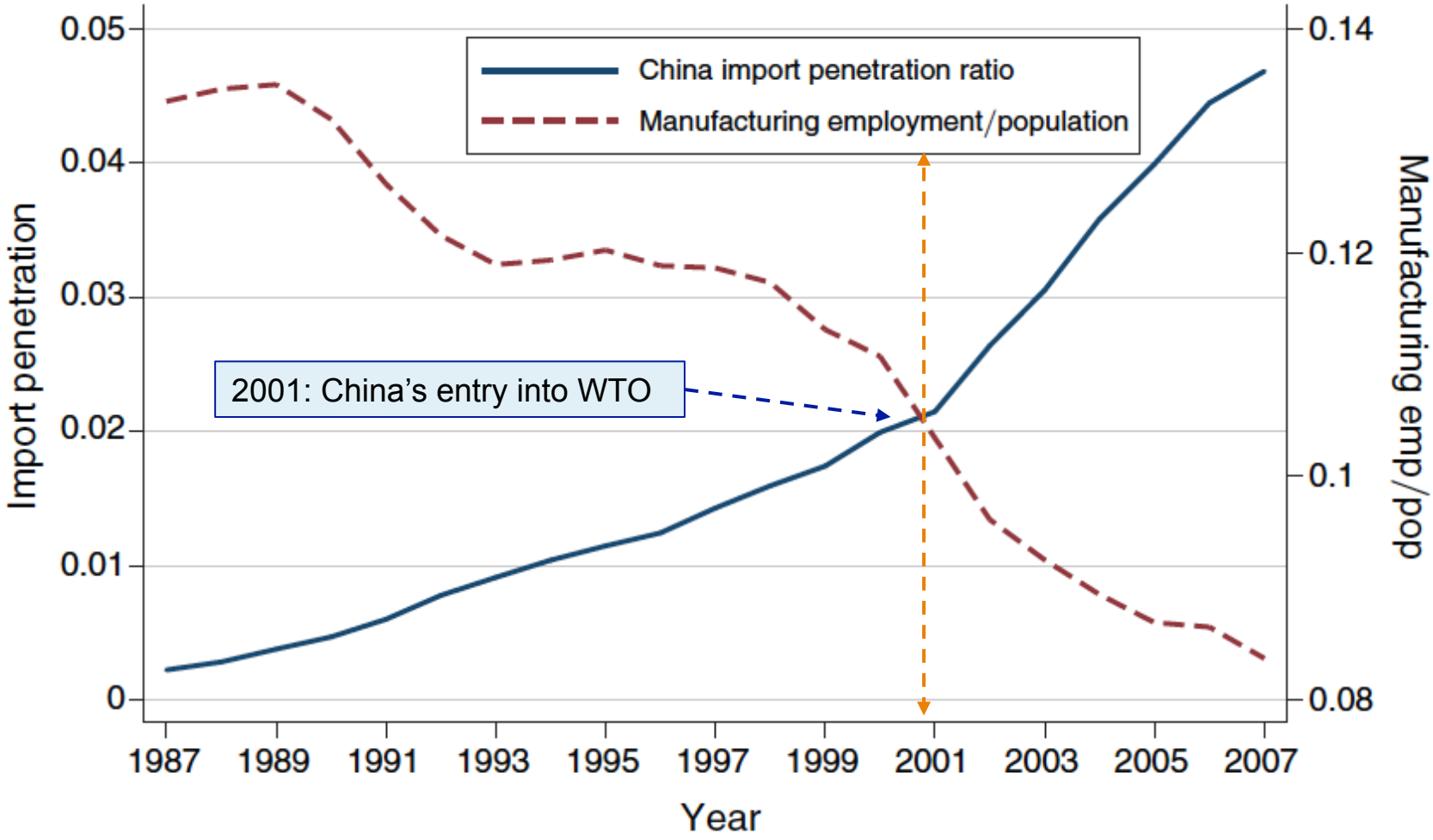
Explanations (2)

- "China shock" (Autor, Dorn & Hanson, 2013, 2016)
  - Rising imports from China cause higher unemployment, lower labor force participation, and reduced wages in local labor markets that house import competing manufacturing industries
  - 1/4 of aggregate decline in U.S. manufacturing employment is due to the rise of Chinese import penetration
  - Similar findings for Spain, Germany, Norway and Denmark
    - Donoso et al. (2014), Dauth et al. (2014), Balsvik et al. (2013), Keller & Utar (2016)

  - Keller & Utar (2016) rise in Chinese imports led to labor mkt polarization:
  - the decline of Danish middle-paid manufacturing jobs
  - transfer to low-wage services or high-wage employment
  - overall, Chinese import competition accounts for about a 1/5 of total middle-paid employment decline

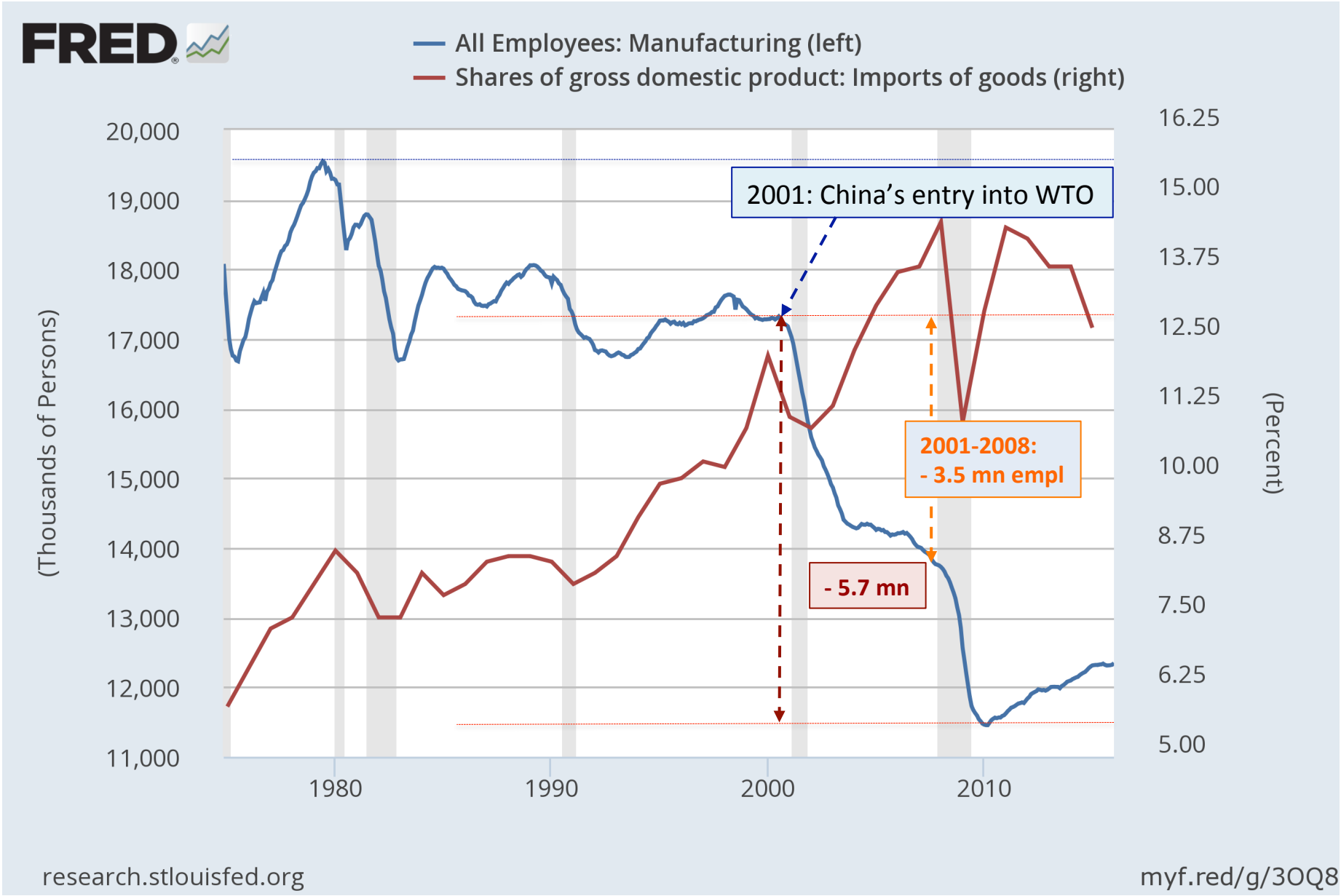
China shock in US

Import penetration & share of manufacturing jobs

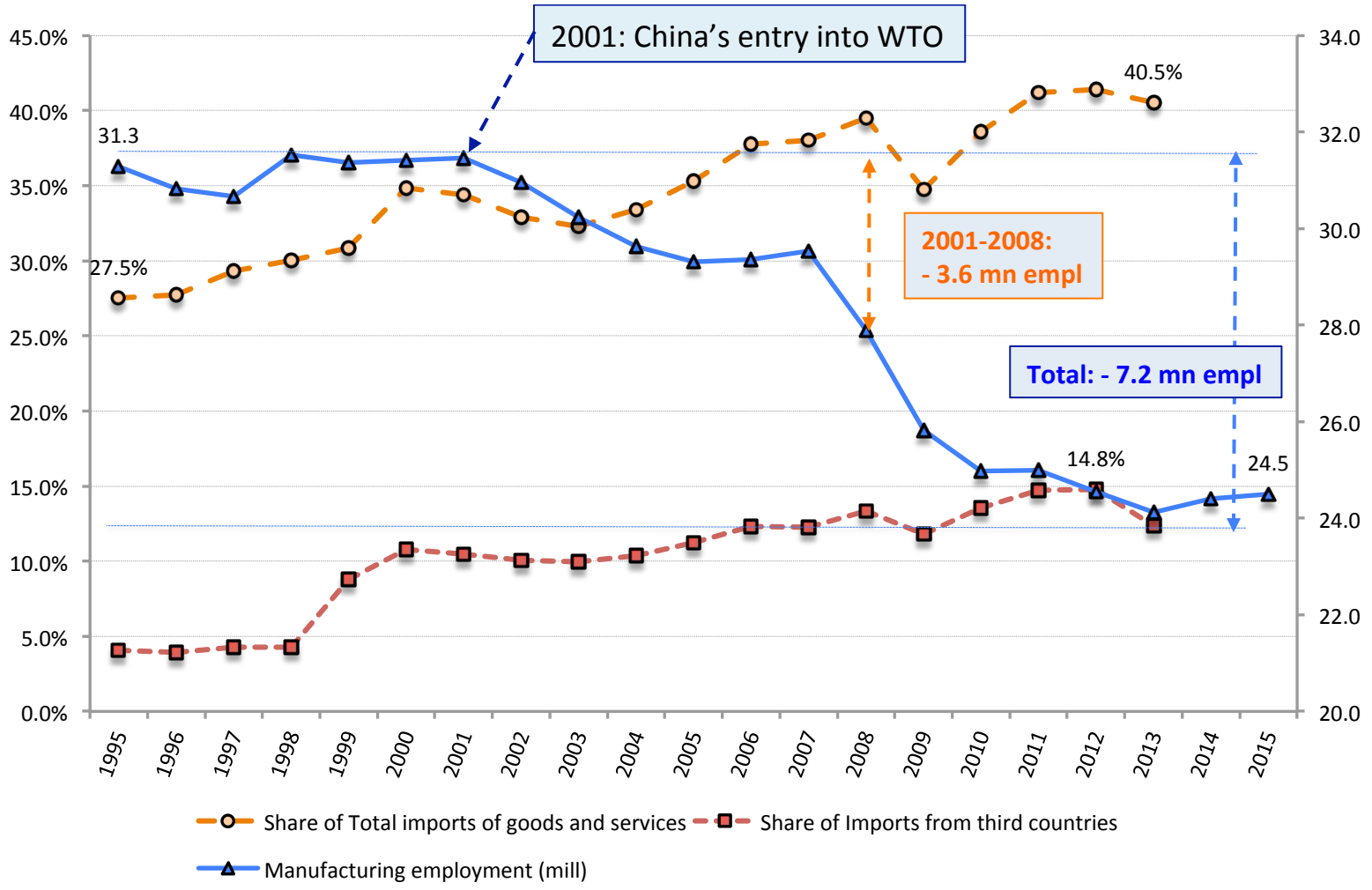


Boost in import penetration after 2001

US manufacturing employment & import share



EU-15 manufacturing employment & import share



This research

- Study labor market polarization in EU in 1995-2010
- Decompose polarization into between-sector and within-sector polarization
- Empirically verify how competing market forces and institutional factors contributed to increased polarization
  - both between- and within-polarization

This research

- Non-competing theories, but rather complementary forces at work
- Focus on three forces:
- A: Technology & innovation (SBTC):
  - Routine tasks computerized and carried out by machines (automation, M ↓)
  - some either *abstract* tasks or *simple* tasks cannot (H & L ↑)
- B: Globalization & offshoring:
  - GVCs: relocation of production, HQs remain home (M ↓, H ↑)
  - Reinforces SBTC
- C: "China shock":
  - Import penetration & competition: L & M ↓
- + D: Labor market institutions:
  - Dampening (min. wage, empl.protection) vs. amplifying effects (trade unions)

Extent of polarization in EU

20 EU countries, LFS data, 1995-2010

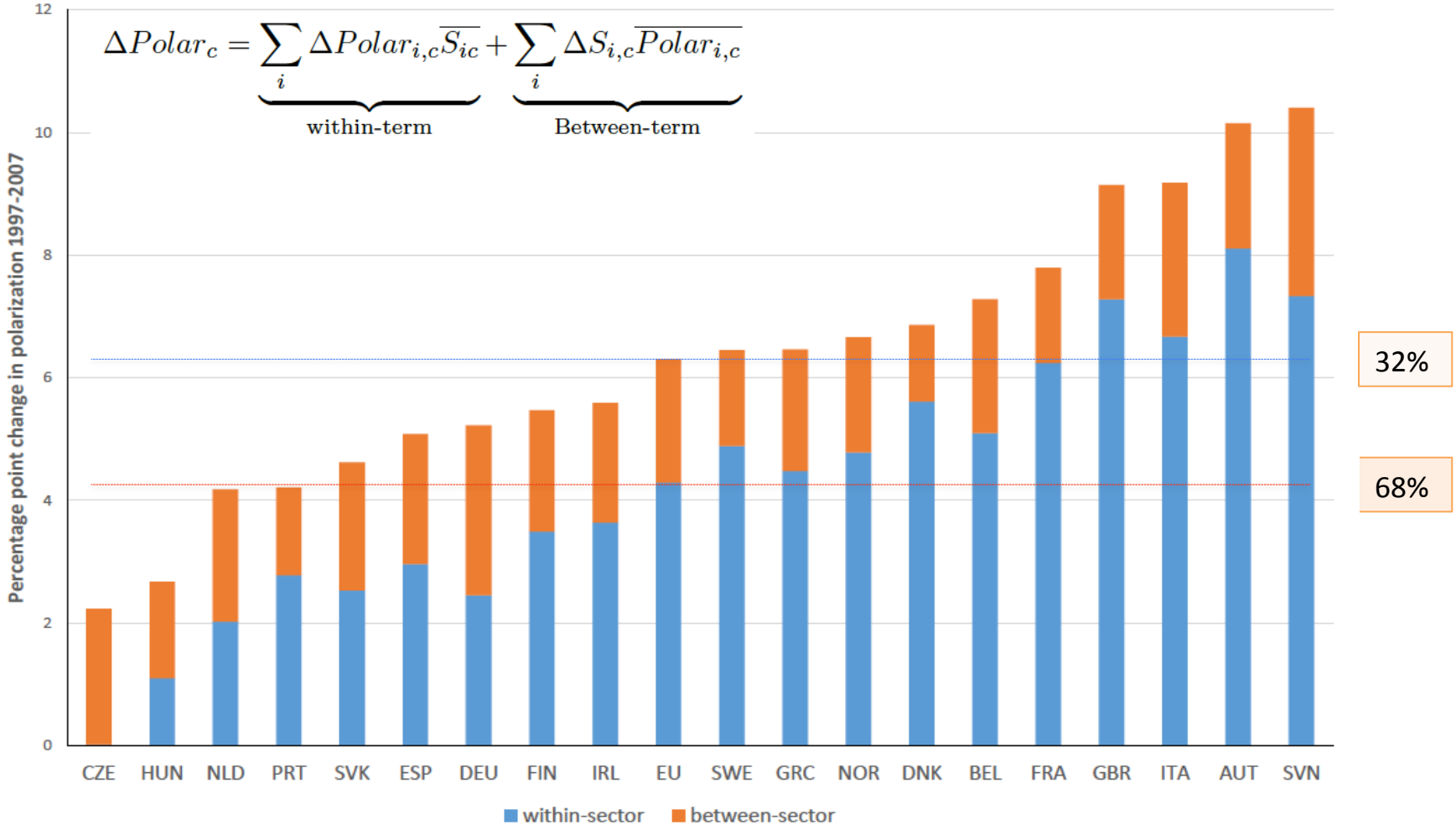
			%point change
Occupation (ISCO)	1995	2010	1995-2010
low Paying	24.1	27.9	3.8
Elementary occupations	11.0	12.3	1.3
Service and Sales Workers	13.1	15.7	2.6
Middle Paying	48.3	36.6	-11.7
Clerical Support Workers	17.6	14.9	-2.7
Craft and Related Trades Workers	18.2	12.0	-6.2
Plant and Machine Operators	12.5	9.7	-2.8
High Paying	27.6	35.5	7.9
Technicians and Associate Professionals	13.7	17.0	3.3
Professionals	8.9	12.6	3.7
Legislators, senior officials and managers	4.9	5.9	1.0

Disapearing Middle-paid jobs replaced by Low- & High-paid jobs

Within- vs. between-polarization

20 EU countries, LFS data, 1997-2007

$$\Delta Polar_c = \underbrace{\sum_i \Delta Polar_{i,c}\overline{S_{ic}}}_{\text{within-term}} + \underbrace{\sum_i \Delta S_{i,c}\overline{Polar_{i,c}}}_{\text{Between-term}}$$



32%

68%

within-industry component is the most important contributor to overall polarization (68 % vs. 32 % on average)

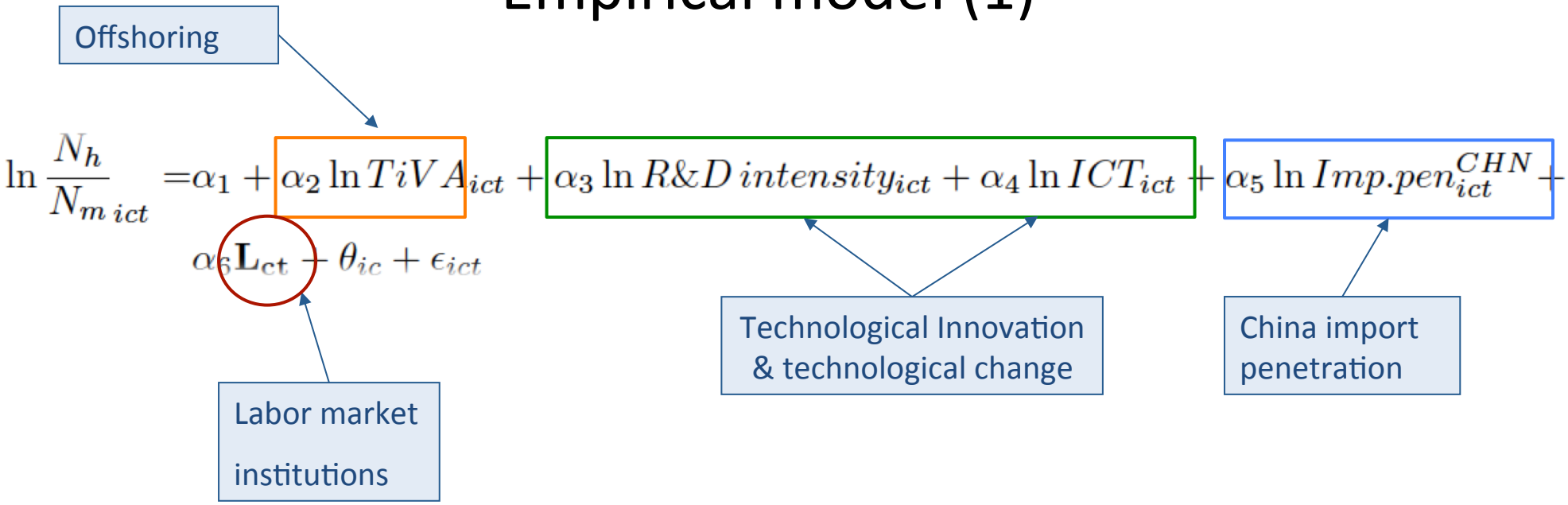
Within- vs. between-polarization in EU

20 EU countries, LFS data, 1997-2007

Industry	Within	Industry	betwee
Hotels & Restaurants	-0.023	Manufacturing	-1.407
Mining	0.020	Financial Intermediation	-0.244
Agriculture	0.057	Public Administration	-0.206
Other Services	0.107	Electricity, gas, water	-0.182
Electricity, gas, water	0.117	Agriculture	-0.161
Education	0.153	Transport&Communication	-0.131
Construction	0.157	Mining	-0.063
Health&Social work	0.212	Education	0.050
Transport&Communication	0.304	Other Services	0.071
Financial Intermediation	0.389	Construction	0.222
Business Services	0.528	Wholesale&Retail trade	0.487
Public Administration	0.567	Hotels & Restaurants	0.699
Wholesale&Retail trade	0.568	Health&Social work	0.681
Manufacturing	1.133	Business Services	2.185
Total average contribution	4.290	**Total average contribution**	2.002

Manufacturing is the biggest contributor to between and within polar.

Empirical model (1)



- Dependent variable in two forms:

$$\ln \frac{N_l}{N_m}$$

Differential growth of employment:

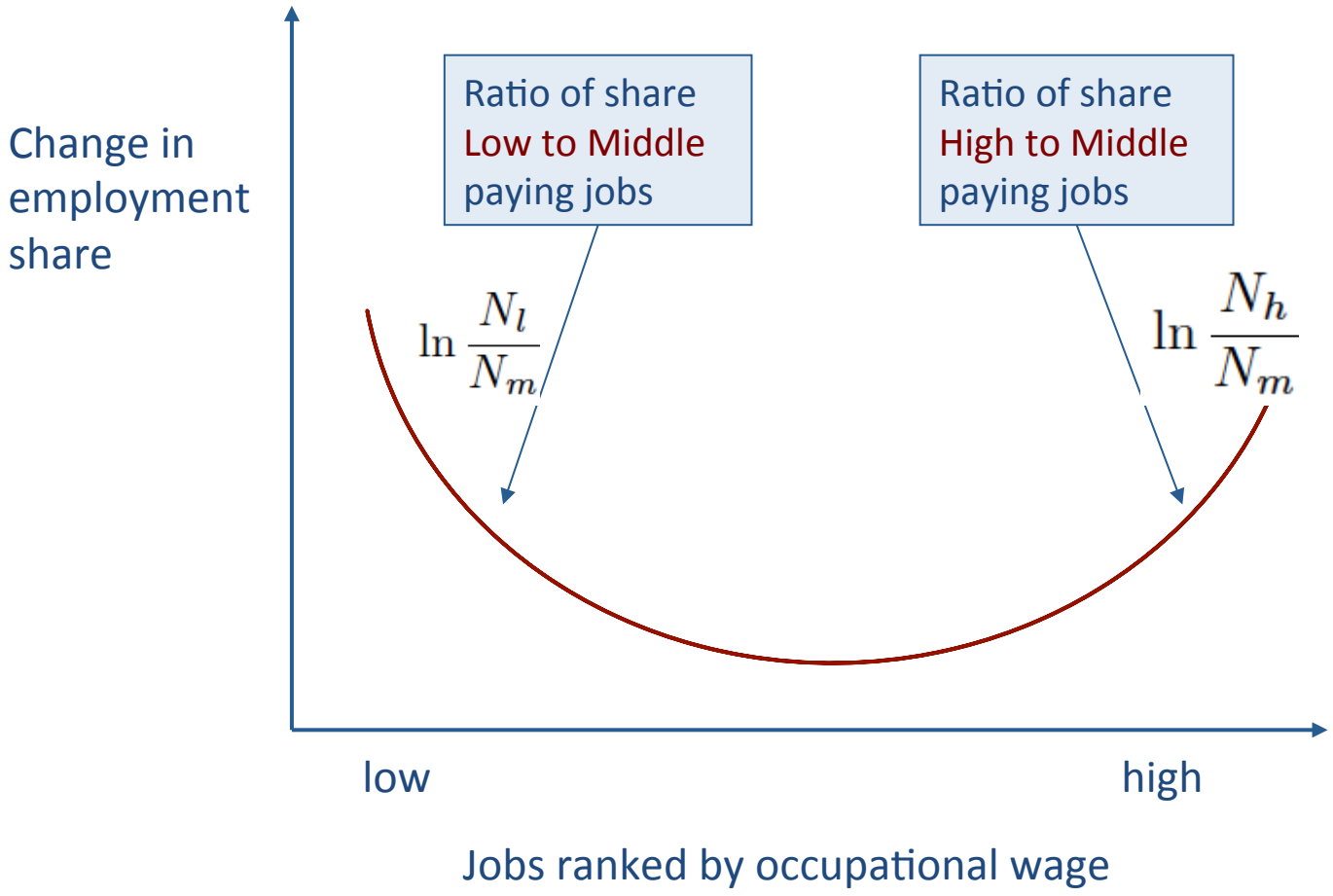
- Lowest-paying over middle-paying jobs

$$\ln \frac{N_h}{N_m}$$

- Highest-paying over middle-paying jobs

* Similar approach as in Autor and Dorn (2013), Oldenski (2014), Keller and Utar (2016)

Capturing the polarization effects



Data

Employment

- European Labor Force Survey, 1995-2010 (Eurostat)
- 18 EU countries with complete data (ISCO 2008 1-digit occupation)
- Nace 2-digit for manufacturing, Nace 1-digit for other industries
- But info on wages incomplete

Technology & Innovation

- R&D intensity (OECD)
- ICT capital services (EU Klems)

Globalization & Offshoring

- Foreign value added share in exp (TiVA)
- China import penetration (Based on WIOD)

Labor market

- Kaitz index, empl. protection, union density (OECD)

Estimations

- Separate estimations:
  - Within polarization
  - Between polarization
- OLS with:
  - Country x industry FE
  - Robustness check with country x year or country x period
  - Weighted regressions (w: employment shares)
  - All variables in logs (hence: elasticities)
- Splitting the sample:
  - Manufacturing, Non-manufacturing
  - Pre-crisis (mainly) & Post-crisis

Results for Within polarization:

Manufacturing

	(1) top	(2) bottom	(3) top	(4) bottom	(5) top	(6) bottom
TiVA	0.26**	-0.03	0.30*	-0.02	0.24	-0.08
	(0.12)	(0.23)	(0.16)	(0.23)	(0.15)	(0.24)
R&D intensity	0.07**	0.06			0.09***	0.05
	(0.03)	(0.03)			(0.02)	(0.05)
ICT			0.23***	0.15	0.20***	0.07
			(0.04)	(0.12)	(0.05)	(0.09)
Imp.pen^{CHN}	0.14***	0.09	0.11***	0.09	0.11***	0.10
	(0.02)	(0.05)	(0.03)	(0.06)	(0.03)	(0.06)
Union Density	-0.43	1.24	0.91	1.94	0.80	1.69
	(0.70)	(1.93)	(0.56)	(2.40)	(0.58)	(2.44)
EPL	-0.02	0.00	0.04	0.04	0.03	0.01
	(0.07)	(0.17)	(0.08)	(0.17)	(0.07)	(0.17)
Adjusted Kaitz index	0.09	0.37	-0.13	0.22	-0.08	0.31
	(0.10)	(0.23)	(0.10)	(0.32)	(0.11)	(0.25)

- Offshoring, technology & Chinese competition correlated with high paid empl. polarization only
- Both innovation and technological change correlated with polarization on top
- Labor market regulation has no effect

Results for Within polarization:

Non-Manufacturing

	(1) top	(2) bottom	(3) top	(4) bottom	(5) top	(6) bottom
TiVA	0.22	0.18	0.26**	0.47***	0.16	0.31***
	(0.15)	(0.14)	(0.10)	(0.14)	(0.16)	(0.10)
R&D intensity	0.02	-0.00			0.01	-0.01
	(0.02)	(0.01)			(0.02)	(0.01)
ICT			0.16***	0.07	0.17***	0.09*
			(0.04)	(0.06)	(0.04)	(0.04)
Imp.pen^{CHN}	0.00	0.01**	0.01	0.02	0.01	0.01*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Union Density	-2.51**	-0.33	-0.62	1.17	-1.01	0.74
	(0.91)	(0.54)	(0.95)	(0.68)	(1.06)	(0.66)
EPL	-0.03	-0.02	0.03	0.07	0.03	0.05
	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)	(0.03)
Adjusted Kaitz Index	0.28*	0.30	0.07	0.40**	0.13	0.23
	(0.15)	(0.18)	(0.07)	(0.14)	(0.12)	(0.14)

- Offshoring correlated with high paid polarization (but only when controlling for tech.change)
- Technological change correlated with polarization on top, but not innovation
- Chinese competition associated with polarization at bottom
- Labor market regulation no systematic effect

Implications so far

- Consistent with theory in previous evidence
- The triggers are
  - Labor augmenting technological progress benefiting the high-skilled tasks at the expense of middle-skilled tasks (both in manufacturing and non-manuf.)
  - Offshoring adds to polarization, but mostly to high-paid jobs in manufacturing and low-paid jobs in non-manufacturing
  - Chinese competition ads to polarization at top in manufacturing and on bottom in non-manufacturing

Results for Within polarization:

Importance of labor market regulation

	Manufacturing		Non-Manufacturing	
	(1)	(2)	(3)	(4)
	top	bottom	top	bottom
TiVA×Union Density	1.02*	1.74	0.11	0.62
	(0.53)	(1.23)	(0.54)	(0.42)
$Imp.pen^{CHN}$×Union Density	-0.04	-0.08	-0.02	0.00
	(0.12)	(0.32)	(0.06)	(0.03)
EPL	-0.11	-0.41	0.11	0.26
	(0.59)	(1.28)	(0.26)	(0.15)
TiVA×EPL	0.06	0.12	-0.02	-0.08
	(0.17)	(0.38)	(0.09)	(0.06)
$Imp.pen^{CHN}$×EPL	0.03*	-0.05	-0.00	-0.01
	(0.02)	(0.04)	(0.01)	(0.01)
Adjusted Kaitz index	-0.72	0.68	-0.73	0.34
	(0.79)	(1.32)	(0.70)	(0.32)
TiVA×Adjusted Kaitz index	0.19	-0.11	0.09	-0.18
	(0.19)	(0.31)	(0.18)	(0.16)
$Imp.pen^{CHN}$×Adjusted Kaitz Index	-0.10	-0.05	-0.15	-0.11**
	(0.11)	(0.28)	(0.09)	(0.04)

- Offshoring correlated with high paid polarization in manufacturing where unions are strong
- Chinese competition associated with polarization at top where EPL stronger
- Min.wage can have a dampening effect on polarization in non-manufacturing exposed to China
- But no systematic labor market regulation effect

Results for Within polarization:

Importance of LICs & exports to China

	(1) top	(2) bottom	(3) top	(4) bottom	(5) top	(6) bottom	(7) top	(8) bottom
TiVA	0.24	-0.08	0.28*	-0.04	0.24	-0.07	0.36**	0.02
R&D intensity	0.09***	0.05	0.10***	0.06	0.09***	0.05	0.09***	0.06
ICT	0.20***	0.07	0.23***	0.09	0.21***	0.08	0.25***	0.11
Imp.pen^{CHN}	0.11***	0.10			0.11***	0.10		
Exp.pen^{CHN}					-0.01	-0.02		
Net Imp.pen^{CHN}							0.02*	0.01
Union Density	0.80	1.69	0.59	1.48	0.73	1.53	0.33	1.26
EPL	0.03	0.01	0.02	0.00	0.03	0.01	0.01	-0.01
Adj. Kaitz	-0.08	0.31	-0.09	0.30	-0.07	0.32	-0.07	0.31
Imp.pen^{LIC}			0.09**	0.07				

- Import competition from low income countries also important for polarization at top, but smaller effect than China
- Exports to China might dampen polarization on top and bottom, but not significant
- Hence, net effect of Chinese competition on polarization is lower than only for imports

Empirical model (2)

Between polarization

$$\Delta \ln E_{ict} = \gamma_1 + \gamma_2 \Delta \ln TiVA_{ict} + \gamma_3 \Delta \ln R\&D\ intensity_{ict} + \gamma_4 \Delta \ln ICT_{ict} + \gamma_5 \Delta \ln Imp.pen_{ict}^{CHN} + \delta_c + \omega_{ict}$$

Similar model, but different dependent variable:

- Overall employment growth

- Estimations:
- Differentiating between pre-crisis and whole period
- Differentiating between manufacturing and non-manufacturing

Results for Between polarization:

Main results

	Manufacturing		Non-manufacturing	
	(1)	(2)	(3)	(4)
	1998-07	1998-10	1998-07	1998-10
TiVA	0.02	0.02	-0.05	-0.43
	(0.30)	(0.23)	(0.24)	(0.28)
R&D intensity	-0.01	-0.06**	0.05	0.03
	(0.05)	(0.02)	(0.04)	(0.02)
ICT	-0.05		0.20	
	(0.09)		(0.12)	
Net Imp.pen^{CHN}	-0.03***	-0.02***	-0.05	0.01
	(0.01)	(0.01)	(0.13)	(0.01)
Constant	0.04	-0.26***	-0.13	0.48***
	(0.11)	(0.02)	(0.13)	(0.09)
N	145	356	59	146
Country FEs	Yes	No	Yes	No
Country×period FEs	No	Yes	No	Yes
R^2	0.350	0.245	0.358	0.444

- Chinese net import penetration is correlated with employment decline in manufacturing
  - Both before and after the crisis
- R&D related technology investment associated with decreasing employment after 2007
- No impact of offshoring, technology and Chinese competition in non-manufacturing

Conclusions

- Polarization occurs within all industries
  - but is especially prevalent in the manufacturing industry
- Employment relocation between sectors:
  - Chinese net import penetration is correlated with employment decline in manufacturing
  - R&D related technology investment is associated with decreasing employment in manufacturing after 2007
  - Offshoring through GVCs not correlated with relocation between sectors
- Polarization within sectors:
  - Mostly associated with a rise in Chinese import competition and technological change in manufacturing (polarization at the top)
  - Associated with a rise in technological change and offshoring in industries outside of manufacturing
  - Chinese competition ads to polarization at top in manufacturing and on bottom in non-manufacturing
- However, large heterogeneity across countries
  - Old vs. New MSs, North vs. South

Policy implications

- Polarization in labor market does take place
  - Heterogeneity across countries, regions and industries
  - Most affected industries and regions are those that are more exposed to Chinese competition (Autor et al, 2016a; Dauth et al, 2014, etc.)
  - And where technological change is more intensive
  - Labor market regulation has less clear implications
- Economic polarization seems to affect political polarization:
  - Autor et al (2016b) show that in regions more severely hit by Chinese shock political polarization rises ("*importing political polarization*")
  - congressional elections 2010: in trade exposed districts voters vote more extreme – i.e. moderate representatives removed by Republican or liberal democrats
- Policy implications
  - Strengthening social, welfare and active labor market policies to compensate the "losers" and help finding jobs with matching wages