

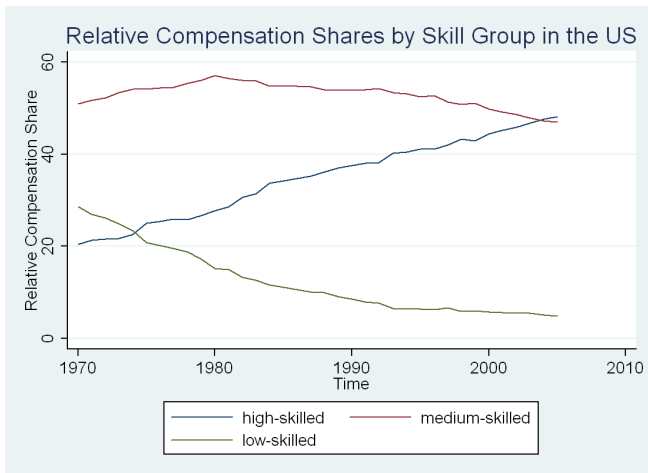
The Impact of ICT Investment on the Relative Demand of High-, Medium-, and Low-Skilled Workers: Industry versus Country Analysis

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Changes in Relative Compensation



Changes in Relative Compensation, Employment and Investments in ICT in the US

		High	Medium	Low	$\frac{ICT}{Y}$	gr $\frac{ICT}{Y}$
75-85	W	0.031	0.001	-0.063	0.002	0.389
	L	0.032	0.007	-0.054		
85-95	W	0.018	-0.004	-0.055	0.010	0.171
	L	0.014	0.001	-0.033		
95-05	W	0.016	-0.011	-0.027	0.068	0.195
	L	0.015	-0.006	-0.009		

Average Annual Growth Rate of the Total Compensation Share (upper row) and Employment Share (lower row);

ICT investment in total value added in levels (upper row) and the 10 year average annual growth rate (lower row)

My Contribution

- An investigation of the influence of ICT investments on relative compensation shares in advanced **countries**.
⇒ Is there a persistent effect across countries?
- An analysis of the influence of ICT investment on the relative shares across **industries**.
⇒ Are there differences of the connection between ICT and compensation shares across industries?
- A study on the changes of these effects over **time**.
⇒ Is there de-skilling or adaption to new technology over time?

Motivation

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Related Literature and Hypotheses

Data

Econometric Specification

Estimation Results

- Results by Country

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- Results with a Structural Break

Conclusion



Empirical Literature Concerned with Technology as the Driving Force

- Microlevel analysis for individual countries (e.g. Bound and Johnson, AER 1992, Katz and Murphy, QJE 1992)
- Industry level analysis (e.g. Autor, Katz and Kruger, QJE 1998, Machin and Van Reenen, QJE 1998)
- Task based approach (e.g. Autor, Levy and Murnane, QJE 2003, Spitz-Oener, JLE 2006)

Literature Using Share Equations

- Berman, Bound and Griliches 1994 (QJE)
- Machin and Van Reenen 1998 (QJE)
- O'Mahony, Robinson and Vecchi 2008 (Labour Economics)

Hypotheses

Skill-Biased Technological Change

- Linear effect of ICT on relative compensation shares
- Higher education → positive effect of ICT on compensation

Expected Results:

- Significant and **positive** effect of ICT on high-skilled workers compensation share,
- a bit less positive effect of ICT on medium-skilled workers compensation share,
- a **negative** effect on low-skilled workers compensation share.

Hypotheses

Tasks

- Specific Tasks are substitutes and complements
- Polarizing effect of ICT on relative compensation shares

Expected Results:

- Significant and **positive** effect of ICT on high-skilled workers wages,
- a **negative** and significant effect of ICT on medium-skilled workers wages,
- a **non-significant** effect on low-skilled workers wages.

EU KLEMS Dataset

- Project funded by the European Commission
- Industry level data, using 23 private sectors
- Measures of economic growth, productivity, capital formation and technological change
- EU 25, Australia, Japan, Korea, US
- Time: Starting from 1970 to 2005

Set of Countries Analyzed in this Study

Countries	times periods
Australia	1982 - 2005
Austria	1980 - 2005
Czech Republic	1995 - 2005
Denmark	1980 - 2005
Finland	1970 - 2005
Germany	1991 - 2005
Italy	1970 - 2005
Japan	1973 - 2005
Korea	1977 - 2005
Netherlands	1979 - 2005
Slovenia	1995 - 2005
Sweden	1995 - 2005
United Kingdom	1970 - 2005
United States	1970 - 2005

Set of Industries Analyzed in this Study

Table 1 of 2

Mining and Quarrying
Food, Beverages and Tobacco
Textiles, Textile, Leather and Footwear
Wood and of Wood and Cork
Pulp, Paper, Printing and Publishing
Coke, Refined Petroleum and Nuclear Fuel
Chemicals and Chemical
Rubber and Plastics
Other Non-Metallic Mineral
Basic Metals and Fabricated Metal
Machinery, Nec.
Electrical and Optical Equipment
Transport Equipment
Manufacturing Nec.; Recycling

Set of Industries Analyzed in this Study, continued

Table 2 of 2

Electricity, Gas and Water Supply
Construction
Wholesale and Retail Trade
Hotels and Restaurants
Transport and Storage
Post and Telecommunications
Financial Intermediation
Real Estate, Renting and Business Activities
Other Community, Social and Personal Services

Share Equation and Fixed Effects Estimation

From the translog cost function the following wage bill share equation can be derived for estimation:

$$share_{j,i,t} = \alpha + \beta_{KY} \ln \left(\frac{K_{i,t}}{Y_{i,t}} \right) + \beta_{K^{ICT}Y} \ln \left(\frac{K_{i,t}^{ICT}}{Y_{i,t}} \right) + \eta D_t + u_{j,i,t}$$

- share: relative compensation share
- j: high-, medium-, or low-skilled
- i: industry or country
- t: year
- K: capital stock
- Y: value added
- K^{ICT} : ICT capital investments
- D: year dummies

Results by Country Estimation of the share equation for each country for the available time period.

ICT Coefficient	High	Medium	Low
positive significant on the 10% level	Australia Denmark Korea	Finland	Italy Slovenia US
insignificant	Austria Czech Rep. Germany Italy Japan Netherlands Slovenia UK US	Australia Czech Rep. Denmark Germany Japan Korea Netherlands Slovenia Sweden UK US	Austria Czech Rep. Denmark Germany Japan Korea Netherlands Sweden UK
negative significant on the 10% level	Finland Sweden	Austria Italy	Australia Finland

Results by Industry

Estimation of the share equation for each industry including the 10 countries with the longest the available time period.

ICT Coefficient	High-Skilled	Medium-Skilled	Low-Skilled
Textiles, Textile, Leather, Footwear			
Pulp, Paper, Printing, Publishing			
Chemicals	+	0	0
Manufacturing Nec.			
Post and Telecommunications			
Mining and Quarrying			
Food, Beverages, Tobacco			
Rubber, Plastics	0	-	+
Electrical/ Optical Equipment			
Transport Equipment			
Real Estate, Renting	0	-	0

+ : positive significant, 0: insignificant, - : negative significant

Results by Country with a Structural Break

	High-Skilled		Medium-Skilled		Low-Skilled	
	until 1994	1995- 2005	until 1994	1995- 2005	until 1994	1995- 2005
Australia	+	0	0	0	-	0
Austria	0	0	0	-	0	+
Denmark	0	+	0	-	0	+
Finland	-	+	+	0	-	0
Italy	0	0	-	-	+	+
Japan	0	+	0	-	0	+
Korea	0	0	0	-	0	0
Netherlands	0	0	0	0	+	+
UK	0	0	0	0	0	0
USA	0	+	0	-	0	+

+ : positive significant, 0: insignificant, - : negative significant

Results by Industry with a Structural Break

- High-Skilled pos. sig. results are driven by the earlier period
- Medium-Skilled results are mixed
- The pos. sig. low-skilled results are driven by the later period.
- Evidence for a break in the fixed effect
- → decreasing impact of ICT on the high-skilled workers

Concluding Remarks

- ICT seems to have no homogeneous effect on the relative wage shares across developed countries.
- An analysis of ICT across industries may explain this and may also fit better into the task-based-framework.
- ICT seems to have an impact on the polarizing of wage shares by skill groups.
- The impact of ICT on high-skilled workers shares has weakened over time.
- At the lower end of the skill distribution ICT caused some polarization.
- Biased technological progress can only explain some of the divergence of the income distributions across countries.