

High-Tech Capital, Outsourcing and Demand for Skills

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1 General topics of interest

1. Increasing relative demand for skilled workers
2. Rising relative wages of skilled workers
3. Rising relative wage bill of skilled workers

caused by

1. particular types of technical change
2. trade and outsourcing

Trends

Average annual change in

Country	log relative wages		wage bill shares	
	w_H/w_{ML}	w_{HM}/w_L	wb_H	wb_{HM}
AUT	-0.42	0.16	0.55	0.43
BEL	-0.55	0.08	0.17	1.44
CZE	-0.49	-0.79	0.19	0.28
DNK	-0.28	-0.04	0.23	0.70
ESP	-0.75	0.34	0.80	1.75
FIN	0.95	1.12	0.83	1.09
FRA	-1.70	-1.63	0.22	0.49
GER	0.53	-0.36	0.36	0.33
HUN	-0.09	0.27	0.43	0.41
ITA	-1.65	2.03	0.05	0.06
NLD	-2.26	-2.10	0.34	0.22
POL	0.60	0.52	1.90	0.61
SVK	-0.47	0.06	0.05	0.57
SVN	-3.09	-1.71	0.17	0.14
SWE	-1.43	0.31	0.70	1.13
UK	0.22	0.92	0.76	0.69

Table 1: Summary statistics

3 Potential explanations

1. Skill biased technical change
 - (a) Factor bias
 - (b) Sector bias
 - (c) Capital-skill complementarity
2. Outsourcing, trade and FDI
3. High-tech capital

3.1 Sector bias of skill biased technical change

Haskel and Slaughter (EER, 2002)

$$\Delta\omega_j = \alpha_0 + \alpha_1\Delta \ln \frac{w_{js}}{w_{ju}} + \alpha_2\Delta \ln \frac{K_j}{Y_j} + \varepsilon_j$$

$$SBTC_j = \alpha_0 + \varepsilon_j$$

$$SBTC_j = \alpha + \beta_{BIAS} \frac{S_j}{U_j} + u_j$$

Interpretation:

1. $\alpha_1 > 0 \dots$ skill-biased technical change
2. $\alpha_2 > 0 \dots$ capital-skill complementarity
3. $\beta_{BIAS} > 0 \dots$ skill biased technical change is concentrated in skill intensive sectors

Dependent variable	Change in wage bill share of high skilled	Change in wage bill share of high and medium skilled
Δ Relative Wage	0.050*** (0.003)	0.025* (0.071)
Δ Capital-output ratio	0.008 (0.326)	0.007 (0.454)
Country dummies	Yes	Yes
F	41.31	782.05
R^2	0.75	0.90
Obs.	154	154

Bias	0.019*** (0.000)	0.028*** (0.000)	0.000 (0.732)	-0.000* (0.085)
Country dummies	Yes	Yes	Yes	Yes
F	1.99	54.02	0.01	3000.03
R^2	0.24	0.91	0.00	0.89
Obs.	154	176	154	176

Notes: Weighted OLS regressions; Robust standard errors; p-values in brackets.

Table 2: Preliminary results

3.2 Outsourcing and high-tech capital

Berman, Bound and Griliches (1994); Autor, Katz and Krueger (1998); Feenstra and Hanson (1996); Feenstra and Hanson (1998);

$$\begin{aligned}\Delta\omega_j = & \alpha_0 + \alpha_1\Delta \ln \frac{K_j}{Y_j} + \alpha_2\Delta \ln Y_j \\ & + \alpha_3\Delta \ln \frac{M_j^{proc}}{IIM_j} + \alpha_4\Delta \ln \frac{M_j^{parts}}{IIM_j} + \alpha_5\Delta \ln \frac{K_j^{ICT}}{K_j} + \varepsilon_j\end{aligned}$$

Outsourcing measure

UN COMTRADE 5-digit data with correspondence to use categories

1. Primary
2. Processed
3. Parts
4. Final

Notes:

1. Narrow measure of outsourcing
2. Breakdown by groups of partner countries (not yet used)

Dependent variable	Average annual change in wage bill share of		
	high skilled	medium skilled	low skilled
$\Delta \ln \frac{K_j}{Y_j}$	-0.027 (0.483)	-0.013 (0.573)	0.114 (0.133)
$\Delta \ln Y_j$	-0.042** (0.010)	-0.026** (0.015)	0.093** (0.012)
$\Delta \ln \frac{M_j^{proc}}{II_j}$	0.215*** (0.000)	-0.065*** (0.000)	-0.366*** (0.000)
$\Delta \ln \frac{M_j^{parts}}{II_j}$	-0.084 (0.116)	0.001 (0.961)	0.155 (0.100)
$\Delta \ln \frac{K_j^{ICT}}{K_j}$	0.378** (0.030)	-0.125* (0.059)	-0.719*** (0.009)
Country dummies	Yes	Yes	Yes
Industry dummies	No	No	No
F	53.15	48.50	549.72
R^2	0.83	0.69	0.86
Obs.	154	154	154

Notes: Weighted OLS regressions; Robust standard errors; p-values in brackets.

Table 3: Preliminary results

Dependent variable	Average annual change in wage bill share of		
	high skilled	medium skilled	low skilled
$\Delta \ln \frac{K_j}{Y_j}$	-0.025 (0.412)	0.003 (0.854)	0.119** (0.036)
$\Delta \ln Y_j$	-0.062*** (0.009)	0.015 (0.121)	0.137*** (0.001)
$\Delta \ln \frac{M_j^{proc}}{II_j}$	0.074 (0.185)	-0.081 (0.610)	-0.131 (0.127)
$\Delta \ln \frac{M_j^{parts}}{II_j}$	-0.055 (0.235)	0.049** (0.034)	0.100 (0.209)
$\Delta \ln \frac{K_j^{ICT}}{K_j}$	0.380*** (0.010)	-0.026 (0.510)	-0.814*** (0.002)
Country dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
F	51.93	45.25	99.10
R^2	0.86	0.79	0.89
Obs.	154	154	154

Notes: Weighted OLS regressions; Robust standard errors; p-values in brackets.

Table 4: Preliminary results

Feenstra and Hanson (1998): mandated price regressions; results are sensitive to measure of high-tech capital

Price regression:

$$\Delta \ln p_{it}^{VA} = -TFP_{it} + \sum_k \bar{s}_{kit} \omega_{kt} + e_{it}$$

Definition of *effective TFP*:

$$ETFP_{it} \equiv TFP_{it} - e_{it}$$

Total impact of structural variables on value-added prices and productivity:

$$\Delta \ln p_{it}^{VA} + ETFP_{it} = \gamma' \Delta z_{it} + \eta_{it}$$

Predicted wage change due to that structural component:

$$\gamma_k \Delta z_{kit} = \delta'_k \bar{s}_{it} + u_{kit}$$

4 Summary

Preliminary results suggest

1. Evidence for skill-biased technical change
2. Evidence for SBTC being concentrated in (high) skill intensive sectors
3. Evidence for (high tech) capital-skill complementarity
4. Effects of outsourcing
 - (a) negative effect on low skilled
 - (b) relatively smaller (compared to high-tech capital)
 - (c) exact specification matters

Further research:

1. Robustness checks
2. Country (group) specific estimations
3. Outsourcing measures
4. Longer time period
5. Sector bias of outsourcing