

Innovation and wage polarisation in European industries



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AISSEC conference, Parma, June 21-23 2007



Aims of the paper

- by linking different innovation indicators and education to the **polarisation of wages** by skill level within industries
- find out the importance of sectoral structure: industry analysis
- analysis of **levels** of polarisation (not change)
- so to test the relevance of technology and educational factors in polarisation of wages



Skill biased technical change

(D. Acemoglu)

- “technical change favors more skilled workers, replaces the unskilled, exacerbates inequality”
- Excess demand for the High-Skilled → wage up
 - The increasing supply of educated workers is outweighed by increasing demand for high skill workers
- Excess supply for the Low-Skilled → wage down
 - Decreasing demand for the unskilled



Moving beyond the skill bias view

- Rough definition of skills in the literature (blue/white collar, years of education ...)
 - Need to look with greater detail into skill structure, education and different technology factors
 - Need to consider labour markets dynamics and the role of employment polarisation



The role of technology

- upgrading skills is complementary to ICTs → wage dispersion
- general diffusion of new technologies → wage compression
- effect of ICTs and new processes on blue collars:
 - labour saving → lower wage bills
 - upskilling → higher average wage
- mismatch between acquired skills and corresponding wage (overskill?)



The role of education

- Higher shares of university education → wage dispersion
- Higher shares of secondary education → wage compression



The role of labour markets

A faster **growth of employment** can be associated to:

- **wage dispersion** by skill within industries (more dynamic industries create jobs that rise the high and reduce the low wages)
- **wage compression** (new jobs lift the middle wages)

A higher **polarisation of employment** by skill can be associated to:

- **wage dispersion** (skill premium effect)
- **wage compression** (quantity effect)

Importance of national **labour market institutions** and welfare systems



Empirical patterns

- structure of employment in high/low innovation industries (manufacturing and services)
- skill structure in EU countries
- innovation intensity of industries and employment changes
- wage inequality and employment rates



The analysis of wage polarisation within industries

- Sectoral specificities → 11 sectors
- Country patterns → 7 EU countries
- Manufacturing vs services → 6:5
- High vs low innovation → 5:6

| COUNTRIES | ECHP |
|-----------------|------|
| France | 3576 |
| Germany | 2971 |
| Italy | 4302 |
| United Kingdom | 3465 |
| the Netherlands | 2480 |
| Spain | 4080 |
| Portugal | 2795 |

SECTORS

| | | |
|-------|---|--|
| DA | l | Manufacture of food products, beverages and tobacco |
| DB+DC | l | Manufacture of textiles, clothing and leather products |
| DD+DE | l | Manufacture off wood and paper products;publishing and printing |
| DF-DI | h | Manufacture of coke, refined petroleum/chemicals/rubber & plastic/... products etc... |
| DJ+DK | h | Manufacture of metal products, machinery and equipement n.e.c. |
| DL-DN | h | Other manufacturing |
| G | l | Wholesale and retail trade; repair of motor vehicles, motorcycles and personal/household goods |
| H | l | Hotels and restaurants |
| I | l | Transport, storage and communication |
| J | h | Financial intermediation |
| K | h | Real estate, renting and business activities |



Methodology

- Measure of wage polarisation:
ratio of average wages of managers plus professionals and white collars to blue collars
- Sources: ECHP (wage, skills, education data) database 1994 aggregated by 11 industries and matched to CIS (innovation) and STAN (employment) databases
- Strength: more detailed, integrated data
- Weakness: heterogenous sources

Fig.1: Percent composition of jobs in EU countries

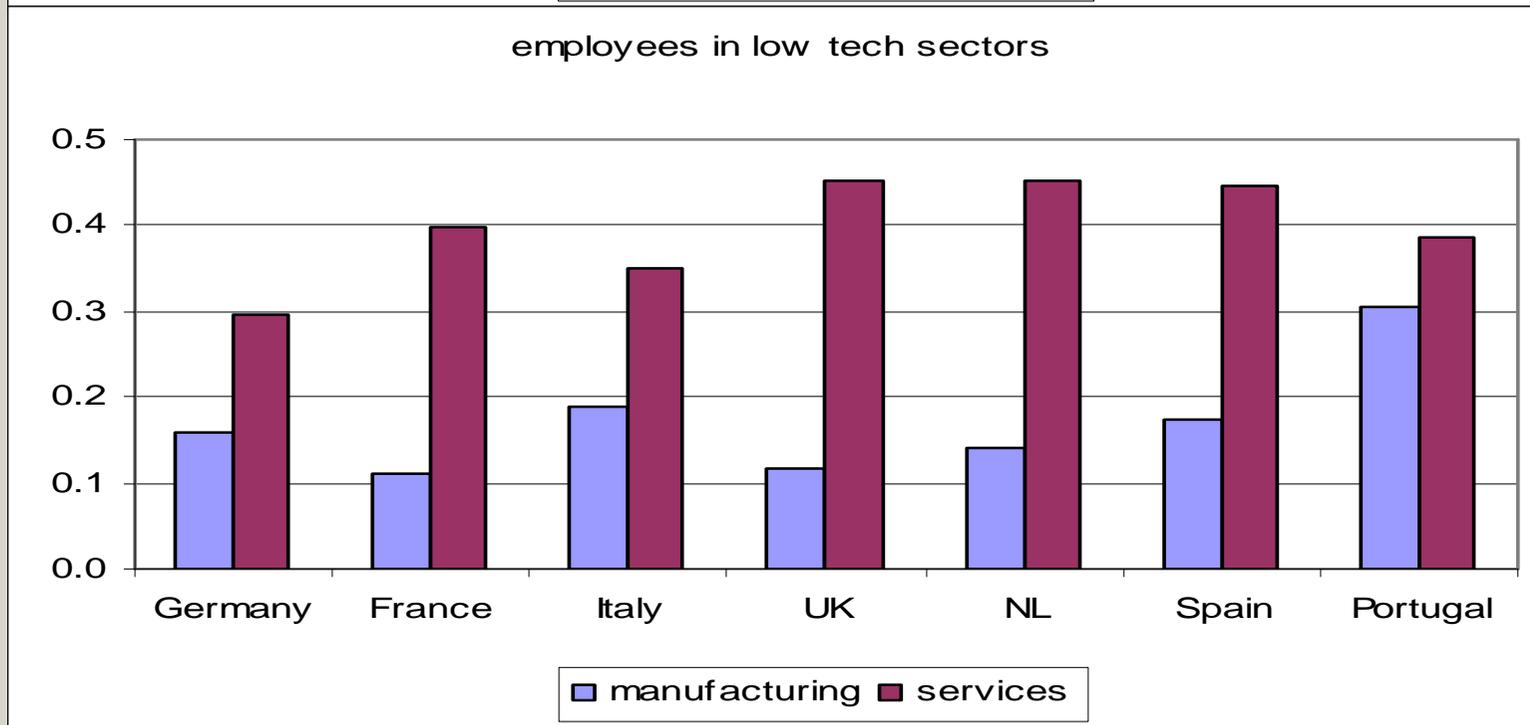
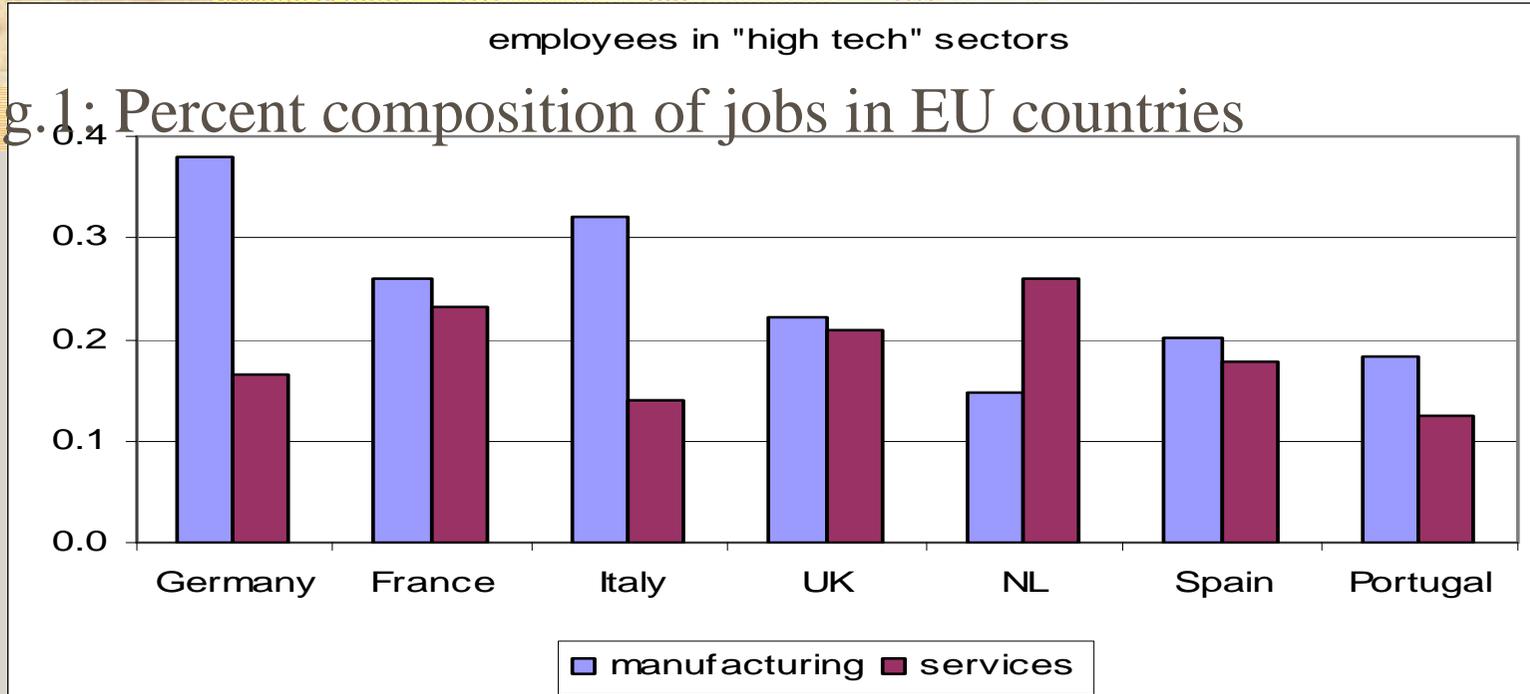


Fig. 2: The composition of jobs by skill

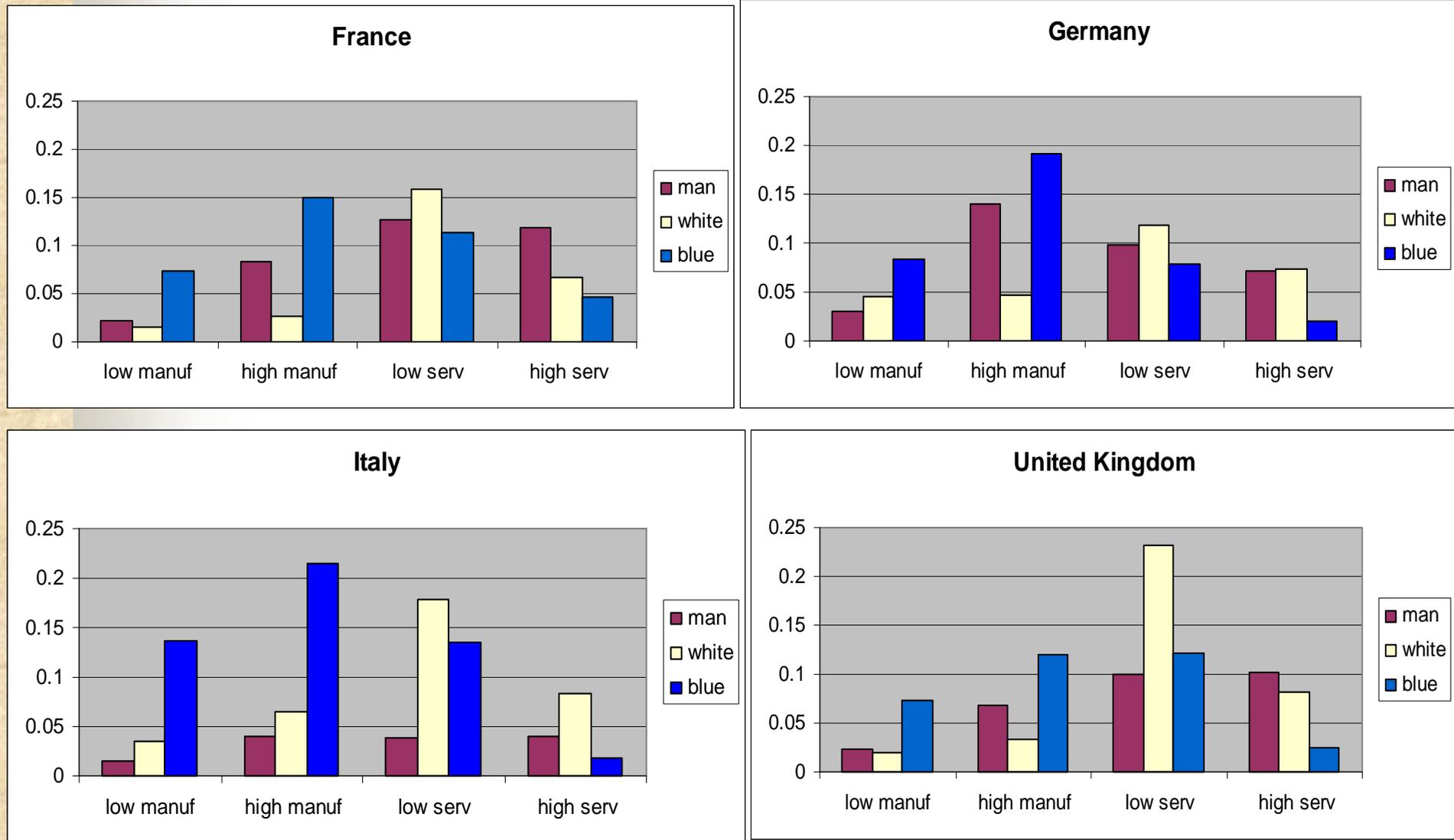




Fig.2: Percent composition of jobs in countries

Overall, the highest percentage of jobs is:

- *Low Technology Manufacturing:* Blue collars
- *Low Technology Services:* White collars
- *High Technology Manufacturing & Services:* Managers

- North European countries: larger percentages of Managers in High Technology (Manufacturing and Services) with respect to South European countries

Fig.3a Employment rates and wage inequality in European countries 1979-2000

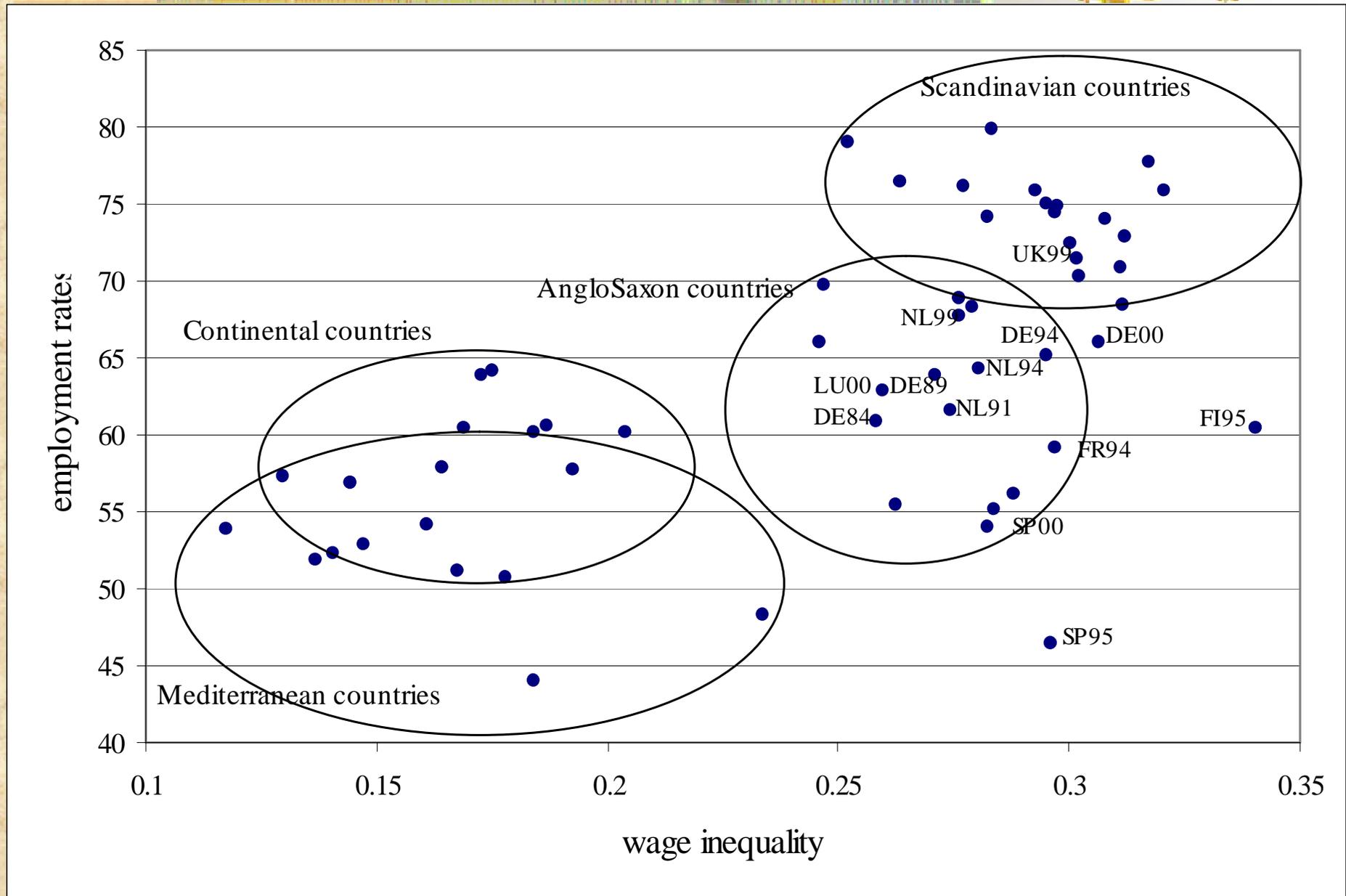
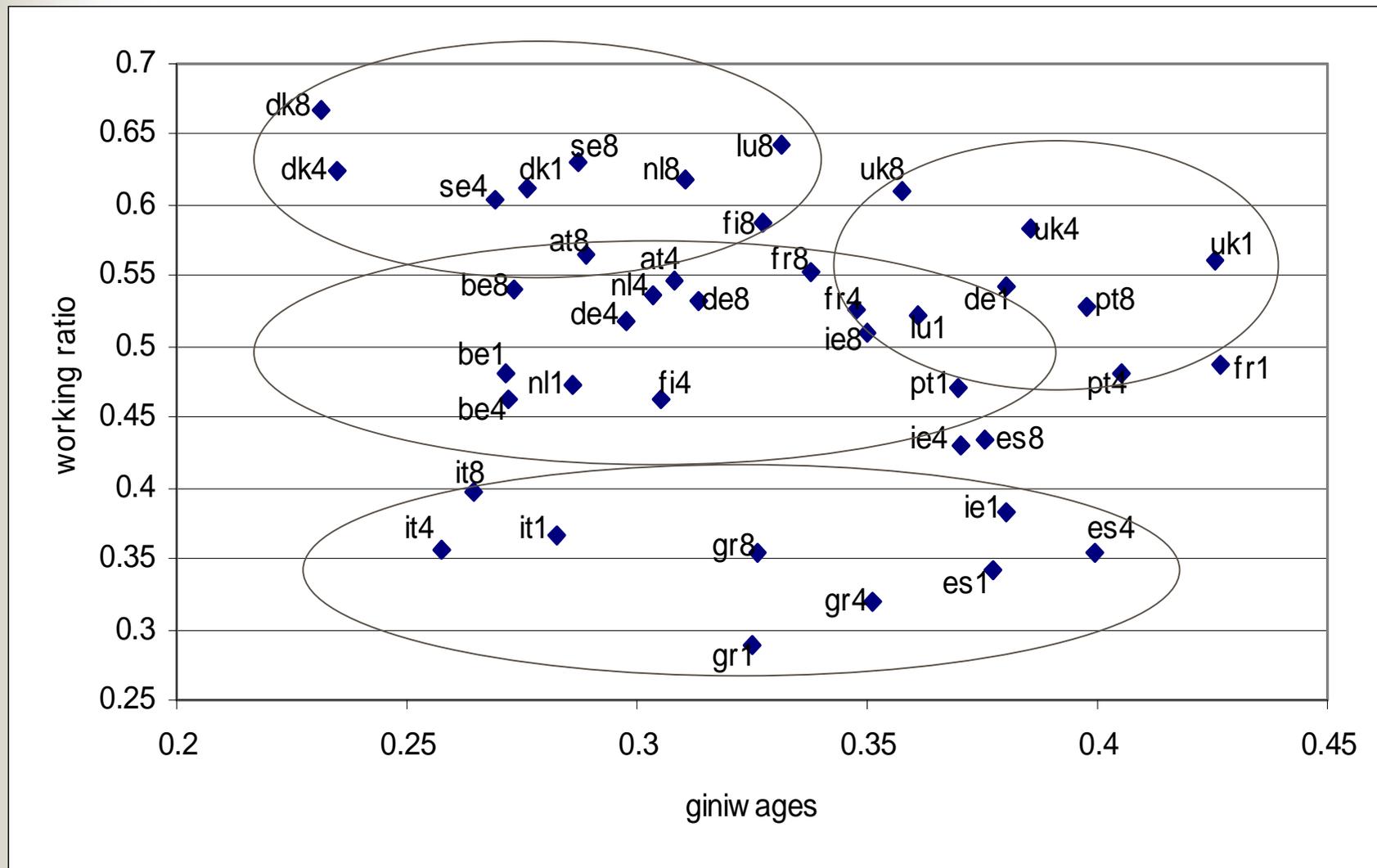
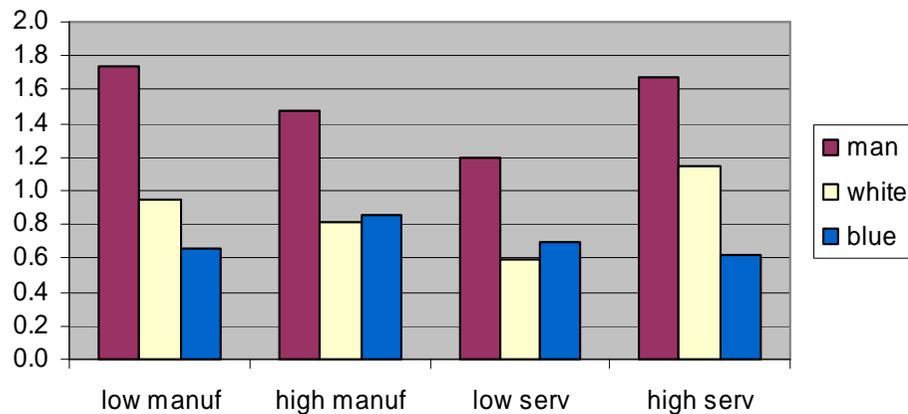


Fig.3b Working ratios and Gini Net Wages in the EU-15 (1994, 1997, 2001)

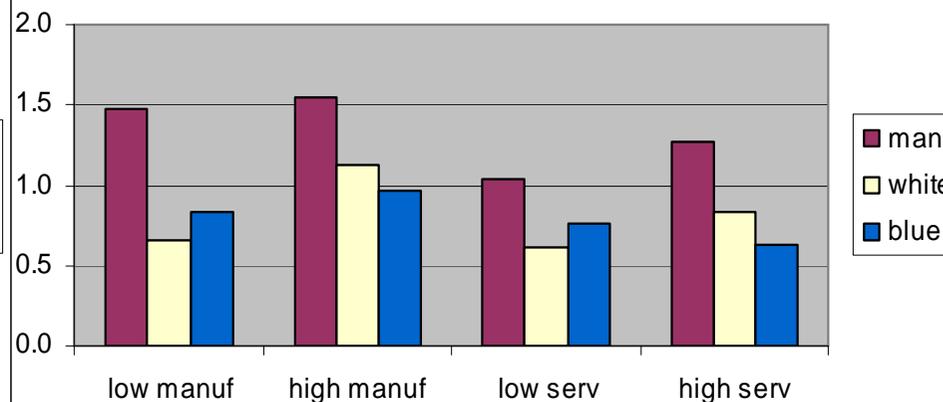


Employees' average wages

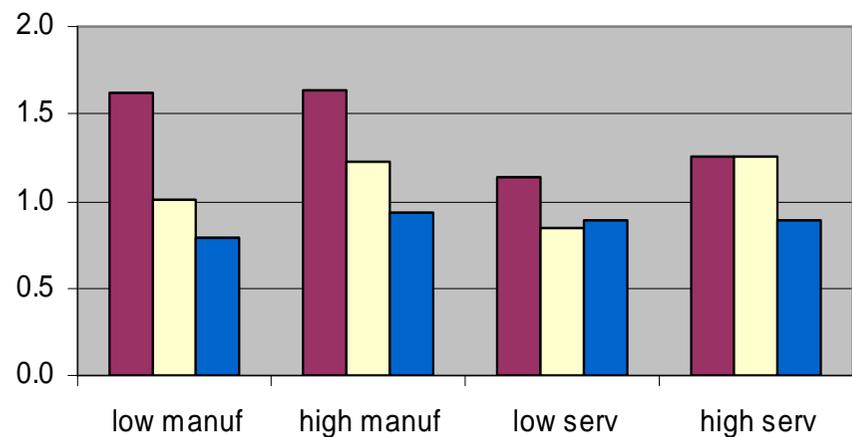
France



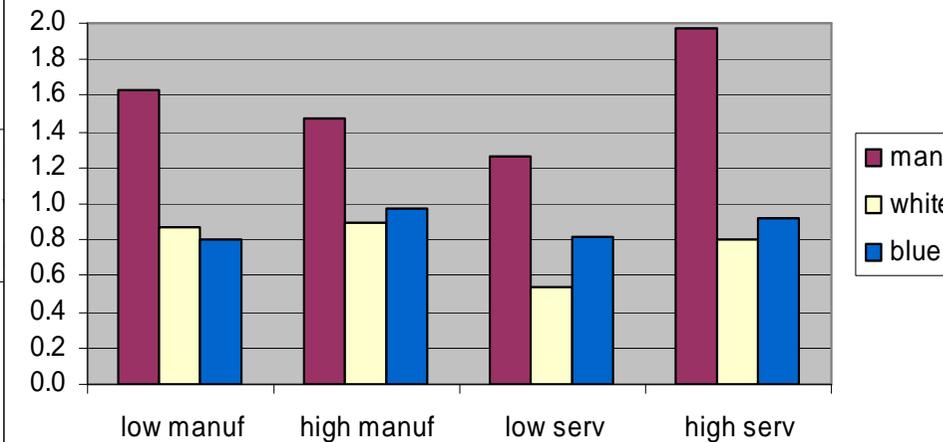
Germany



Italy



United Kingdom



The model

$$WPol_{ij} = aInn_{ij} - bDiff_{ij} + cLmkt_{ij} + cost_{ij} + e_{ij}$$

- **WPol** = average wages of (Man+WhC)/(BlC)
- **Inn** → share of
 - innovative firms or
 - employees with university education
- **Diff** →
 - Expenditure for innovation per employee (total/for machinery only)
 - share of employees with secondary education
 - share of employees overskilled
- **Lmkt** →
 - change in employment 1990-94
 - (managers+white collars)/(blue collars)



Econometric method

- Weighted regression (by total employment 1994, leaving the same total variance)
- Dummies for industry, manufact/services regional dummies (never relevant)

Table 1 - The determinants of wage polarisation in European industries

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--|----------------------|---------------------|--------------------|---------------------|---------------------|---------------------|
| Dispers. Wage dispersion effects of technology and skills | | | | | | |
| Share of innovative firms | | | 1,517 (2.28)** | 1,330 (2.07)** | | 1,331 (2.07)** |
| Share of employees with university degree | 3,468 (4.46)*** | 2,575 (3.61)*** | | | 3,108 (4.13)*** | |
| Compr. Wage compression effects of technology and skills | | | | | | |
| Total expenditure for innovation per employee | -0.119 (-2.93)*** | | | | | |
| Expenditure for innov.-related machinery per empl. | | -0.273 (-1.90)* | | | -0.295 (-2.10)** | |
| Share of employees with secondary education | | | -1,545 (-1.76)* | | | |
| Share of employees overskilled in current jobs | | | | -2,558 (-2.08)** | -2,225 (-2.27)** | -2,558 (-2.08)** |
| Dispers. Wage dispersion effects of labour markets | | | | | | |
| Change in employment, 1990-94 | 0.058 (2.23)** | 0.048 (1.78)* | 0.06 (1.88)* | | | |
| Ratio of managers+white collars to blue collars | | | 0.036 (4.15)*** | 0.038 (4.69)*** | 0.015 (1.89)* | 0.038 (4.69)*** |
| Constant | 2,582 (17.15)*** | 2,590 (15.65)*** | 2,712 (6.92)*** | 3,526 (5.80)*** | 3,636 (6.82)*** | 3,526 (5.80)*** |
| <i>Adjusted R-squared</i> | 0.26 | 0.2 | 0.25 | 0.25 | 0.28 | 0.249 |
| <i>Nobs</i> | 58 | 57 | 68 | 68 | 68 | 68 |

t-statistics in brackets. Significance levels: *90%, **95%, ***99%



Results

- Diversity of effects of technology: innovation vs diffusion
- Diversity of education : high vs. medium
- Job dynamics is linked to wage polarisation
- Skill polarisation is linked to wage polarisation